

SUSTAINABILITY AND ECOLOGICAL TRANSITION IN THE POST-COVID ERA

Challenges and Opportunities
in the Face of Climate Change
and Energy Transition

Ricardo García-Mira
Petra Schweizer-Ries
Cristina García-Fontán
(Editors)



In recent years we have seen the need for changes emerge in the global context from both the social and ecological point of view. More recently, over the last three years, the Covid19 crisis and the climate change with which it is related, through the breakdown of the natural barriers that separate us from other species, is an example that we can go further from this return point and placing ourselves in a context of maximum interest. What is happening with this, therefore, does not take us by surprise, considering that we can clearly identify its anthropocentric origin and how it is related to climate change, from the alterations that human beings have caused in the cycle of ecosystems that maintain equilibrium at the planetary level.

Psychology has taught us that there is no single point of view, and that different theories explain the paralysis of society in the face of the urgency of undertaking effective and efficient climate action. On the other hand, different interests coexist in interaction within a social system. Manufacturers and producers observe nature with different perspectives than users, conservers and consumers, who, in turn, differ in different identities and ideologies, some oriented to act on the improvement of clean production, while others are more focused on reducing the impact by transforming consumption. Some organizations and social movements are oriented towards green production, while others call attention to the need to reduce demand, to go with de-growth. Development and growth, therefore, have occupied different positions in the public debate.

Meanwhile, whoever one has to define the policies that mark the trajectory to follow, in one direction or another, define guardrails to build a regulatory system with sustainability governance and broad participation. The development model has to be sustainable, regenerative and healthy and generate global ideas and values that permeate education and the social system with ethics, convictions and common objectives, which are authentic reference points of respect for planetary boundaries. In this context, the energy transition must begin by understanding what a transition is and why the way in which energy is managed is important within that transition. Generating interdisciplinary knowledge about this is important to be able to design a de-coupling plan to the different economic, technological, ecological, cultural and social ingredients of this transition of the whole system.

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Xoan Vicente Viqueira

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TABLE OF CONTENTS

ACKNOWLEDGEMENTS

00 INTRODUCTION: SUSTAINABILITY AND ECOLOGICAL TRANSITION IN THE POST-COVID ERA: CHALLENGES AND OPPORTUNITIES IN THE FACE OF CLIMATE CHANGE AND ENERGY TRANSITION P.10

Ricardo Garcia-Mira¹, Petra Schweizer-Ries² & Cristina Garcia-Fontán¹
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01 ENERGY TRANSITION, URBAN PLANNING AND HEALTH COLLABORATION IN ENERGY TRANSITION RESEARCH AND PRACTICE IN TIMES OF COVID19 AND BEYOND P.18

Julia Sollik, Katharina Kötter-Lange, Lara Brungs, Alena Schüren and Petra Schweizer-Ries
(University of Applied Sciences Bochum, Germany / Accompanying Research Energiewendebauen)

02 SOME CHALLENGES IN URBAN PLANNING AND HEALTH P.35

Cristina Garcia Fontán
(University of A Coruna-Spain)

03 ACCEPTABILITY, ACCEPTANCE, AND ADOPTION OF RENEWABLE AND SUSTAINABLE ENERGY TECHNOLOGIES: DEFINITIONS AND THEIR TECHNOLOGICAL, CONTEXTUAL, AND PERSONAL DETERMINANTS P.41

Marino Bonaiuto, Federica Dessi & Silvia Ariccio
(Sapienza University of Rome, Italy)

04 CLIMATE CHANGE AND SUSTAINABILITY CLIMATE CHANGE: RESEARCH, POLICY AND HEALTH: A PSYCHOLOGICAL PERSPECTIVE P.64

Ricardo Garcia Mira¹ & Graciela Tonello²
(¹University of A Coruna, Spain; ²National University of Tucuman, Argentina)

05 CONSTRAINTS ON COMMUNITY PARTICIPATION IN SUSTAINABLE SOCIAL HOUSING UPGRADING CAUSED BY THE COVID-19 PANDEMIC P.89

Janine Pöbneck & Sigrun Kabisch
(Department of Urban and Environmental Sociology, Helmholtz-Centre for Environmental Research, Leipzig, Germany)

06 CONTRIBUTIONS FROM LIGHTING RESEARCH TO SUSTAINABILITY AND COVID-19 PANDEMIC P.110

Graciela Tonello
(National University of Tucuman, Argentina)

07 TECHNOLOGIES, SPACES AND PARTICIPATION THE ROLE OF SMART AND SUSTAINABLE TECHNOLOGIES IN SUPPORTING ELDERLY INDEPENDENCE IN THE HOME ENVIRONMENT P.124

Hebatallah Ibrahim¹ & Deniz Hasirci²
(¹Design Studies, Faculty of Fine Arts and Design, Izmir University of Economics, Turkey; ²Dept. of Interior Architecture and Environmental Design, Faculty of Fine Arts and Design, Izmir University of Economics, Turkey)

08 RESEARCH ON THE IDEAL FORM OF OFFICE SPACES AS WORKPLACES FOR TEACHERS P.142

Kinuyo Shimizu¹ & Kaname Yanagisawa²
(¹School of Science and Engineering, Chiba University, Japan; ²School of Engineering, Chiba University, Japan)

09 REGENERATION STRATEGIES FOR AN ANCIENT TEMPLE OF NORTHWEST CHINA BASED ON RURAL COMMUNITY PARTICIPATION P.157

XU Yubin¹, LI Bin² & LI Hua²
(¹School of Humanities and Social Sciences, Xi'an Jiaotong University, China; ²College of Architecture and Urban Planning, Tongji University, China)

10 SUSTAINABLE LIFESTYLES, ATTITUDES AND ADAPTATION MOTIVATIONS TO ENGAGE IN SUSTAINABLE AND CONSCIOUS FOOD CONSUMPTION. ADVANCES FROM MULTIDISCIPLINARY EMPIRICAL RESEARCH ON COLLECTIVE FORMS OF CONSUMPTION P.172

Isabel Lema-Blanco, Ricardo Garcia-Mira & Jesús-Miguel Muñoz-Cantero
(University of A Coruna, Spain)

- 11** A COMPREHENSIVE MODEL OF STRESSORS AND ADAPTATION ON SHIFT WORKERS DAILY WORK LIFE: CONSEQUENCES FOR SUSTAINABLE LIFESTYLES P.189
Amelia Fraga-Mosquera & Ricardo Garcia-Mira
(University of A Coruna-Spain)
- 12** APPLIED SOCIAL SCIENCE RESEARCH FOR HOUSING UPGRADING IN TIMES OF A PANDEMIC P.202
Doris C. C. K. Kowaltowski¹, Elisa A. D. Muianga¹, Marcelle Engler Bridi¹, Luciana Szymanski², Cynthia Nunes de Almeida Prado², Vanessa G. da Silva¹, Daniel de Carvalho Moreira¹, Ariovaldo D. Granja¹, Regina Coeli Ruschel¹, Douglas Lopes de Souza¹, Carolina Asensio Oliva¹
(¹University of Campinas (UNICAMP). Department of Architecture and Building, School of Civil Engineering, Architecture and Urban Design; ²Catholic University of São Paulo (PUC SP). Department of Psychology.)
- 13** THE COVID-19 PANDEMIC'S IMPACT ON ENVIRONMENTAL ATTITUDES P.220
Cristina Gómez-Román^{1,2,3}, Marcos Dono^{1,3}, Sergio Vila-Tojo^{1,2,3}
& José Manuel Sabucedo^{1,2,3}
(¹Department of Social Psychology, Basic and Methodology, Santiago de Compostela, Spain; ²CRETUS Singular Centre, Santiago de Compostela, Spain; ³Universidade de Santiago de Compostela, Spain)
- 14** CITIZEN'S CLIMATE RESPONSIBILITY AND HUMAN VALUES IN THE EUROPEAN UNION P.236
Fernando Bruna
(University of A Coruna, Spain)
- ENVIRONMENTS AND RESIDENTIAL SCENARIOS**
- 15** DEVELOPING COVID-19 SAFETY SOLUTION AT A CROWDED AREA IN KOLKATA P.256
Aratrika De & Woojeong Chon
(Inje University. Division of Multimedia Design, South Korea.)
- 16** UNDERSTANDING SPATIAL AFFORDANCE THROUGH THE EVALUATION OF URBAN SPACE QUALITY EXPERIENCED BY USERS UNDER WEATHER VARIATIONS: THE CASE OF ROOFTOP GARDENS IN CENTRAL TOKYO P.274
Yem-Khang, Nguyen Tran & Ryo Murata
(Ryo Murata Laboratory, Department of Architecture and Building Engineering, School of Environment and Society. Tokyo Institute of Technology, Japan)
- 17** TOWARDS A DUAL RESIDENTIAL SCENARIO AND THE DISAPPEARANCE OF THE INTERMEDIATE SITUATIONS P.290
Luciano G. Alfaya¹, Patricia Muñiz² & Alberto Rodriguez-Barcón²
(¹Polytechnic University of Madrid, Spain; ²University of A Coruna, Spain)
- 18** ECOLOGICAL MOMENTARY ASSESSMENT OF THOUGHT VALENCE IN GREENSPACE AND INDOOR ENVIRONMENTS P.303
Thomas R. Brooks & Rosol Alftealh
(The College of Idaho-Department of psychology, Idaho).
- ANTHROPOCENE AND NATURAL ECONOMY**
- 19** THE ANTHROPOCENE NEW CHALLENGES P.314
Cintia Okamura¹ & Jacques Lolive²
(¹CETESB -Environmental Agency of State of São Paulo, Brazil; ²CNRS -National Center for Scientific Research of France)
- 20** THE SUBTLETIES OF THE ANTHROPOCENE: FROM OVERARCHING NARRATIVES TO THE CONSTRUCTION OF ALTERNATIVE FUTURES P.326
Robin Dianoux
(School for Higher Studies in Social Sciences, Network for the Advancement of Social Sciences. University of Milan)
- 21** NATURAL ECONOMY P.333
Xosé Gabriel-Vázquez
(University of A Coruna, Spain)

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SUSTAINABILITY AND ECOLOGICAL TRANSITION IN THE POST-COVID ERA

Challenges and Opportunities in the Face of Climate Change and Energy Transition

Ricardo García-Mira, Petra Schweizer-Ries & Cristina García-Fontán

The concept of sustainability has become a central challenge for the development of societies, linked to the demand for urgent changes in our lifestyles. The rapid advancement of science and technology is conveying the need to once and for all convert the already widespread awareness of environmental damages into climate action. This requires defining specific development models based not on mitigating the impact of climate change, but on adapting our infrastructures, our economy, and our way of living to the new situation. Yes, the change has already arrived, without a way to remedy it. It is now necessary to adapt to the conditions it imposes to maintain diversity and natural resources. And there is an urgent need for regeneration.

In the search for these development models, psychology has taught us that there is no single point of view, and that different theories explain the paralysis of society in the face of the urgency of undertaking effective and efficient climate action. On the other hand, different interests coexist in interaction within a social system. Manufacturers and producers observe nature with different perspectives than users, conservers and consumers, who, in turn, differ in different identities and ideologies, some oriented to act on the improvement of clean production, while others are more focused on reducing the impact by transforming consumption. Some organizations and social movements are oriented towards green production, while others call attention to the need to reduce demand, to go with de-growth. Development and growth, therefore, have occupied different positions in the public debate.

Meanwhile, whoever one has to define the policies that mark the trajectory to follow, in one direction or another, define guardrails to build a regulatory system with sustainability governance and broad participation. Scientists are part of the system and with the „scientists for future“ movement, they take over responsibility to fulfil the sustainability goals the world has agreed on in the Paris Agreement in 2015. The development model has to be sustainable, regenerative and healthy and generate global ideas and values that permeate education and the social system with ethics, convictions and common objectives, which are authentic reference points of respect for planetary boundaries.

In this context, the energy transition e.g. must begin by understanding what a transition is and why the way in which energy is managed is important within that transition. Generating interdisciplinary knowledge about this is important to be able to design a de-coupling plan to the different economic, technological,

ecological, cultural and social ingredients of this transition of the whole system. The purpose of this book is to analyse a set of experiences that contribute to a better understanding of the concept of sustainability. The strategy is to get a broader picture on the principles behind these experiences and their application in different scientific fields, using different methodologies and different theoretical approaches. Reading the contributions contained in this book should help to realize that concepts such as sustainability or climate change are related not only to technological impact and infrastructure, but also to social aspects, to the welfare for the whole living earth system. With our lifestyles, the way of how we connect with each other and take over responsibility in participation and sustainability governance of all different cultures and societies. In addition, the book provides this analysis from different culturally and disciplinary visions that increasingly show the multidimensional origin of the challenges and the multilevel strategies necessary to face the transition towards a sustainable development.

Science can provide important knowledge like IPCC already showed (IPCC, 2022). Now it is the time for the politicians to follow the call of our citizens for a more ecological and just world in the Fridays for Future Movement. Regulatory systems need to be established that delegates more sovereignty to local associations and civil society organisations. Most important is, that governance systems are established with the participation of society and the formation of empowered communities that involve themselves in a way that supports good communication and cooperation (see also Inner Development Goals, 2022) so that social impact supports sustainable development.

Transition, Urban Planning and Health

COVID19 has come to highlight the vulnerability of society in the face of unexpected developments that gave an experimental approach on governments and sub-government levels. Large impacts were observed on climate and societal change. Collaboration is necessary to govern towards more sustainable systems. This is stated by Sollik and his collaborators.

Sustainability also raises important aspects that have to do with urbanism and our health, which is affected by very diverse technical and social factors, like García-Fontán points out. Finally, Bonaiuto, Dessi and Ariccio raise the need to combine an analysis that takes into account contextual and technological determinants, but also personal ones in decision-making that has to do with sustainable and renewable technological development, and how this has an impact on the acceptability of proposals for action on the territory.

Climate change and sustainability

Strategies to address adaptation to climate change differ, as we have pointed out, in the nature of the disciplinary analysis, but also in the approaches of the different actors. Here, Universities have a great responsibility, since it is

IN PRODUCTION

SUSTAINABILITY AND ECOLOGICAL TRANSITION IN THE POST-COVID ERA
Challenges and Opportunities in the Face of Climate Change and Energy Transition

necessary to train generations of graduates who know how to communicate risk and strengthen the bridges that connect science and politics. García-Mira and Tonello carry out an analysis of the nature of risk and of the opportunities and variables that influence participation to improve community action, describing the key dimensions of social behavior in the face of disasters caused by management models of limited energy resources. They also refer to aspects that have to do with health.

For their part, Pößneck and Kabisch analyze the limitations to community participation that the pandemic showed in the introduction of sustainability criteria in the rehabilitation of social housing. The impact of the pandemic on sustainability is also discussed by Tonello providing some contributions to alleviate the impact from current lighting research.

Technologies, community space and participation

Ibrahim and Hasirci focus on the role of sustainable technology in reinforcing the independence of the elderly in the home environment. One of the important aspects in his analysis is the evidence of how some older people accept, reject or interact with technological advances based on physical, design and psychological criteria. This, in turn, can raise a social perspective in the smart modernization and digitization of the different services that a home environment demands or offers.

For their part, Shimizu and Yanagisawa describe the impact of Covid19 on the work environment of teachers, in terms of healthy working conditions, and present results that support the influence of space on the worker's living conditions, and how the pandemic helped to better understand the changes that the pandemic context introduced in spatial perception and how the unpredictability of an event may require coping strategies based on prevention.

Finally, Yubin, Bin and Hua resort to participatory strategies for the conservation of cultural heritage through research-action strategies with community social fabric. The research process reflects the transactional relationship between people and heritage, where traditional values interact with social needs to reinforce the local identity of the community.

Sustainable lifestyles, attitudes and adaptation

Sustainability has another facet which connects with the transition to a low carbon society through daily activities related to consumption. The work presented by Lema-Blanco and collaborators introduces social and psychological aspects relevant to understanding the motivations for engaging in conscious and sustainable food consumption. This work underlines the role of collective initiatives that mobilize identities, and feelings of connection with organizations that reinforce the values of autonomy in food choices, compared to the products offered by large corporations. These motivations would play a relevant role in

strengthening the feeling of control over one's own decisions when it comes to satisfying one's own needs based on values shared with the community of conscious consumption initiatives.

If the choice within the framework of sustainable lifestyle initiatives is important, so is the impact that shift work has on these lifestyles, which is analyzed by Fraga-Mosquera and García-Mira, who propose a model for understanding of stressors and adaptation to stress in industry.

Adaptation to the pandemic is also analyzed in the work of Kowaltowski et al., who expose the value of applied social research to increase knowledge of the impact of home renovation, or in that of Gómez-Román et al., who propose a model to understand the impact of the pandemic on attitudes towards the environment, showing that the information provided to people about the pandemic can influence their environmental attitudes, which is relevant in the design of campaigns and implementation of public policies on change climate. Finally, the interaction of citizens' climate responsibility with their human values is analyzed by Bruna, who highlights how the self-protection dimension tends to reduce responsibility, while values based on the dimension of self-transcendence, openness to change, or more biospheric values and universalists tend to increase it, and proposes the analysis of values as a strategy for the design of environmental communication policies in relation to the European Green Deal.

Environments and residential scenarios

The residential environment is also a context that deserves evidence in order to understand the role of space and the possibilities offered by urban space for the design of solutions that favor or hinder adaptation transformations to climate change and its most negative impacts.

In this sense, security has always been an objective of public policies. Reducing risk in the most crowded areas during the pandemic was explored in the work of De and Chon, while Khang, Tran, and Murata focused on user input through space assessment under different climatic conditions.

Alfaya, Muñiz and Rodríguez-Barcón focus their analysis on the concept of a dual residential scenario, on the one hand with an urban center based on equal density and greener, with more pedestrian areas, and on the other a dispersed scenario, but digitally connected with resources close and less dense. An intermediate flexible scenario is also opened here that would be imposed according to uses and circumstances. In short, they provide an explanation of how the pandemic and the need to guarantee security raised the need to establish alternative residential and coexistence models. What is the residential management model in the face of uncertainty remains open here.

IN PRODUCTION

SUSTAINABILITY AND ECOLOGICAL TRANSITION IN THE POST-COVID ERA
Challenges and Opportunities in the Face of Climate Change and Energy Transition

Along with security, Brooks introduces here the role of green areas as generating benefits for mental health, in relation to the theory of restoring attention and improving cognitive ability.

Anthropoceno and Natural Economy

Okamura and Lolive introduce the debate on the new challenges of the Anthropocene as a global phenomenon that raises the planetary nature of planetary transformations of anthropogenic origin. The first has to do with disaster management and the need to restore the sense of what is possible to face the impacts; the second is the territorial scale at which we act; and the third has to do with who will act when faced with a problem in which human indifference continues to be a characteristic in the face of the ecological crisis that threatens our relationship with nature. His proposal is the implementation of a research program that defines the framework of actions to face the consequences of the crisis.

Dianoux focuses on the ways that the different actors analyze the global context, where the Anthropocene, climate change or the biodiversity crisis raise the need to make choices based on very different criteria, and proposes the questioning of the narratives that maintain the current understanding of the threat, without which the opening to alternative futures is not possible. To finish, Vázquez reflects on the need to introduce a multilateral criterion in the understanding of the economic system, initially conceived as a way to satisfy the benefit of the human being, to raise the possibility of different perspectives, connecting with more realistic and alternative narratives. challenging.

Conclusion

In conclusion, we need a change of position that allows us to face sustained, intelligent and inclusive development. This constitutes something basic to advance in the profound changes inside economy, policy and education towards a more social conceptualization and the approval of a regulatory framework of the system of governance and decision-making that is fairer and more participatory in which the organized community feels empowered and is enabled to carry out the change needed for a more sustainable development.

This framework of empowerment and enablement to face the different climate and social challenges which largely determine how the world works. And this requires alternative and understandable narratives that strengthen solidarity and its application in communities in a natural way. Top-down approaches can be supplemented by bottom-up approaches. Universities and Education on all levels play a crucial role in teaching also social skills, establishing relationships and building bridges between one discipline and another as well as between science and society. The efficient use of resources requires disconnecting economic growth and the use of resources, promoting zero-emission economies with a transition towards an effective implementation of e.g. clean energy based

on respect for the landscape and for communities and not to plunder valuable natural areas for the clean production of energy.

This book aims to provide experiences that illustrate part of the scientific reflections, introducing science-societal debates and discussions on procedures that could further develop and define the trajectories to follow and the narratives that involve people to adopt.



04

ENERGY TRANSITION, URBAN PLANNING AND HEALTH



01 / COLLABORATION IN ENERGY TRANSITION RESEARCH AND PRACTICE IN TIMES OF COVID19 AND BEYOND

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ABSTRACT

A sustainable energy system will be grounded in renewable energy technology, but its successful implementation also depends on social issues like the needs, fears and the active acceptance of consumers, the challenges faced by technicians and engineers or the assumptions hold by all actors about what a 'sustainable' energy supply for the future will mean. Involved people's varying backgrounds and cultures do and will always hold potential for conflicts, misunderstandings, and the clash of particular interests. In our most current project, which is financed by the Federal Ministry for Economic Affairs and Climate Action, we accompany more than 800 research projects in the context of the national government's initiative on energy transition in the building sector ('Energiewendebauen'). Within our greater research consortium which is composed of scientists with varying backgrounds, our aim is to connect practice and science in order to accelerate the energy transition. By the application of new, mostly uncommon methods, we thrive to foster collaboration and create spaces in which good communication is practiced and where we are able to come into joint action to build a more sustainable world. Within a transformative research design, we argue that the inner transition of every individual plays a vital role in the achievement of the urgently needed societal transformation.

In this paper, we illustrate how our research team at the Teaching and Research Laboratory on Sustainable Development at the University of Applied Sciences in Bochum seeks to implement insights from environmental psychology and sustainability research as well as our experience and findings from previous and current research projects into the practical design of the German energy transition in the building sector.

Keywords: Energy; Covid 19; Sustainable development, Energy transition.

1. INTRODUCTION

The implementation of the energy turnaround in Germany requires a far-reaching transformation of our society including all sectors associated with the energy system. One key sector is buildings and quarters, which accounts for about 35% of the final energy consumption and 30% of CO₂ emissions in Germany. In alignment with the international (United Nations, 2015), European (European Commission, 2020) and national climate policy goals, the German government is aiming for a nearly climate-neutral building stock by 2050 (FME, 2019). This requires the achievement of a significantly lower energy consumption of buildings. Currently, however, the refurbishment rate of buildings is stagnating at 1% (Deutsche Energie-Agentur, 2018). The question arises: What is causing this stagnation?

Building-integrated photovoltaic modules, high temperature heat pumps, building information modeling and machine learning for heat grids are approaches we already have at hand but which we struggle to implement, as challenges in the energy transition lie not only in the development of technological and economic solutions but also in social issues. These include the integration of needs, of fears and the active acceptance of consumers (Schweizer-Ries *et al.*, 2013) as well as embracing all the different assumptions of involved actors about what a 'sustainable' energy supply for the future will mean (Schweizer-Ries, 2011; Schweizer-Ries *et al.*, 2018). Due to the multiple, interconnected actions and actors involved, and the resulting complexity, uncertainty, and divergence of viewpoints, values and intentions, the energy transition has been considered a 'wicked problem' (Head, B, 2008; Seager *et al.*, 2012). Actors' varying backgrounds and cultures do and will always hold potential for conflicts, misunderstandings, and the clash of particular interests. As sustainability scientists and communication researchers, we see it as our responsibility to analyze, but more importantly to transform such situations and conflicts by means of communication and by kindling awareness in all actors (including ourselves) for their deeply personal beliefs and desires as well as for the shared intention of a just and future fit global society (Iser *et al.*, 2012). Our basic idea is to foster collaboration (Münger & Riemer, 2012) and create spaces, where communication can happen, arguing that doing so accelerates the process of the energy transition (Brungs *et al.*, 2021). In times of covid-19, and probably in the post-covid-era as well, our special challenge is to bring the spirit of real interpersonal connection, which we usually generate in physical encounters, into forms of digital collaboration, also for the purpose of meeting worldwide without travelling and producing CO₂ emissions (Westermann *et al.*, 2021).

2. OUR THEORETICAL EXPERIENCE: 30 YEARS OF ENVIRONMENTAL PSYCHOLOGY, ECOPSYCHOLOGY AND SUSTAINABILITY SCIENCE

Our interdisciplinary team draws from a wealth of experience spanning three decades in a broad spectrum of relatively newly evolved interface disciplines such as Environmental Psychology, Ecopsychology and Sustainability Science. Our theoretical background as well as our research methods and practical application will briefly be discussed in the following.

2.1. Environmental Psychology and Ecopsychology

A large part of our interdisciplinary team members' past experiences and background knowledge is grounded in Ecopsychology and Environmental Psychology, two subfields of psychology. In a broader sense, both understand the human being and its environment as one integrated whole rather than viewing them as separate entities (Jäger & Schopaus, 2020). This is essential for acknowledging people's power of shaping our *Mitwelt*¹, the influence of their actions and how this reflects back on us.

Shortly defined, ecopsychology is concerned with how the affiliation and identification (or the lack thereof) with our natural environment impacts human mental and physical health, which is assumed to be further interrelated with sustainability (Conesa-Sevilla, 2019). Environmental Psychology, on the other hand, engages with the “scientific study of the transactions and interrelationships between people and their surroundings including built, social, natural and virtual environments, and sustainability-related behavior”, according to the Journal of Environmental Psychology's description (Journal of environmental psychology, 2022).

2.2. Sustainability Science and Awareness-Based Action Research

Above all, we regard ourselves as sustainability scientists, a research field intended to bring different kinds of knowledge and disciplines together creating a transdisciplinary endeavor to tackle global challenges of sustainable development (Jahn, 2021). We hereby follow a transformational path of sustainability science, as described by Wiek & Lang (2016), with the goal of actually contributing to a change towards sustainable futures (Wiek & Lang, 2016). This action-oriented approach is closely connected to awareness-based action research (Scharme & Käufer, 2015; Scharmer et al., 2021), which is fed by the theory of constructivism. Thus, findings are placed in the context of the social reality of the researcher, which is considered to be constructed and shaped by individual circumstances and

¹ *Mitwelt* is difficult, if not impossible to translate. It is a term coined by Meyer-Abich, a professor for natural philosophy, to express that there is no environment surrounding us (*Umwelt*), which conveys an anthropocentric view, but that humans are a part of it (*Mitwelt*). It seeks to break up the assumed dichotomy of nature and humans and suggests that nature is the whole, embracing both humans and our fellow world (Ingensiep & Eusterschulte, 2002).

values (Michelsen, 2005; Siebet, 2005). This way, action research aims to break down and expand the prevailing understanding of science and truths recognized as universally valid. Through its action-oriented approach, this type of research pursues the claim to clearly lead to an improvement of the life of a community instead of dwelling on the theoretical, descriptive level. It is indispensable here that findings are generated collaboratively, i.e. together with people and ideally free of hierarchy. It includes not only the awareness building of 'the researched', who are seen as co-researchers in the field, but also the main researchers (Iseer et al., 2012). This awareness building is practiced in 'Communities of Practice' (Wenger, 2011) (cf. also chapter 3.2.).

2.3. Systemic 'Interventions' and Sustainability Communication

The energy transition, similar to other sustainable transformations, must be approached systemically and thus entails great complexity. Midgley et al. (2021) propose Systemic Interventions, a methodology located in systems thinking, which he defines as a "purposeful action by an agent to create change in relation to reflection upon boundaries" (Midgley & Rajagopalan, 2021, p. 131). Key to this are two things: first, it embraces critique about value judgements and boundaries of the intervention or the project, summarized under the term boundary critique (Midgley & Rajagopalan, 2021). Reflecting on the boundaries supports the exploration and diagnosis of possible conflicts and marginalization in social processes, which in turn creates knowledge as a basis for action. Second, it uses a varied mix of methods and practices to ensure flexibility (Midgley & Rajagopalan, 2021). Midgley et al. (2021) argue that any form of research is always also an intervention, because the scientist him- or herself is inevitably interconnected with the researched subject (Midgley & Rajagopalan, 2021). Systemic Interventions require stakeholder participation, which leads to the necessity of good communication. In our projects, we try to generate a target-oriented intervention through transparent sustainability communication to create a change in awareness for action. On a broad level, this concerns the operational rules of the system that is to be changed. The prerequisite here is system knowledge, i.e. an understanding of the interactions and interrelationships of the system.

Sustainability communication is described by Michelsen (2005) as a "process of understanding in which the focus is on future-proof social development, at the center of which is the guiding principle of sustainability" (Michelsen, 2005, p. 27). This can take place in different contexts and at different scales, e.g. between individuals, between institutions, in politics, or at universities (Michelsen, 2005). Our underlying assumption here is that good communication does not happen 'naturally along the way', but is an active learning process. As a central aspect, we see that sustainability communication does not imply speaking of but *about*²

² The preposition *of* includes a notion of simply transmitting information from the sender to a receiver, whereas *about* creates a horizontal, hierarchy-free discourse (cf. (Newid et al., 2013), table 1).

sustainability, i.e. communication is not only seen as an information transfer, but as a process that works two-ways (Newid et al., 2013). It needs active interpretation and several steps to be overcome from meaning-saying, saying-hearing, hearing-understanding, understanding-agreeing, agreeing-acting together. Communication should create a resonance in society by generating a discourse, and at the same time accompany and enable transformation processes (Godemann, 2005; Severin, 2005). As all different players need to be connected by shared intentions, visions, values and a 'common ground', we argue for a dialogic, inter- or transdisciplinary and integrative approach, inherent to sustainability (Godemann, 2005). The communication impulses we set during an intervention must be 'appropriately unusual'. That is, if they depart too far from the structure of the system, aversion emerges and the system cannot change without losing its autonomy (Wike, 2005). Ultimately, the impetus for change must come from the system itself. For this, change must be made tangible in practice, which is also reflected in the action research described above (cf. also Siebet, 2005).

3. RESEARCH METHODS, PRACTICAL THEORIES AND APPLIED PROJECTS

In our sustainability science projects, we are following a transformative research design with the aim of extending awareness among researchers and researched (cf. also Scharme & Kaefer, 2015, 2015). At our own university (Iser & Schweizer-Ries, 2021), at a neighborhood in our town, in a German federal state, in a Spanish region and, currently, within the German energy transition in the building sector, we mainly apply transformative research methods and settings described below. *Figure 1* gives an overview of our theories, methods and projects.

The Corona crisis has pushed us to transfer and adapt our methods as well as classes and conferences to online settings and thereby has created "new ways of interaction and collaboration" (Westermann et al., 2021, p. 198). In one of our university's interdisciplinary and international student projects, e.g., we have been working on applied sustainable development using the example of olive-growing regions in southern Spain since 2015 (cf. *Figure 1*: Spanish Region). Within the framework of our intercultural digital summer school which has been financed by the German Academic Exchange Service (Deutscher Akademischer Austauschdienst, DAAD), we have explored scientifically how to establish and foster a feeling of social closeness and the sense of community as well as spaces for collaboration, participation and engagement among the participants who are geographically apart.

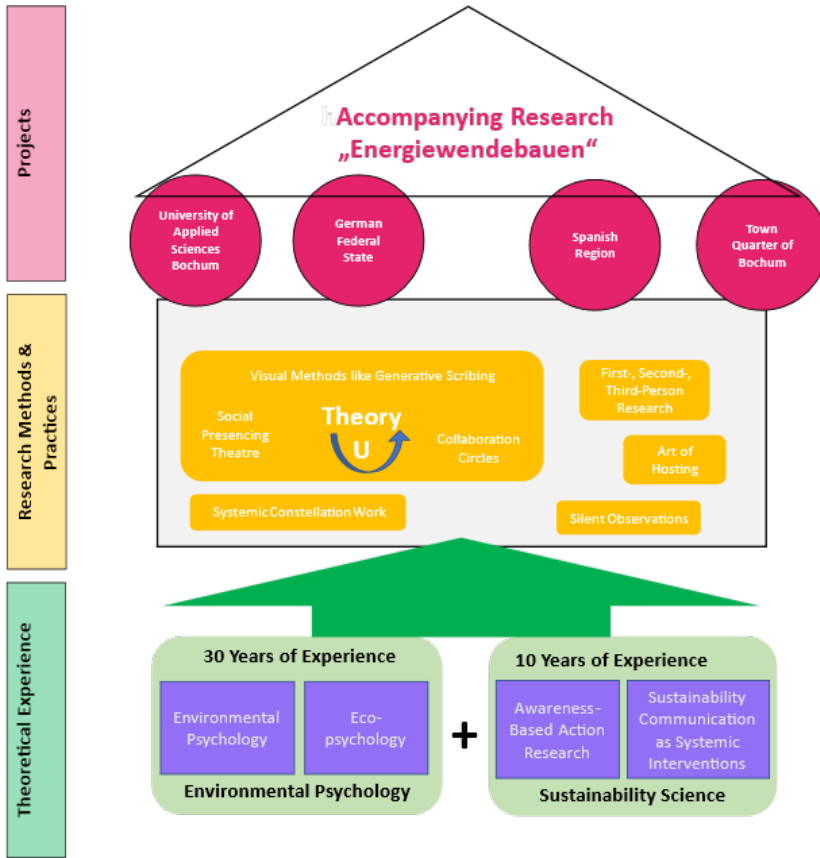


Figure 1. Overview of our theories, methods and projects.

3.1. First-, second- and third-person research

Transformational action research (going back to the famous environmental psychologist, Kurt Lewin (Lewin, 1946) distinguishes three broad strategies that we pursue in our projects: first-, second- and third-person research (cf. e.g. (Reason & Torbert, 2001). All three need to be taken into account for a truly transformational design on all levels and, as Torbert (2000) puts it, “to transform our own research into a bridge between knowledge and practice” (Torbert, 2001, p. 68).

First-person research focuses on the I, the researching individual, and recognizes – in accordance with constructivist theories – how its research and action are inevitably influenced by all aspects of the researcher’s life. In the process of challenging our own perspectives, assumptions and biases, critical subjectivity is gained (Reason & Torbert, 2001). In second-person research, we inquire our team and co-researchers in a collaborative process (Reason & Torbert, 2001).

Consequently, findings are based on intersubjectivity (Chandler & Torbert, 2003). First- and second-person research go hand in hand as group members provide feedback and reflect on one another, ultimately influencing again one's own perspective and thus the work in a team (Reason & Torbert, 2001; Chandler & Torbert, 2003). To reach out to and support a larger audience, communities or even countries, the third-person research seeks to establish an environment that cultivates first and second-person research and practice with the aim of "empowering participants to create their own knowing-in-action in collaboration with others" (Reason & Torbert, 2001, p. 23).

3.2. Theory U (Otto Scharmer)

Theory U, which can be understood as a framework, a method and a process, is based on findings gained in two decades of research by Otto Scharmer, Kurt Lewin, Peter Senge and other action researchers at the Massachusetts Institute of Technology (MIT). Scharmer and his colleagues conducted 150 interviews with leaders, entrepreneurs and innovators in order to investigate change processes (Scharmer & Kaefer, 2015). Social fields play a vital role in Theory U. Social fields are made up of the relationships amongst their members (individuals, groups and systems) which bring about different ways of operating and different practical results (Scharmer, 2019). Scharmer based his work and investigations on the field theory of the above-mentioned Kurt Lewin, also considered founder of action research (Scharmer, 2009). In this approach the behavior of an individual is defined as a function of the current field, which constantly changes and in which different forces influence the individual (Lewin, 2012).

As Theory U integrates action research and organizational learning, design thinking, mindfulness, cognition science and phenomenology as well as civil society movements (Scharmer, 2019), it presumably brings about the urgently demanded transformation. Theory U makes us aware of our blind spots, i.e. the source of our actions. Ultimately, how we pay attention in our Mitwelt influences the way things develop. In the context of Theory U, a lot of methods like coaching circles (cf. chapter 3.4.), Social Presencing Theatre (cf. chapter 3.6.), Generative Scribing (cf. chapter 3.5.) etc. have been developed in order to lead groups and individuals from an ego to an eco-system-perspective and to help systems see and sense themselves (Scharmer, 2019). The U visualizes the process which every individual and group will follow until this state is achieved. On the left side of the U, we start to see and sense our old habits and patterns. We are able to open them up and let them go until we finally reach the bottom of the U, in which the system and the person connect with it-/themselves. Here the connection is made with our source of action as well as with the shared intention of the group as a whole. Up the right side of the U we investigate possibilities of action and via prototyping the emerging future can be explored. In 2015, Scharmer (2019) and his colleagues implemented the Massive Open Online Course (MOOC) u.Lab

which aims not only to practically implement Theory U as a process within a globally community, but also to scientifically advance it (Pomeroy & Oliver, 2018).

In the framework of Theory U, our research aims to vertically deepen learning and teaching (Scharmer, 2019), i.e., connecting with inner processes, thoughts, feelings, and needs, and empathically encountering one's Mitwelt in order to arrive, individually and collectively, at processes of opening our mind, our heart and our will (Scharmer, 2018; cf. also Iser, 2017). Through these processes, we thrive to overcome old ways of thinking, preconceptions and structures and to recognize and realize the highest future potential in the present. We argue that the transformation of inner dimensions, i.e., inner transition, is key for the transformation towards sustainability at the system level (Woiwode et al., 2021). We have applied and researched this process in different projects ranging from a university background to a whole federal state in Germany (cf. also *Figure 1*). In one of our projects at our own university, Bochum University of Applied Sciences, we aim to enable students to develop social meta competencies such as mindfulness, reflection and empathy, and to practice social and scientific methods building on these competencies to advance sustainability research and practice. Our research question is what is needed to create a high quality, mindfulness- or awareness-based environment (cf. also Girmes, 2012), a socio-ecological field (Scharmer, 2009; Lewin, 2012), within the institutional framework of the university that is developmentally supportive for students. To this end, we have mutually been participating in the u.lab course within a research process since 2018. By the application of focus groups, interviews and journaling which have been assessed in seminar papers, we have shown that in a collective practical experience, research and teaching can have a transformative effect. Still, we have experienced the limits of our actions, both with ourselves as well as with the students in the form of our own old, powerful patterns of thinking and acting. However, the open exchange and the methodological support provided by u.lab helped us to trust the process and to endure the ambiguity about what was emerging (Iser & Schweizer-Ries, 2021).

3.3. Art of Hosting

At the gatherings and events that we organize and conduct as part of our projects, we use the so-called Art of Hosting, which can best be described as a way to create resilient learning spaces. The Art of Hosting combines different elements and methods, such as World Cafés, Open Spaces, circle culture, and others. By 'hosting' we mean to facilitate a participatory process of diverse groups with the goal of creating collective meaning and making the groups capable of acting. The basic pillars here are to approach the whole with curiosity, preparedness and openness and to have confidence in the process. The Art of Hosting follows the so-called chaordic path: a path moving between chaos and order. It ensures

a certain amount of structure to the process, but similarly allows for creativity and flexibility so that e.g. unexpected solutions can emerge. At the end of every session accompanied by Art of Hosting, there is harvesting, an integral part that figuratively reaps the fruits of the conversations. They can classically be recorded as a report, but visual or artistic forms such as a drawing (cf. Generative Scribing, chapter 3.5.) are evenly welcome (BZ, 2014).

Based on the 2018 cooperation agreement with the Mayor of Bochum and our University (cf. *Figure 1*: Town Quarter of Bochum), and together with students, we conduct research on the urban renewal process in one town quarter of the city of Bochum (SDG 11). Embedded in a town renewal program and together with the town planners and developers, our goal is to further develop this town quarter as an open, lovable and lively neighborhood and to implement new forms of participation for citizens in the planning and redevelopment process. The focus of our cooperation is the scientific accompaniment of the urban renewal process, bringing together people and institutions in the district as well as actors from local politics, city administration and civil society. By working with Art of Hosting as well as Generative Scribing and art (cf. chapter 3.5.), we aim to support the development of ideas and measures in a collaborative process to advance this district to become more sustainable based on the activities of the residents supported by the town development administration.

3.4. Collaboration Circles



Figure 2.
Connecting actors by the
Accompanying Research
Energiewendebauen – Source:
Jana Kottmeier.

Collaboration Circles or Coaching Circles are a method established in the context of Theory U. Small groups ranging from three to six people meet on a regular basis in order to share and help each other with current concerns by experiencing the U-process together and by engaging themselves in a generative dialogue (ULAB, 2019). A process which is suggested to be followed in the coaching circles is the so-called ‘case clinic’, in which one of the participants shares a particular challenge and the other group members consult the case giver (PISSCG, 2021).

During the pandemic, the initiative Global Activation for Intention and Action (GAIA) established 'Solidarity Circles', which is a modified version of the Case Clinic (PISSCG, 2021). The order is similar to the Case Clinic; however, no case giver is needed as all participants are able to share their current questions or challenges due to the time being split. This framework is used if no group member has a challenge that they think would be suitable for a Case Clinic.

3.5. Visual methods like Generative Scribing

Generative Scribing is a method developed by Kelvy Bird to visually display ideas and discussion points in group meetings or during events to accompany and foster group transformation processes. Precisely within the framework of Theory U (cf. chapter 3.2.), Generative Scribing aims to display meta-aspects of communication such as underlying patterns, dynamics, energies, moods, emotions and future potentials (Bird, 2018). As the scribe – the accompanying artist – draws during the meeting and often in front of the participants, the group can follow the creation process live and sees the image emerging from their discussion, giving them a better overview and new perspectives that feed right back into the scribing. At the end of the meeting, the group has the opportunity to reflect on the process and final image of the Generative Scribing (Bird, 2018).

By using Generative Scribing, the artwork in *Figure 2* visualizes one of the tasks within our new project, the Accompanying Research Energiewendebauen (cf. chapter 4.), which is connecting the different actors involved in the energy turnaround – researchers, practitioners such as NGOs, administrations, municipalities etc. and consumers. During transformation processes or challenging times, the artwork “has high potential to becoming the basis of a shared intention guiding the social body” (Brungs et al., 2021).

3.6. Systemic Constellation Work

In psychological counseling and psychotherapy, Systemic Constellation Work is applied to depict a (social) system e.g. family (Hellinger, 1996) or organisations (Weber, 2001, etc.) with its elements and relationships in space in order to identify and analyze symptoms and challenges in the relationship structure of the system as well as underlying patterns and possible approaches for change and solution of the problem. Starting from the point of view of a system member, the actors which are to represent the system ('representatives') are selected and put in relation to each other (Scholtens et al., 2021).

Within the framework of Theory U (Scharmer, 2021; cf. chapter 3.2.), elements of Systemic Constellation Work are integrated into a mindfulness- and awareness-based practice called Social Presencing Theatre (SPT) (Hayashi, 2021). However,

this practice has less of a therapeutic background and facilitators neither intervene nor interpret the results but go by what is emerging from the process (Hayashi, 2021).

4. OUR CURRENT PROJECT: THE ENERGY TRANSITION IN THE GERMAN BUILDING SECTOR – ACCOMPANYING RESEARCH ‘ENERGIEWENDEBAUEN’

More than 800 German research projects are accompanied by our research on the energy transition in the German building sector (‘Energiewendebauen’) financed by the Federal Ministry for Economic Affairs and Climate Action. Since the end of 2020, the accompanying research follows the structure of five modules: Monitoring and Documentation (I), Buildings (II), Quarters (III), Digitalization (IV) and Networking and Knowledge Transfer (V). Partners of the modules (I) and (V) are the German Society for Solar Energy – Section Berlin Brandenburg (Deutsche Gesellschaft für Sonnenenergie, DGS), the Institute for Future Energy and Material Flow Systems (Institut für ZukunftsEnergie- und Stoffstromsysteme, IZES) and the University of Applied Sciences Bochum (Hochschule Bochum, HSBO) (SERER, 2021).

Our main task at the University of Applied Sciences Bochum is to support good communication and transepistemic, transdisciplinary collaborations between all research projects and the many different actors involved in the energy transition in the building sector in Germany, i.e., fostering collaboration. Within the framework of the Accompanying Research ‘Energiewendebauen’, we bring stakeholders of the building sector together by organizing meetings and exchange formats to promote networking, mutual understanding and cooperation with the ultimate goal of enacting the German Energy Turnaround in the building sector (SDG 7). We focus on collaborations between researchers (engineering as well as social and economic scientists), different kinds of practitioners like NGOs, administrations, municipalities, technicians, energy providers, producers and consumers, which are also seen as prosumers and active citizens. Communications are quite challenging as actors are part of different systems and mindsets (Siebert, 2007). Collaborations are meant to amplify the scope of ideas and perspectives, increase relevance and practicality and getting into action together despite the different languages and cultures of specialized fields (Israel et al., 2008).

4.1. Methods applied in our newest project

We apply and integrate our theoretical and empirical experience described above into our practical research design for the German energy transition in the building sector. Due to the special circumstances during the pandemic, we have

Figure 3.
The need for transdisciplinary collaboration between research, civil society, economy and politics within the energy turnaround - Source: Jana Kottmeier.



been forced to realize various meetings and interactive workshops, Generative Scribing, Silent Observations, Systemic Constellation Work, Collaboration Circles and other formats and methods digitally. This is based on the experiences made in our previous and current projects (cf. Figure 1), in which we have been able to identify enabling and facilitating terms and conditions to establish feelings of social closeness and of community in online settings. These include digital face-to-face meetings, collective check-ins and check-outs, breakout sessions in small groups and the practicing of guidelines for Internet communication, i.e. a 'netiquette', in meetings (IETF, 1995).

We apply first-, second- and third-person research in various settings and in a more agile way than in classical research designs common in environmental psychology. We allow the process to develop itself, leading to an awareness-based research from inside the system (Iser et al., 2012). Hence, we aim to achieve a true, holistic transformation in the building sector.

4.2. First results and outlook

Our meetings and interactive workshops, which have been accompanied by Generative Scribing (cf. chapter 3.5.), show the need for but also the challenges of transepistemic and transdisciplinary collaborations between the research projects and other different actors involved in the energy transition in the building sector in Germany. During one of our latest workshops (cf. Figure 3), participants discussed the communication in (transdisciplinary) research projects as well as the communication between research projects and practice. Participants pointed to communicative challenges resulting from different ways of thinking, views and interests and, at the same time, recognized the great opportunity in these kinds of collaborations to accelerate the energy turnaround.

We ourselves have been experiencing communicative challenges within the greater consortium of the Accompanying Research 'Energiewendebauen', where we as sustainability scientists and communication researchers work together with other social and economic scientists and, most of all, natural and engineering scientists. For example, we have encountered some skepticism against Generative Scribing, Collaboration Circles and other scientific methods that are still rarely used in research practices. To investigate this further and to depict our system within the project, we have conducted different forms of Systemic Constellation – one at the beginning of our project in 2020 and a second one in 2021 – together with an external coach. With this, we have visualized both the system's current state and its best possible future potential. On that basis, we discussed facilitating and obstructive factors to arrive there. In our meetings, we have been practicing the method of the 'Silent Observation' which enables a meta-level reflection of communication beyond what is said in terms of technical and factual content (cf. chapter 3.2.) in order to perceive underlying communication structures and dynamics. Currently, we are processing the results to feed them back into the system and stimulate awareness for communication dynamics. We seek to benefit from the diversity within our consortium and establish favorable communication practices and contribute to the expansion of mindsets and ways to embody the knowledge in order to get into action together to realize our common goal, i.e. help to design the energy turnaround in the building sector in Germany.

With our research team at the University of Applied Sciences Bochum, we have formed Collaboration Circles in teams of four, in which we connect ourselves with each other. By applying this method, we aim to fuel the societal transformation by practicing and pursuing inner transformation (Woiwode *et al.*, 2021). In these circles, we empower each other, so that we are able to engage ourselves for a more sustainable world in the respective context of each one of us. So far, we have been experiencing multiple benefits for our cooperation within the team as well as for our personal development. Our team meetings have become more effective than before as we have been able to connect with each other on a deeper level and consider the interests of others. Therefore, we aim to establish further collaboration circles as 'Communities of Practice' in our greater research consortium as well as with some of the research projects we are supporting in the Accompanying Research Energiewendebauen.

In the following three years of our four-year project, we will continue to gather data on communication processes and drivers and constraints of collaboration among researchers as well as practitioners in a co-creative, participatory action research process and feed these insights into our work to accelerate the process of energy transition in the building sector. The idea is to generate actionable knowledge, that is to say knowledge, which is generated inclusively with the actors involved in a certain transition process (e.g., an energy-efficient housing project).

5. CONCLUSION

Throughout our running projects in sustainability science, we have experienced the complexity of bringing together multiple actors from different (professional) backgrounds and cultures in the real world. To solve the resulting communication challenges and conflicts, we emphasize the necessity of a 'shared intention' to establish true connections and fruitful collaborations (SDG 17). However, theoretically and experientially, we have observed a lot of resistance, reservations and fears as people are not yet used to this new form of cooperation. Therefore, further research on collaboration is needed.

We have shown that it is indeed possible to connect digitally and form a community of practice without traveling, setting an example for how to reduce emissions when organizing academic conferences. Although more senses are involved if we meet in a physical space, we have experienced how consciousness building can also further develop online, if spaces are designed with video and a netiquette.

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02 / SOME CHALLENGES IN URBAN PLANNING AND HEALTH

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ABSTRACT

In a context where everything is wanted quickly, it should be pointed out that the city cannot be planned or modified in the short term. The vision or projection of what will be in the future must be anticipated 10 or 20 years in advance. Transformations are necessary and urgent, but we hope they will be enjoyed by future generations.

In this context, as early as the 1970s the Lalonde report outlined a conceptual framework for a holistic understanding of health as a result of four factors: human biology, the environment, lifestyle, and the organization of health care. Health. From urban planning as a science, the key aspects that it directly affects are the environment and lifestyles.

It is important to note that the city we currently have is the one that has been planned in the 70s, 80s or 90s, depending on the case, and after experiencing this urban model during the last 50 years, a revision is necessary. This urbanism has generated cities based on production as a means and as the ultimate goal of urban environments. Mobility by private car has been a maxim all this time. The increase in asphalted roads and parking areas has implied, in many cases, the reduction of green areas in the city. The tree ceased to have an important role and became a "nuisance". In short, we have cities designed for the car, where citizens become pedestrians, losing many of their rights and having an impact on the creation of healthy and safe environments.

Keywords: Urban Planning; Safe environments; Health; Lifestyle.

1. INTRODUCTION

Focusing on health issues, a key issue is population. The current demographic reality of European cities is very characteristic and must face new challenges. The increase in life expectancy and low birth rates generate an aging population, and the proliferation of one-person households or loneliness are issues that today's city has to urgently address, adapting the design of the city and public space.

The city planned for the middle-aged working man with a car must give way to other models, much more complex and not too much experienced, but must inevitably be more inclusive. The scheme of 8 hours of work, 8 hours of rest and 8 hours of leisure is no longer in force and, in the future, it will be less so. The Covid pandemic has taught us that other ways of working are possible and that it is necessary to rethink the relationship between employment and residence and, with that, the adaptation of housing to new realities.

We must consider that for the city itself to have "health", the environmental, agricultural and forestry systems and, above all, the water cycle, must function correctly, so it is necessary to act throughout the urban organism to connect the life. In this case, the application of urban green infrastructure strategies will play a fundamental role. Green infrastructure, in association with European funding linked to "nature-based solutions", will allow the establishment of a series of environmental corridors based on the water network with which to generate an environmental network where the biodiversity of the city is increased. The health of the city will have a direct impact on that of its inhabitants.

2. THEORETICAL FRAMEWORK

Urban agriculture is another important link in this system that can greatly help public health and environmental education. Already in Howard's (2015) "garden city" proposal, at the end of the 19th century, the need to balance the population centers was raised by establishing 32,000 inhabitants in a total area of 24,000km², of which 4,000km² would be dedicated to urban settlement and the remaining 20,000km² would be reserved for agricultural and forestry production. The proposed garden city had a limit, a balance and the need for an agricultural-livestock-forestry space that would produce what needed to be consumed in the city. In today's city, which has grown without limit, this balance is no longer possible, but it is possible to take advantage of small free islands, some terrain vague, to generate spaces for urban agricultural production, very important for social cohesion. These are meeting places where the possibility of producing healthy and organic food is offered. These are meeting places where the possibility of producing healthy and organic food is offered.

Taking care of an urban garden involves effort, but it is also very therapeutic if the dimension is correct for the strength of each one. All age groups can and should be involved in this activity. Santiago de Compostela has numerous spaces dedicated to these purposes. I have designed the gardens of the Almaciga park, where a proposal for participatory budgets called Hortaliza-te is being developed with great success, which involves the group of young people between 15 and 20 years old in the production of organic garden and has had a much better welcome than expected. Those are small actions, but with a great social impact.

In this reflection on the future of urban planning and health, the climate -or climate change- acquires a fundamental role. In general, in city centers the "heat island" effect occurs due to the concentration of energy, polluting gases from vehicles and the effects of radiation. All this causes increases of 4 degrees in the temperature of the center with respect to the peripheral areas. Climate change foresees significant increases in temperature in the coming years, and these, together with the heat island effects of some urban centers, will make them unbreathable if we do not act quickly.

The measure is simple: it has been proven that vegetation significantly decreases the temperature. In summer, a street with trees and another without them can have temperature differences of 10 degrees. It is a clean solution, without technology, but that takes time. The shade of a 5-year-old tree is practically negligible, while a 40-year-old will generate generous shade. We should think about this when we cut down trees in the city or in any environment or forest. To have a 100-year-old tree, it takes 100 years, the process cannot be accelerated. There is no technology that is worth it, we can put gadgets in the city of all kinds as pollution collectors and justify it as a smart city, but the smartest city of the future will be the one with more green surfaces and the one that recovers its waterways.

In urban planning, we usually work with regulations and standards for green areas per inhabitant and proximity to green areas, among others. These standards, which are minimal, have been taken as maximum in many cases. The World Health Organization recommends that cities have at least 10 to 15 square meters of urban green area per inhabitant. However, it is advised that this ratio can reach values of 15 to 20 meters, and the cities that exceed them are those that have put the environment at the center of their public policies and in their planning and urban design, such as the case of Vitoria, Berlin or Copenhagen.

The transformation of the urban landscape is key. A new design of public space and more permeable green areas is required. Deurbanization is necessary. We will have to undo the city, keep what is necessary and stop the excessive occupation of the territory of the urban plans.

On the other hand, the current city is, in general, hostile to the walker, and strolling in a contemplative way is alien to us. However, the aesthetic aspect of

walking referred to by Francisco Careri (2014) in the book *Walkscapes*, walking as an aesthetic practice, reminds us of the importance of the journey as a place and not as a means, drift as an aesthetic and experimental enjoyment of the city and the environment. scenery.

In this sense, the Covid-19 crisis has caused that, in the first moments of the pandemic, the enjoyment of the walk occurred, that one-hour walk without being able to do anything other than walk. I want to think that many of those moments have reconciled us with the city, they have made us recover a little of the flâneur spirit. I remember the historic center of Santiago dozing like a village with hardly any inhabitants all day and, at 8 o'clock, it became a place full of walkers, since it was a comfortable and pleasant place, without cars.

With the reduction of traffic to what is strictly necessary, the environmental improvements became notable. The streets without noise or pollutants raise a first question about the space destined to the private parked vehicle, which occupies a surface of the public space necessary to fulfill the physical distancing, and a second one about the need to be close to recreational areas that allow us contact with nature.

The distances traveled daily, the feedback need that we generate by expanding the city and depending on the possibilities of the private vehicle should be weakened by the proposals to improve conditions in sustainable mobility and the return of pedestrian space for the development of life urban and health prevention.

Temporary tactical urban planning interventions that seek to quickly return the pedestrian space necessary to fulfill the physical distancing, are carried out today as measures that seek not to solve only a quantitative fact, but also a qualitative one towards a more humane city adapted to the present conditions and future.

The roads closed to traffic and the increase in the capacity of the sidewalks have their precedent in examples such as the intervention carried out in the city of Rionegro, Colombia, whose objective was to change collective behavior by expanding the space for pedestrian mobility, the decrease for road transport and the recovery of adjacent vacant land.

Health safety and pedestrian swelling will be aspects that we will have to take into account in future urban transformations, guaranteeing the right to the city and to continue being in public space.

On the other hand, there have recently been important reflections and publications related to improving the living conditions of the people who inhabit the city, where it should be a friendlier environment that provides a better quality of life for its inhabitants. Chinchilla (2020) in her book ``the city of care'' shows

the need to take into account people, their opinions and their experiences to help transform the city. A more participatory city will be healthier, and efforts must be made to improve human relations and activities other than productivity, such as being able to choose where to sit and rest, use a public toilet, drink clean water without paying or breathe unpolluted air. In the practice of urban planning, in addition to technical, formal and abstract knowledge, the public and civic dimension will be as or more important to generate much healthier environments.



Figure 1. By 1868, Barillet-Deschamps had planted 102,154 trees along the boulevards of Paris.



Figure 2. Almáciga vegetable gardens in Santiago de Compostela. Hortaliza-te Project.

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03 / ACCEPTABILITY, ACCEPTANCE, AND ADOPTION OF RENEWABLE AND SUSTAINABLE ENERGY TECHNOLOGIES: DEFINITIONS AND THEIR TECHNOLOGICAL, CONTEXTUAL, AND PERSONAL DETERMINANTS

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ABSTRACT

Although attention to technologies for renewable and sustainable energies has grown exponentially in recent decades, there are still few theoretical-conceptual reflections on the concepts of acceptability, acceptance, and adoption. Because there is no common understanding and constructs' definitions are sometimes overlapping or contradictory, this chapter summarizes the concepts' definitions, and tries to disentangle them. This chapter identifies the main variables, and models employed in the literature in order to advance the scientific debate on this topic. Conclusions highlight that acceptability is the favourable attitude towards the renewable and sustainable energy technology; acceptance, is a tripartite intention concept comprising both socio-political support, and community use, and market buying; adoption is the behavioural outcome towards the target technology for a certain renewable and sustainable energy.

Keywords: Acceptability; Renewable; Sustainable energy; technologies.

1. INTRODUCTION

Every country in the world is committed to increase the contribution of renewable and sustainable energy sources to its energy needs. Some countries have set themselves ambitious targets, thus creating a very fertile context, from a technical-economic point of view, to develop new technologies for renewable and sustainable energy production. However, as the penetration of renewable and sustainable energy plants and new technologies increases, it can be observed that their deployment is not as efficient as expected. In fact, it is not uncommon for new projects and new plants to be strongly contested. The aspect of social acceptability, acceptance and adoption of sustainable technologies is therefore of fundamental importance, although it has so far been marginally

and peripherally addressed, if compared to the attention devoted to the core technological innovation – since the 1970s and 1980s, when programs to create environmental policies were launched.

Consistently, one of the first studies on technology acceptance, specifically nuclear technology, was published in 1977 (Fischhoff *et al.*, 1978). As early surveys of public acceptance of renewable and sustainable energy, particularly wind power, revealed very high levels of support for the technology, local energy companies, authorities, and private investors did not think implementation would have been a problem (Carlman, 1982).

Carlman was among the first scholars to define the problem of social acceptance regarding a renewable and sustainable energy technology, highlighting how the siting of wind turbines was a matter of public, political, and regulatory acceptance (Carlman, 1984). Despite this, until the 1990s issues regarding the social acceptability, acceptance and adoption of renewable and sustainable energy technology were not studied in depth and, still nowadays, they remained as mostly confused and ambiguous issues (Wüstenhagen *et al.*, 2007). The present contribution aims to disentangle among such constructs, as well as to clarify their major determinants, with reference to the technologies for renewable and sustainable energy in general, but with a special attention and exemplifications referring to biofuels (as part of the EC H2020 ABC-Salt project: <https://www.abc-salt.eu/>). For the sake of the present writing, the term “social” is considered as implicit when using the expression of acceptability, acceptance and adoption of renewable and sustainable energy technology, as this issue pertains either individuals and/or their collective aggregates

2. DEFINITIONS OF ACCEPTABILITY, ACCEPTANCE, AND ADOPTION

Wüstenhagen *et al.* (Wüstenhagen *et al.*, 2007) (p. 2684) pointed out that in acceptance studies “clear definitions are rarely given”, and the same can be argued for all the terms: acceptability, acceptance, and adoption. For example, in relation to the study of renewable and sustainable energy technologies, on the one side when we refer to the term “acceptance” we usually refer to an approval process, active or passive, of a specific technology product or policy (Bertsch *et al.*, 2016). Despite the clarity of this definition, on the other side, the same authors point out that the concept of acceptance is often mistaken for acceptability within the literature. As pointed out by Wolsink (Wolsink, 2012), there is currently no common understanding of acceptance, especially if we consider it relatively to its neighbour terms such as acceptability and adoption. The terms acceptability, acceptance, and adoption referred to renewable and sustainable energy technologies are used interchangeably, or in place of other concepts such as user satisfaction or engagement, in much of the literature

(Nadal *et al.*, 2019). Because the term “acceptance” is sometimes interchanged with the term “acceptability”, even if the two have a different semantic meaning (Schumann, 2015), and because they are the foundation on which both the evaluation framework and the acceptance models are built (Adell & Nilsson, 2018), with the aim of having a clearer understanding of the topic, the definitions and uses of acceptability, acceptance, and adoption most frequently found in the literature are described below.

2.1. Acceptability

The term “acceptability” appears underrepresented in the literature compared to the term “acceptance”. Brunson’s (Brunson, 1996) (p. 27) definition of social acceptability is general and intends a concept that is loosely applied in the social sciences to describe the extent to which people prefer a given situation. In another, more recent definition, however, “social acceptability is a judgment people make about whether an action, attribute, or condition is valued as superior or relatively neutral when compared to potential alternatives” (Brunson & Shindler, 2004) (p. 531). In relation to wind energy projects, Fournis and Fortin (Fournis & Fortin, 2017) (p. 5) offer a comprehensive definition of acceptability “as a process of collective assessment of a given project (understood as the specific embodiment of complex interactions between technology and society within a given socio-technical project), integrating plurality of actors (stakeholders) and spatial scales (from global to local) as well as involving the specific trajectory (past and future) of a political group or policy (community/society)”. Some authors agree that the technology acceptability is an a priori phenomenon in the time scale: that is, one’s perception of a system before use and therefore it predicts the willingness to use a tool (Barcenilla & Bastien, 2009; Dillon & Morris, 1996; Distler *et al.*, 2018; Février, 2011; Quiguer, 2013). As pointed out by Tricot *et al.* (Tricot *et al.*, 2003), acceptability is thereby a mental representation that a user has of a tool prior to its use (and we could further speculate that by approaching it as a shared mental representation, we could study it in terms of social representations). In sum, when referring to the individual level, acceptability can be operationalised as a favourable attitude towards the renewable and sustainable energy technology.

2.2. Acceptance

“Acceptance” is a more common term in the literature and, consistently, its definitions are more present, though they are not necessarily more consensual. Some definitions suggest that acceptance would be an evaluation of the technology and of the presence of related facilities in the community, providing definitions of “acceptance” that are very close to the once of “acceptability”. For instance, Schumacher and Schultmann (Schumacher & Schultmann, 2017) define “local acceptance as a positive evaluation by direct residents of a local

biogas facility, including both passive approval and active support.” (p. 2395). Similarly, according to Wolsink (2012), the social acceptance of a phenomenon such as the implementation of wind energy is the degree to which people like or dislike the phenomenon (p. 1786).

Several other definitions, instead, present acceptance as a construct more related to behaviour and behavioural intentions. Following Huijts et al. (Huijts et al., 2012), the term “acceptance” refers to features favouring a behavioural response either in favour or against a renewable and sustainable energy technology. Thus, “acceptance” refers to a behaviour that accepts and promotes the use of a technology, rather than inhibiting or criticizing it. Support can be expressed by publicly supporting the technology, or simply by buying and using it. Instead, resistance can be expressed not only through rejection of the technology, but also through real protest initiatives (Schweizer-Ries, 2008). Therefore, for Chin et al. (Chin et al., 2014), “it is a metric to indicate public support toward an innovative technology for a sustainable development path” (p. 31). On the other hand, to Anderson et al. (Anderson et al., 2012) (p. 687), state that acceptance implies passivity and thus does not necessarily reflect community approval or support.

Thus overall there is agreement among several authors that acceptance is an a posteriori pragmatic evaluation, i.e., one’s perception of the system after use (Distler et al., 2018; Février, 2011; Quiguer, 2013). However, the above mentioned array of definitions results in a confusing mix of psychological constructs, spanning from an attitude to an intention, up to a behaviour.

One of the first widely shared, and psychologically more focused, definitions of acceptance is the one proposed by Wüstenhagen, Wolsink and Burer in 2007 (Wüstenhagen et al., 2007). Acceptance is here divided into three distinct dimensions, respectively called socio-political acceptance, community acceptance, and market acceptance. The authors have elaborated this model underlining the interaction between levels of analysis, each one with its corresponding specific actors and related interests (Wüstenhagen et al., 2007). First, the socio-political dimension of acceptance lies at a more general and extended level: it concerns the general context relating to the community of professionals, politicians and public opinion. This level includes all of the opinions that have been identified at national level, which may differ from one country to another depending on specific energy options. In the socio-political dimension, the opinions of the general public, stakeholders and policy makers are closely linked. Second, the community acceptance refers to the acceptance of site selection by the local community and includes the issue of NIMBYism (acronym of “Not In My Back Yard”), i.e., the phenomenon for which a person supports the development of a renewable and sustainable energy technology until the relative plant has to be done in their vicinity (Kahn, 2000). At this level, the quality of the trust relationship between the community and local

institutions, and specifically the perception of being faced with a pre-established or non-transparent decision-making process, is particularly important; another very important factor is the perception of a cost-benefit distribution that is perceived as fair, just and clear as possible. For this reason, three main factors have been identified in determining community acceptance: procedural justice, distributive justice, and trust in the community (Wüstenhagen *et al.*, 2007). Third, according to market acceptance, it is possible to analyse a technology social acceptance by following the literature regarding the relevant processes of introduction, development and diffusion of an innovation. These processes involve the producers' community, the investors and the end-users. However, the triangular model of Wüstenhagen *et al.* (Wüstenhagen *et al.*, 2007) is mainly based on the literature related to the acceptance of wind energy's technology. The same authors, in fact, argues that the crucial factors for the acceptance of different technologies can be very different.

The model of Wüstenhagen *et al.* (Wüstenhagen *et al.*, 2007) has the merit of presenting a first theoretical framework that opened the way to a whole series of theories about energy technology acceptance. On the basis of this model, several theories, each one considering an ad hoc set of variables, have tried to explain why some energy proposals, which generally seem to meet the public opinion's approval, then find concrete obstacles at the individual level when they are locally implemented. If acceptance corresponds to the favourable or contrasting orientation of the person towards the renewable and sustainable energy technology implementation, it matches the psychological concept of intention.

In sum, when referring at the individual level, acceptance can be operationalised as a tripartite intention, within such a framework, namely: as an intention to support, to use or to buy a certain renewable and sustainable energy technology.

2.3. Adoption

When discussing technology adoption, among the broadest definitions is the one proposed by Rogers (Rogers, 1995): an individual or collective decision to accept and use a tool. With regard to agricultural technologies, for Bewket (Bewket, 2007) (p. 409), adoption "refers to the farmers' expression of commitment for a sustained utilization of the technologies as part of the local agricultural system after the external assistance is withdrawn". Technology adoption is viewed as a multi-step process that begins with the "decision to adopt (selecting, purchasing or committing to use it) and then achieving persistent use", according to Renaud *et al.* (Renaud & Van Biljon, 2008). In sum, adoption can be operationalised as a stable favourable behavioural support, use or adoption of the sustainable technology, a somehow stabilised and prolonged action across time, up to the habit.

In conclusion, there are numerous meanings for the term's acceptability, acceptance, and adoption. Although the terms have often been interchangeable (Nadal *et al.*, 2019), it is possible to find an unambiguous key across many definitions in the literature. In the presence of a new tool or technology – including those in the field of renewable and sustainable energies such as wind turbines, biofuels, and the like – the users first evaluate the acceptability of the renewable and sustainable energy technology, then they can coherently develop a favorable intention to accept it (Bobillier-Chaumon & Dubois, 2009). Thus, it is possible to make a distinction between an a priori perceived use of a renewable and sustainable energy technology, i.e., its acceptability; and its intended use, i.e., its acceptance; up to including its use into one's own daily life, i.e., its adoption (Barcenilla & Bastien, 2009; Dillon & Morris, 1996; Distler *et al.*, 2018; Février, 2011; Quiguer, 2013; Renaud & Van Biljon, 2008).

With this differentiation in mind, it is clear that most studies consider acceptability and acceptance rather than adoption (Busse & Siebert, 2018). Scientifically disentangling among the three terms above can help in clarifying, understanding, and managing the social processes involved in developing and adopting technologies for the renewable and sustainable energy transition. This, of course, implies a proper mapping of all the relevant clusters of variables which act as their potential determinants, as highlighted in the next paragraph.

3. ANTECEDENTS

The acceptability of a renewable and sustainable energy technology, and its subsequent acceptance, up to its final consequential adoption by the stakeholders and the public, can be influenced by three macro-categories of antecedents, or classes of variables. They are operationalised as perceptions, beliefs or other psychological constructs from the standpoint of the stakeholders and/or the public of a given renewable and sustainable energy technology (e.g., biofuels). They can be:

1. an energy technology's intrinsic technological aspects;
2. the contextual factors involved in its adoption process;
3. the personal factors of its adopter.

The first class of variables clusters the intrinsic features of the item to be accepted: for example, beliefs about biofuels' technology characteristics.

The second class of variables clusters the adoption process' contextual features which surround and accompany the new renewable and sustainable energy technology introduction: for example, beliefs about biofuels' economics and marketing, and their relevant global and local policies.

The third class of variables clusters the adopter subject's personal features: for example, beliefs and other social-psychological features of both expert stakeholders and potential public which are relevant for biofuels on the market.

3.1. Technological features

Perceived renewable and sustainable energy technologies' intrinsic characteristics – such as, in biofuels case, chemical properties, compatibility with existing infrastructures, change of land use, feedstocks, emissions and environmental impact – are an important factor affecting acceptability and acceptance because they are able to influence people's assessments of the renewable and sustainable energy technology (e.g., regarding the noise generated by wind turbines, (Pedersen, 2004) or the various intrinsic biofuels technology's pros and cons (Dessi *et al.*, 2022). Taking into account biofuels, which are among the key players in the renewable and sustainable energy transition, the main technical barrier to acceptance and adoption seems to be their chemical properties compared to traditional fuels (Jayed *et al.*, 2009). There are, however, other problems related to the biofuel technology's characteristics, such as landscape changes like deforestation to accommodate agricultural crops. These landscape changes can cause concern about environmental and aesthetic features (Zoellner *et al.*, 2008), and also lead to resistance from local farmers (Amigun *et al.*, 2011). Among the positive characteristics of biofuels, there is their compatibility with conventional engines (Milazzo *et al.*, 2013): biofuel use does not require crucial modifications to traditional engines and it can also be supplied with the existing petrol facilities (Van den Hoed, 2007). Dessi *et al.* (Dessi *et al.*, 2022) identified the full range of intrinsic features of biofuels' as a renewable and sustainable energy technology: they represent potential biofuels' acceptability antecedents: each of them can favour or hinder the subsequent biofuels acceptability attitudes and the consequent acceptance intentions, in view of a final biofuels adoption; together with two other classes of antecedents, namely, contextual factors and personal factors.

3.2. Contextual features

Contextual factors, namely perceived characteristics of the context, are also able to directly or indirectly affect the acceptability of renewable and sustainable energy technologies (Hackbarth & Madlener, 2016). Regarding the adoption process context, it is possible to investigate two main different aspects: economic and market aspects; and policy and administration aspects.

In the market context, for example, the cost of biofuel is central to acceptance: in fact alternative fuels are mostly perceived positively, as long as they are not more expensive than conventional fuels (Hackbarth & Madlener, 2016). However,

this might not always be the same. Studies show that non-expert consumers are willing to pay more for biofuels than fossil fuels (Pacini & Silveira, 2011; Savvanidou *et al.*, 2010), whilst people who are familiar with biofuels are less willing to pay a higher price for them (Lanzini *et al.*, 2016). When the price of biofuel is the same as the price of fossil fuels, other factors influence the consumer choice (van Vliet & Mbazza, 2011), such as environmental sustainability aspects like reduced carbon emissions (Van de Velde *et al.*, 2009) or economic aspects like the cost of ownership (Mabit & Fosgerau, 2011): this shows the relative interplay among the various features both within the same class or across different clusters of variables. Among car owners, the increase in food prices represents one of the factors that prevents from buying biofuels, along with the lack of availability at the nearest petrol station (Tyner, 2013). Among the relevant economic aspects, there is the positive effect of local biofuels adoption on local jobs and, more broadly, on local income. For example, in a study by Selfa *et al.* (Selfa *et al.*, 2011) the concern about the location of a biofuel refining plant has decreased in view of deriving economic benefits.

On the other hand, an important socio-political aspect driving the acceptance of biofuels is their support by policy makers: a study by Scarlat and Dallemand (Scarlat & Dallemand, 2011) showed that the use of biofuels is related to government policies and support programs. In order to ensure the implementation of sustainable technologies, it is important that decisions are taken via participation processes and not through hierarchical procedures (Wolsink, 2007). A study by Terwel *et al.* (Terwel *et al.*, 2011) on the acceptability of decisions regarding Carbon Capture and Storage technology showed that people were more willing to accept decisions by the political authority after knowing that environmental NGOs and industry organizations had been involved in the decision-making process. As highlighted by Chin *et al.* (Chin *et al.*, 2014), a policy in support of biofuels must have several characteristics: it needs a clear objective, it must be consistent (Bomb *et al.*, 2007), it must have government agencies able to deal with biofuel issues in a timely manner (Sovacool & Ratan, 2012), and the community must be involved (Wüstenhagen *et al.*, 2007).

Over and above the technology to be accepted and its context of adoption, the specific individuals can still make a difference on the basis of their social-psychological differential features.

3.3. Personal features.

Literature shows that main social-psychological factors that play a key role in the acceptability, acceptance, and adoption – of renewable and sustainable energy technologies – are the cognitive, affective, and social features of the potential acceptor and adopter, i.e., her/his own knowledge, experience, perceived outcome efficacy, values, emotions, trust, norms, fairness, place attachment and place identity.

In general, people have little subjective knowledge about renewable energy such as biofuels (Amin *et al.*, 2017; Savvanidou *et al.*, 2010; Terwel *et al.*, 2011). A low level of knowledge on carbon capture and utilization technology is associated to a greater perception of risk and a stronger rejection of the technology (van Heek *et al.*, 2017). Knowledge can also influence the evaluation of the pros and cons of energy alternatives; for instance, the stronger the knowledge that respondents have about hydrogen, the more it is perceived as environmentally friendly (Molin, 2005). Multiple studies regarding the acceptance of hydrogen technology have shown that, the greater the person's knowledge about renewable energy, the more likely the person is to accept it (Achterberg *et al.*, 2010; Pagiaslis & Krontalis, 2014). Experience is able to increase the knowledge of a given technology as well as the perception of costs, risks and benefits (van Heek *et al.*, 2017). Studies on wind energy have shown that having directly visited a wind farm and therefore having direct experience can influence the acceptance of wind energy (Baral, 2018; Emmerich *et al.*, 2020; Molin, 2005). A study with early adopters of hydrogen vehicles, showed that after a ride with hydrogen vehicles, they were perceived as safer and better performing than before (Martin *et al.*, 2009).

Outcome efficacy refers to the extent to which solutions to a problem can be found. In the case of technology acceptance, outcome efficacy concerns both the likelihood that the new technology will reduce energy problems, and the extent to which a person thinks that pro or anti-technology behavior will influence the implementation of the technology (Huijts *et al.*, 2012). Outcome efficacy was the strongest predictor of intention towards biofuel use (acceptance, in our terms) in a study on Iranian agriculture advisors' perception toward biofuel (O'Garra *et al.*, 2008).

When it comes to values, those of self-transcendence are able to influence the cost and benefit assessments of energy alternatives (i.e., their acceptability) and they can affect acceptance; biospheric values correlate with perceived energy risks, while selfish values seem to correlate with perceived benefits (De Groot *et al.*, 2013; Dietz *et al.*, 2005).

Regarding emotions, both positive and negative affect predict attitudes (Devine-Wright, 2009) and, in studies regarding acceptance of energy technologies, positive affect have positively influenced laypeople's evaluations of hydrogen technologies (Montijn-Dorgelo & Midden, 2008), nuclear power plants (Peters & Slovic, 1996), and carbon capture and storage (Midden & Huijts, 2009); while negative affect have negatively influenced evaluations of these renewable energy technologies.

Speaking of trust, several studies have shown that trust is able to influence the perception of risks and benefits for a technology with a high level of risk such as nuclear (Siegrist & Cvetkovich, 2000) or hydrogen technology (Montijn-Dorgelo & Midden, 2008), and it influences the assessment and acceptance of a little-

known CO₂ storage technique (Midden & Huijts, 2009). Investigating trust based on moral integrity and on competence, in a study on the public acceptability of renewable energy projects in China and in the Netherlands, it was seen that trust based on moral integrity is more likely to influence the acceptability of the project (Liu et al., 2020). Dessi et al. (Dessi et al., 2022), however, find that for EU expert stakeholders both kinds of trust bases are valued as important in order to facilitate biofuels social acceptance, while the trust in a technical-scientific source is key. More broadly, trust can be conceived as a part of wider social processes: for example, in Sattler and Nagel (Sattler & Nagel, 2010), acceptance of an innovation is due to the interaction and mutual learning that occurs within a group of individuals or a community (p. 71); while for Heldt et al. (Heldt et al., 2016), “acceptance can be influenced through trust and shared responsibility in public participation processes.” (pp. 1052, 1053).

When it comes to norms, subjective and descriptive social norms significantly predict intention to use biofuels by Iranian agricultures’ advisors (Yaghoubi et al., 2019). Social norms are positively correlated with support intention for the renewable energy transition, especially among countries with higher levels of individualism and cultural rigidity, or lower levels of air pollution and vulnerability to climate change risks (Chan et al., 2021).

Individuals also evaluate a specific technology on the basis of their perception of the fairness of the various decision-making processes involved in its implementation. Procedural and distributive fairness influence attitudes (i.e., acceptability) directly and intentions (i.e., acceptance) indirectly. Empirical evidence has been found in relation to wind energy (Aitken, 2010; Gross, 2007; Wolsink, 2007; Wüstenhagen et al., 2007) for the general public.

Finally, some studies (Devine-Wright, 2009; Zoellner et al., 2008) stress the link between people and the territory as a further factor that affect the acceptability of innovations or transformations of the territory itself (regarding renewable and sustainable energy technology too).

Such a wide array of relevant personal features can also be conceived in terms of variables which strictly pertains to: the person’s relation with the technology (e.g., knowledge, experience, outcome efficacy, emotions); the person’s relation to the social context (e.g., norms, trust); the person itself (e.g., values). Such a continuum can have implications in terms, for example, of each feature malleability and therefore of its possible management in view of its impact in favouring the transition towards the acceptability, acceptance and adoption of renewable and sustainable energy technologies.

Of course, the above-mentioned antecedents are matched with relevant criteria to gauge their effects, as summarised in the next paragraph.

4. CRITERIA

The measurement operationalisation for dependent variables such as acceptability, acceptance, and adoption of sustainable technologies includes attitudes, intentions, support, and Willingness To Pay (WTP).

A review of the literature on public's attitudes (i.e., acceptability) toward wind energy projects and wind energy installations shows that several different variables and measures were used to operationalise this construct (Geraint & Gianluca, 2016). Most of these studies have used standard quantitative surveys with open and/or closed-ended questions, although there are usually no standard protocols to ensure a defined shared understanding of the core concepts. In a study conducted on a group of German citizens to analyze public acceptability of renewable energy, the results show that participants display very positive attitudes (acceptability, in our terms) towards decarbonization of the energy sector and towards the transition to renewable energy sources (Bertsch *et al.*, 2016). In Spain, to explore the market acceptance of biodiesel among a group of Spanish drivers, a study investigated the intention to use biodiesel and concluded that to increase biodiesel use, the best option is to increase biodiesel knowledge and environmental self-identity. (Gracia *et al.*, 2018).

Regarding intentions (i.e., acceptance), support is generally measured through items of support and opposition as in a study conducted on a sample of German citizens to investigate the social factors which are relevant for the formation of public acceptance towards different types of renewable energies: this shows that some factors have a greater influence on acceptance, such as fairness of procedures and active involvement of local authorities in the implementation of the energies (Zoellner *et al.*, 2008).

Regarding behaviours (i.e., adoption), in the field of biofuels, for example, the WTP for biodiesel on car owners in Spain showed that consumers are willing to pay 5% more than for conventional fuels (Giraldo *et al.*, 2010). Similar results emerged in a study conducted in Finland (Moula *et al.*, 2017). As for expert stakeholders, a study showed that 32% of respondents are willing to spend 5-10% more, only if the biofuel presents reduced environmental impacts. In Italy, a similar study was carried out on a sample of Italian motorists, whose WTP for biofuels was found to be negatively affected by the degree of awareness and knowledge: i.e., the lowest WTP scores occur in those consumers who are more aware and well informed about biofuels (Lanzini *et al.*, 2016).

Antecedents and criteria are incorporated and organized by specific models, with the aim of achieving a broader comprehensive picture of the acceptability, acceptance and adoption process for a certain renewable and sustainable energy technology, as summarized in the next paragraph.

5. THEORETICAL MODELS

The literature offers some models trying to articulate the relations among some of the above-mentioned variables. Some of them focus more on the personal features of the adopter; while other more interdisciplinary models focus on a broader range of determinants as predictors of attitudinal (i.e., acceptability), intention (i.e., acceptance), and behavioural (i.e., adoption) criteria.

5.1. Social-psychological models

These models tend to privilege subjective individual characteristics that can influence perceptions about new renewable and sustainable energy technologies and, consequently, the way people will approach them. As getting detailed information about the effect of psychological variables can help to understand how people come to build an opinion and intention up to behaving, different families of psychological theories have been used to study the acceptability, acceptance, and adoption of renewable and sustainable energy technologies.

The Norm Activation theory (Schwartz, 1977) – and subsequent studies (De Groot *et al.*, 2013) having the basic assumption that people act according to moral obligations, created by their own values, for example – was applied in a study of nuclear power, finding that people are more willing to protest against nuclear power when they feel morally obligated to do so (Steg & De Groot, 2010). The Theory of Planned Behaviour (Ajzen, 2001) – which assumes that people make rational choices, evaluating the expected positive or negative results and then focusing on gain goals – was applied in a study of antinuclear activism showing that attitudes were predictive of intentions (Fox-Cardamone *et al.*, 2000).

Other theories, on the other hand, focus on the role of feelings and therefore take hedonic objectives into account (Loewenstein & Lerner, 2003; Midden & Huijts, 2009). There are several other psychological models in the literature, which use norms, attitudes, and emotions, but also attachment, identity, social representations, which in part are a more complex reformulation of the goals classification adopted by Lindberg and Steg (Lindenberg & Steg, 2007). The Value-Belief-Norm model (VBN) (Stern *et al.*, 1998) – which predicts that pro-environmental behaviour is more likely to occur when certain values, beliefs and personal norms are present – has been validated in different contexts, such as acceptance of energy policies (Steg *et al.*, 2005). According to the Motivational Model (Davis, 1989), acceptance is determined by intrinsic and extrinsic motivations. Intrinsic motivation is defined as the perception that users will have in performing an activity without any apparent external reinforcement. Extrinsic motivation, on the other hand, is defined as the perception that users have in carrying out an activity because it is perceived as instrumental to achieving results that are distinct from the activity itself. Intervening factors, such as perceived user-friendliness and perceived pleasure, can influence

perceived utility which, in turn, promotes acceptance (Taherdoost, 2018). The Social Cognitive Theory, inspired from social psychology (Bandura, 1999), has been proposed on the basis of three main factors: behaviour, personal and environment. These factors interact in a bidirectional way in order to predict both group and individual behaviour (adoption, in our terms). This model has been used primarily to assess the use of information technology using constructs such as self-efficacy, expectations of outcome, anxiety, pleasure (Rana & Dwivedi, 2015). Social Representations Theory (SRT) (Moscovici & Marić, 1968) – according to which people’s understanding of new social objects is influenced by socially constructed representations that serve to make the world meaningful to social actors – has been used extensively to examine technology acceptance such as public support for wind energy where sceptics used intermittency, while supporters referred to variability and fluctuation (Devine-Wright & Devine-Wright, 2006).

5.2. Interdisciplinary models

In order to achieve a greater understanding of the processes underlying any renewable and sustainable energy technology acceptance, an interdisciplinary approach has been advocated (Gaede & Rowlands, 2018). Interdisciplinary models complement purely social-psychological constructs with theoretical elements from Sociology and Economics. Among these, the TAM, i.e., Technology Acceptance Model (Davis, 1989), stands out as the first model to specifically analyze the acceptance of a new technology. The goal of the TAM model (Davis, 1989), was to provide a certain predictive capacity regarding the adoption of a technology, through the analysis and study of two variables: perceived usefulness and perceived ease of use. “Perceived usefulness” is a person’s belief that a computer system will improve their work performance, while “Perceived ease of use” is the belief that the use of the computer system will be effortless. According to the approach designed in the present chapter, they would be two intrinsic features of the technology, working as antecedents of the technology acceptability, acceptance, and adoption. Ultimately, Davis argued that these variables will determine the “attitude towards use” (acceptability, in our terms) and thus influence the “behavioural intention (acceptance, in our terms), which, if positive, will lead to the “adoption” of the new technology (adoption, in our terms).

More recently, the SETA i.e., the Sustainable Energy Technology Acceptance model (Huijts *et al.*, 2012) was developed and used to explain the acceptance of hydrogen re-fueling facilities, including variables adopted in the TAM, and incorporating two psychological theories: the Theory of Planned Behaviour (TPB) (Ajzen, 1991; Ajzen & Fishbein, 2005) and the Norm Activation Model (NAM) (Schwartz, 1977; Schwartz & Howard, 1981). The variables included in the SETA model are experience, knowledge, trust in the municipality and trust in the industry, distributive fairness, problem perception, positive and

negative affect, perceived costs, risks and benefits, subjective and personal norms, outcome efficacy, perceived behavioural control, attitude towards acting, intention to act. In terms of our previous discussion, it can be noticed as it privileges social-psychological features, and very few, if any, contextual and technological features.

Other notable interdisciplinary models include: the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh *et al.*, 2003), which proposes an interesting integration of many models using the original TAM model as the core, enriching it with the two new constructs of social influence and facilitating conditions; the Compatibility UTAUT model (Bouten, 2008), which incorporates the three constructs of hedonic motivation, price value, and habit; the Integrated Acceptance and Sustainability Assessment Model (IASAM) (Aizstrauta & Ginters, 2013), which integrates the metric used by UTAUT model for acceptance evaluation with other socio-technical factors. The IASAM uses system dynamics approach and consists of four groups of factors: management; quality of technology; acceptance and economical context; and domain development.

6. CONCLUSIONS

As argued in this chapter, despite the increasing focus on renewable and sustainable energy technologies for implementing the sustainable energy transition, a common understanding of acceptability, acceptance, and adoption is still to be organized and it is pivotal to this area's scientific endeavour. To achieve clarity in the use of the involved key terms, a distinction between acceptability, acceptance and adoption is proposed as follows.

Acceptability is the favourable attitude towards the renewable and sustainable energy technology.

Acceptance, following Wüstenhagen, Wolsink & Burer (Wüstenhagen *et al.*, 2007), can be conceived as a tripartite concept comprising the intention of socio-political support, of community use, and of market buying, with respect to the renewable and sustainable energy technology.

Adoption is the use behaviour of the renewable and sustainable energy technology, up to the habit of using it.

These three criteria together represent the three main phases of a renewable and sustainable energy technology “adoption process”: from its acceptability (i.e., a positive attitude towards it), to its acceptance (i.e., a favourable intention in socio-political, and/or community, and/or market terms, towards it), up to its adoption (i.e., its use and the habit to use it).

If those are the crucial criteria, and phases, within the field of the technologies for renewable and sustainable energy resources, the review of the determinants which may act as their predictors highlighted three main domains: the characteristics of the technology to be accepted (i.e, its intrinsic features); the contextual conditions surrounding the adoption process (in terms of market and economics, as well as of political support); and the potential adopting users with all their relevant social-psychological characteristics (both cognitive, affective, and social). While major existing models present either disciplinary narrow focuses or interdisciplinary incomplete frameworks, a comprehensive model including the above mentioned determinants and criteria of the technology in the renewable and sustainable energy field can be proposed on the basis of the above systematization and review.

The integrated Sustainable Energy Technology Adoption (iSETA model) encompasses the above mentioned features and it has been confirmed for



Figure 1. The integrated Sustainable Energy Technology Adoption (iSETA) model.

biofuels via a qualitative study on EU expert stakeholders from eight different countries (Dessi *et al.*, 2022); as well as via statistical tests on both samples of EU general public and EU expert stakeholders (through ongoing studies within the EC H2020 ABC-Salt project). The general iSETA model is represented in *Figure 1*.

Future research priorities are, among others, testing the iSETA model against the wide array of the different technologies under scrutiny, including, for example adequate consideration of: the time dimension of the different innovations (i.e., the phase of the technology innovation introduction, e.g., in terms of TRL, that is, Technology Readiness Level); the range of different contexts (e.g., cultures, countries, etc.) which poses a challenge in terms of a global de-carbonisation target; the results' generalisation across various target samples. Regarding this last issue, while the vast majority of the literature focused on samples from the general public, certainly experts stakeholders play a key role in the energy transition. However, they are currently understudied. Moreover, almost non-existent are studies directly addressing a comparison between the general public and the expert stakeholders over the same renewable and sustainable energy technology within a given context under a certain cultural and temporal frame. Combining the comprehension of such processes across the various targets, such as general public and expert stakeholders, could help in the future to advance the knowledge regarding of course each single target, but more importantly it could also shed lights over their reciprocal dynamics within the wider scenario of a collective transition to a de-carbonised, greener, more sustainable local and global community.

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ACCEPTABILITY, ACCEPTANCE, AND ADOPTION OF RENEWABLE AND SUSTAINABLE ENERGY TECHNOLOGIES: DEFINITIONS AND THEIR TECHNOLOGICAL, CONTEXTUAL, AND PERSONAL DETERMINANTS

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02

CLIMATE CHANGE AND SUSTAINABILITY



04 / CLIMATE CHANGE: RESEARCH, POLICY AND HEALTH: A PSYCHOLOGICAL PERSPECTIVE

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ABSTRACT

Over the past few decades, human social behavior has shown its influence on ecosystems and the climate. This influence, in turn, has returned an impact on human activities, which is not without risk and new threats. Specifically, psychology has not been absent from the study of the human dimensions of climate change and in particular of the psychological processes that allow us to better understand the risks that we face. Some contributions have focused on theoretical aspects that seek to establish models to predict the activation of responsible behavior, due to its adaptation to the new climate emergency. Others have been more oriented to modeling and the social simulation of climate-related behavior. Both approaches attempt to serve as a basis for the implementation of policies or combinations of policies that activate change in society. The Covid-19 outbreak and the climate change are related among them and to anthropocentric activities, and both can be considered as environmental disasters with consequences on mental health. By taking this approach and considering the results from various research projects, the present work aims to highlight the importance of trans-disciplinarity to generate a new and innovative knowledge, and the need of communication and public participation in environmental issues.

Keywords: Sustainable lifestyles; Adaptation; Climate resilience; Social cognition; Climate change; Vulnerability; Pandemic; Mental health.

1. INTRODUCTION: CO-GENERATION OF KNOWLEDGE (RESEARCH AND POLICY)

When one thinks of the role a social psychologist should play, what immediately comes to mind is work in social groups, with communities and society; this is political work, where there are many players, and where numerous social and human dynamics arise that have to be taken into consideration. Our responsibility as researchers is to transmit to professionals in psychology, and also to those in political sciences, these keys that should contribute to action, based on the results of psychosocial research. And yet when one attempts to connect research and policy, the first thing one notices is that it is not an easy task. Thinking in terms of the practical application of a scientific discovery is not difficult for the researcher initially designing his/her experiment or performing his/her analysis and exploration of social reality. What is difficult, however, is starting the implementation process through which, the research results actually become the real counterpart of research investment made by citizens by means of the tax they pay. They expect a return in the form of concrete actions, in the form of learning, or in the form of guidelines and recommendations for political action.

Politicians and public administrators need the existence of a strong link between research and policy. Otherwise, political action is more complex and it becomes difficult to achieve the goals of social responsibility that lead to improving the welfare of citizens. We are not referring to a rhetorical link, but a real link in the form of practical engagement, considering that political action should be rooted in knowledge based on social science, and should recognize, moreover, the need to base decisions in research on how communities work, and the need to consider the contribution that civil society - in its many forms of organizing and manifesting itself - makes to the generation of the knowledge base.

There are several arguments that explain the problems that universities and research centers suffer and which constitute real barriers to the implementation of research results. On the one hand, socio-environmental problems, which in order to be addressed in all their breadth, must go beyond specialized disciplinary analysis, which is detrimental to an inter- or trans-disciplinary analysis. Furthermore, if problems are multidimensional, solutions should be too. Thus, the transfer of research results to social and urban practice, and to environmental policy, as well as the exploitation of public resources, requires a comprehensive strategy and not just focusing on a single source of obtaining knowledge.

The conversion of research results into practical and useful results in everyday contexts raises issues that question the very educational system of universities and research centers in two different ways: (a) Firstly, the problem highlights the need for a transversal program for learning to work under an inter- and trans-disciplinary model; (b) In addition, a new paradigm of knowledge development

is needed, starting from methodologies that integrate the citizen, the user, the politician and the stakeholder within a comprehensive system of co-generation of knowledge. Regarding the first point, this refers to reconnecting science with its primary objective, which is the systematic generation of well-structured knowledge through observation, reasoning and experimentation from disciplines working in cooperation and attempting to explain the functioning of phenomena via hypotheses, laws, theories and systems. The trans-disciplinary element here refers to the joint work that generates new knowledge and goes beyond a specific discipline. Regarding the second point, the emphasis is also placed on the co-generation of knowledge; however, not from disciplines, but rather from entities and people involved and interested in applying and obtaining social benefits from the results of an investigation.

1.1. Learning to research together: from multi-disciplinarity to trans-disciplinarity

In general, as Rathzel (2008) pointed out, the academic world has adopted disciplinary (e.g. specialized academic disciplines), multidisciplinary approaches (e.g. specialist disciplines work in a team but remain independent in their contribution to the solution of a real-world problem through the input of their own disciplinary concepts and methods), and interdisciplinary approaches (e.g. the mixing of disciplines). This means that each discipline usually works in a self-contained manner and while there is an attempt to share and integrate, it is only through transdisciplinarity that the focus shifts towards integration at a disciplinary level that creates new knowledge (probably involving lay perspectives), perspectives and insights.

Although there is no consensus on the meaning of transdisciplinarity, we can, however, identify some characteristics in trans-disciplinary research which allow us to identify this approach. As Lawrence and Després (2004) and Després (2005) pointed out, transdisciplinarity (see *Figure 1*) as a mode of knowledge production (2005, p. 12):

- *Challenges knowledge fragmentation. (Problems and organizations that are defined from complex and heterogeneous domains).*
- *It has a hybrid nature, non-linearity and reflexivity, transcending any academic disciplinary structure.*
- *Accepts local contexts of research and uncertainty.*
- *It is the result of a research process that includes the practical reasoning of individuals with the constraining and affording nature of social, organizational and material contexts.*
- *Is action-oriented, dealing with real-world problems and generating knowledge that not only addresses the problem but also contributes to its solution.*

Figure 1.
Transdisciplinarity: Learning to research together (Lawrence & Després (2004) and Després (2005)).



We shall now see how to deal with the difficulties that other authors have found in addressing, for example, the study of sustainability in the urban or the organizational environment in a transdisciplinary way.

1.2. Learning how to generate knowledge together

The co-production of knowledge incorporating the knowledge of citizens, policymakers and stakeholders involves a change in the configuration of politics, towards a conceptually different approach, aimed at decision-making, and which incorporates social innovation as a key element. Among the most important characteristics, we could say that (a) it involves the coming together of actors with different opinions, agendas, languages and expectations; (b) it demands the creation of a suitable space for innovation and social participation, where transformative social innovation can emerge, as a result of the creative processes arising from the encounter of the different actors; (c) it demands a consensus on governance models, discarding those that are guided by criteria of *experience*, in favor of models that are committed to the implementation of participatory mechanisms for building up community policies. Among these, the integration of members of civil society, representatives, scholars, NGOs and citizens is the *usual pattern*, and the joint work for establishing new modes of governance that enhance political responsibility, *the goal*.

Creating new spaces in which researchers, policymakers, NGOs and citizens can establish common terms of reference and a shared language becomes absolutely necessary. But perhaps it is even more important, in addition to the shared language, to share the idea that social and environmental policy, based on knowledge of the social sciences, can contribute to a better society. This

aspect has not always led to agreement between scientists and policymakers. And yet it is a matter that affects the prestige of the social sciences in general, and social and environmental psychology in particular, to be considered as the base for decision-making.

There is a key difficulty that stems from the above, which emerges as a barrier to the integration of scientific knowledge into specific policies that give rise to social action: (a) the lack of interest of policymakers in research in general. They appear to be more interested in knowledge based on experience than in knowledge that is scientifically sustained; (b) the lack of interest among researchers in the possible impact their research could have in the political arena (they usually prefer to merely publish their work in the corresponding journal and leave it at that); and (c) the lack of an effective (and bi-directional) communication for building bridges between languages, agenda and interests.

CSOs (Civil Society Organizations) are currently creating knowledge. Their contact with the reality of social and environmental issues is guided by values and principles that are their reason for being and grouped under a single identity for their members. They are therefore less connected with speculative interests that might be unrelated to social or environmental interest. Their role, therefore, should not be underestimated. The political process would be enriched if it incorporated the knowledge that they are able to contribute.

2. THE IMPACT OF PSYCHOLOGY IN ENVIRONMENTAL POLICYMAKING

In recent decades, in Europe and North America, there has only been a modest impact of psychology on environmental policy-making. Some general reasons for this have been already discussed by Stern and Oskamp (1987) and by Vlek (2000). Among these reasons, we could say that many policy-makers are technologically optimistic and prefer “hard” data, while the conclusions from psychological research are often seen as too “soft” and seemingly less reliable than technical and engineering reports. For example, in the field of environmental psychology, among the contributions we have made to basic research, we could highlight the following:

2.1. The importance of communication and participation in environmental issues.

Environmental policies developed at global levels by national or international agencies and not effectively explained are often misunderstood or ignored by local populations. At local and regional levels, misunderstanding can even lead to opposition, manifested in anti-environmental behavior, if people see only the

disadvantages of pro-environmental behavior affecting their everyday lives. The importance of public participation in environmental decisions has been recognized by numerous institutions (the World Commission on Environment and Development, Agenda 21). At the European level, European Council Directive 85/337/EEC, amended by 97/11/EC, mandates public involvement prior to the implementation of a project (Johnson & Jagg, 2003).

There is tacit agreement about the need for public participation, even among decision-takers, but much less about the guiding principles for such participation. For instance, representation of all interested groups and communities, allowing them to contribute and ask questions, taking decisions within the logic of honesty, based on both scientific and social grounds (Johnson & Jagg, 2003; McCool & Guthrie, 2001). However, there is recognition of the practical difficulties that may arise in achieving the objective of effective participation. Firstly, there are conflicts of interest between actors (e.g. policy-makers, scientists, industry and citizens), which could be avoided. Secondly, both environmental phenomena and communities usually manifest four major characteristics: complexity, uncertainty, large temporal and spatial scales, and (in the case of the environment) irreversibility (Van den Hove, 2000). There is thus a strong component of conflict resolution in participatory approaches to environmental policy-making at the level of communities and larger entities.

The increasing environmental awareness of citizens the world over has promoted considerable demand for participation in environmental policy making, not always in the direction endorsed by government. Our basic thesis is that participation and collaboration are impossible without bi-directional communication. With respect to environmental issues, participation always involves communication and communication always involves participation (Wisner, Stea, & Kruks (1991). The case of the oil tanker 'Prestige' disaster 200 miles off the coast of Galicia (North West Spain) in 2002 (García-Mira, 2013; García-Mira et al., 2005; García-Mira et al., 2006) is a clear example of how ill-informed political decisions can have major social, environmental, and of course, political implications, and how the scale of the problem can vary widely depending on how effectively information and communication are managed (*Figure 2*). Interesting findings were obtained in an extensive field study concerning public support for decision-making and the resulting policy during the crisis from the sinking of the tanker. The disaster was followed by intense social and political upheaval, in addition to obvious impacts upon marine and coastal ecosystems. There were several key issues in this study, related to (a) identifying the scale level of policy-making (local vs. regional vs. national), and (b) different conceptualizations of the problem on the part of citizens on the one hand, and policy makers and public administrators on the other.

With respect to the scale level of policy making, the problem could have been solved at a lower (local) level. However, the decision to send the oil tanker away



Figure 2. The case of the Prestige disaster was a clear example of how the scale of the problem can vary widely depending on how effectively information and communication are managed.

from the coast, combined with the resulting need to confront even worse weather conditions, provoked the sinking of the ship and an oil spill, thus increasing the scale level of the crisis. This required larger-scale citizen participation, including the influx of volunteers from all over Europe, as well as the involvement of higher-level social organizations (e.g. the European Union, multinational organizations and private sector companies). Our results also showed that citizens always evaluated the problem as a large-scale one, both spatially and temporarily, agreeing that it would take several years to solve the problem.

With respect to the different conceptualizations of the problem, while citizens quickly identified the extent of the disaster, the national government, concerned with other local interests (such as the elections just a few months after the disaster), decided to minimize the risk and deny the evidence of danger. Thus, the government ordered the damaged tanker to move away from the coast, without considering that this decision could result in broadening the oil spill, potentially affecting other countries (as in fact occurred on the west coast of France). Denying the risk had another impact: no effective measures to mitigate the consequences of the accident were taken by the government until social protest arose. Our own results support this view, indicating interviewees' assessment of responses to crisis management issues on the part of government as poor. The consequences of the disaster were both political and economic.

Firstly, damage in the coastal areas, followed by social pressure and protest, led to the approval of investment in the affected population, mainly fishermen.

Secondly, it led to changes at the EU level affecting the International Transport System regulations for hazardous cargo. The social consequences of these initiatives were also clear in our quantitative results, with less negative assessments one year following the crisis than immediately afterwards. By using two different times to assess social impact, we saw that in the first wave of interviews the population made assessments similar to those of volunteers, who took part in support and cleaning tasks. However, by the second wave of surveys, population responses had clearly changed, indicating a more optimistic assessment of the situation one year later. These results showed a significant shift in the assessments made in 2002 and 2003. Given that in 2003 the oil spill had hardly been cleaned at all, and that the ecological consequences were still evident, such a shift in the subjects' assessments may be due not just to the elimination or alleviation of consequences of the accident one year later, but also to the compensation and subsidizing policy carried out by the government among the population affected.

The application of environmental knowledge to environmental policy is related to the effectiveness of public participation (the case of disaster knowledge). Creating environmental knowledge among citizens and stakeholders who meet policymakers is not easy unless it is through a process of promotion of public participation.

Participation plays a role in natural resource management (Johnson & Dagg, 2003; McCool & Guthrie, 2001; Stern & Oskamp, 1987; Van den Hove, 2000), and in the definition of environmental policies. In the case of disasters, whose onset is unpredictable, the "before" involves preparation, and impact mitigation; the "after" consists of efforts to repair the human and environmental damage caused. An example of this is the approach of local and national governmental entities, citizens and professionals to ameliorating the damage resulting from the disaster (García-Mira, 2013; García-Mira et al., 2005; García-Mira et al., 2006; García-Mira et al., 2007).

Participation is effective when the communication it implies becomes an active, reciprocal process, in which the information provided by participants and the replies from professionals are both clear and unequivocal. Unfortunately, consideration and action on the part of governmental entities cannot be guaranteed. Participation is said to be effective when it results in action at the policy level.

Some of the lessons learnt from the "Prestige" disaster are (García-Mira et al., 2007):

- *Purely top-down approaches toward solving environmental problems are often counterproductive.* As isolated strategies, such approaches may even elicit resistance among members of the population. In the case

of the 'Prestige' disaster, poor or uncoordinated communication between government and citizens led to distrust. Trust in public organizations and information sources decreases perceived risk and increases perceived benefits (Frewer, 2004).

- *Communication between policy-makers and the public is not usually a bi-directional process, but rather (and quite often) one-directional and top-down.* The consequences of such a strategy during the Prestige disaster, due to its seriousness and broad international impact, have special relevance for public administrators. Environmental psychology can play a key role in the area of public participation, and more specifically, in the introduction of participative strategies.
- *Minimizing apparent risk affects the way citizens deal with threats.* The response of the government in the Prestige case included measures designed to reduce the intensity of social protest, to weaken emergent social support networks and to fragment the unanimity of community response, in order to minimize the political impact of the disaster. Such action is exactly the opposite of what should have been done. Social support networks are among the most important components of the communication process in, and recovery from, a disaster. If they are fragmented or weakened, they also reduce their capacity to deal with present and future threats.
- *The perception of risk on the part of the population is a key indicator of how to direct management of the crisis.* An approach based on the theory of "social amplification of risk" fits the Prestige case quite well (Renn et al., 1992). In this approach, the social and economic impacts of disasters are determined not just by the direct consequences of the event, but also by the interaction of psychological, cultural, social and institutional processes, which augment or diminish, intensify or attenuate, the public experience of risk and, consequently, public response and the final socio-economic impacts. The perception of risk is dependent on both exposure and risk management, and public response is dependent on both exposure and risk perception. The Prestige disaster underlined the need for suitable "risk communication" to augment perceived trust in the government and reduce disagreement among policy-makers, experts and the public.
- *Indemnities are important catalysts to public perception of problems.* This is especially so when socioeconomic factors (e.g. unemployment, poverty and crime) play a role in the crisis. Indemnities can also affect risk perception (Moffatt, Hoeldke & Pless-Mulloli, 2003) and public trust. In the "Prestige" case, poverty and unemployment were alleviated by economic compensations – apparently a positive result -

but environmental concerns were thus reduced. A year later, the public became less critical, explained in part by the dispensation of indemnities. Many of the fishermen were compensated by receiving even more than their usual incomes. When the visible signs of pollution disappear and rocks and beaches seem clean and supportive of life again, it is easy to minimize or even forget what happened (García-Mira et al., 2006). The positive perception of financial compensation leads to what appears to be a satisfactory psychosocial recovery (Bolin, 1988), manifested in increased complacency on the part of the public regarding the situation in question. Had institutional help been perceived as negative or inadequate, the psychosocial impact might have been very different. Managing the consequences of a disaster should include support services that integrate both economic and psychological and social strategies.

- *The findings of the evaluation of the social and environmental impact of the disaster point to a need to establish communication channels between citizens and the government, and to strengthen collaboration between scientists and policy-makers. The collaboration of scientists, policy-makers, the mass media, local associations, ecology groups and other civil organizations can produce useful material for research on the public perception of environmental risk, and at the same time, prevent the dissemination of poorly-supported analyses and conclusions.*

In conclusion, the complexity of working with policy-makers involves the difficulty of simultaneously balancing the viewpoints and preferences of citizens and those who draw up the decisions in the political sphere. However, the proper functioning of modern democratic societies requires the creation of spaces for effective social participation, the pursuit of knowledge based on informed participatory action research and the establishment of an implementation process for policy-makers and citizens to promote the public interest.

2.2. Understanding sustainability: the analysis of everyday life

The problem in understanding sustainability as a set of actions contributing to the development of a social and economic system, balanced with nature, requires certain basic assumptions. On the one hand, an analysis from a trans-disciplinary perspective is necessary, based on the generation of new knowledge, proposals and approaches informing several scientific fields, as well as several groups from the government, NGOs, CSOs and citizens in general. On the other hand, a previous identification and analysis of the conflict of interests in the use of existing natural resources is required, both between different groups and between the individual and the social framework (Breiting & Mogensen, 1999). This analysis allows us to see how sustainability responds to a construction of social and spatial reality, which starts from a set of interpretative frameworks,

built in reply to the action of several agents influencing the maintaining of that state of representations that favors their own interests, related to territory, the use of the land and the exploitation of natural resources. It is not correct to speak about the problem of sustainability as an environmental problem; it would be more precise to speak about a social problem. It is a human problem by its very nature, and it exists in society. It has to be conceptualized as social, with many disciplinary implications. It is not significantly different from other problems, as its origin lies in human behavior and practices. For this reason, theoretical, analytical and methodological approaches to the question are shared by other fields of knowledge whose focus of interest is human behavior in its social and spatial context. Lawrence & Després (2004) and Uzzell (2008) pointed out, however, several reasons to explain the difficulties that arise in the study of sustainability: (a) its complexity; (b) the compartmentalization of scientific and professional knowledge; (c) the sectorial division of responsibilities in contemporary society; (d) the increasingly diverse nature of the social contexts in which people live, and (e) the lack of effective collaboration between scientists, professionals and policy decision-makers which has led to a gap in applicability to sectors that deal with both the natural and human-made environment. Within this context, we can ask what the contribution of psychologists could be in this trans-disciplinary process of integration of knowledge, and application to the real problems of daily life.

The analysis of practices and human behavior in everyday life, for example, has been a subject that has attracted increasing interest and has occupied the research agenda of a number of social scientists. Automatic routines and practices that are repeated continuously in our behavior are and have been central topics of interest. Addressing these practices has primarily focused on the analysis of behavior in the home (e.g. recycling, energy use, etc.), with little attention to other important contexts in the life of a person. Within the framework of the LOCAW project (García-Mira, 2014; García-Mira et al., 2017; Polhill et al., 2017; Ruepert et al., 2016; Uzzell et al., 2017; Craig et al., 2019), funded by the European Commission FP7, we decided to study the workplace as a relevant area of everyday life and analyzed factors characterizing the transition to sustainable production and consumption patterns in large-scale organizations.

This project aimed at identifying the complex determinants of everyday practices in the workplace, as well as the ways in which practices from one life domain influence those in another, in order to be able to provide a thorough account of the barriers to and drivers of transitions to sustainable practices in organizations. It focused on three categories of practices, chosen for their relevance to achieving reductions in greenhouse gas emissions: (a) consumption of materials and energy, (b) waste generation and management, and (c) work-related mobility. The project research focused on structural, organizational and individual determinants of practices and how they interact to create specific contexts that are either supportive of sustainable practices or create specific lock-in situations

that hinder the possibilities of effectively carrying out sustainable practices. It did so in different types of large-scale organizations: 2 heavy industry organizations, 2 public sector organizations and 2 private service suppliers. Furthermore, the conclusions of the empirical research were then used to develop simulations of the case study organizations in which effects of scenarios for transitions to sustainable practices were tested, for the target year 2050. These scenarios were built using participatory back-casting scenario development approaches, with workers of the organizations under study, and by formalizing theoretically and empirically driven conclusions on factors influencing transitions to sustainable everyday practices in organizations. Scenarios included policy pathways that were tested with an agent-based modeling approach. Agent-based modeling was used both to test the assumptions derived from the empirical research as well as to dynamically test policies that could contribute to effective change in everyday practices. Several policies were tested so as to check their effectiveness. Policies were checked separately, in combination, isolated in time and maintained over time.

Some of the main results from the LOCAW project enabled us to observe (García-Mira, 2014), by means of multidimensional scaling, the differences between the environmental behaviour observed in organizations and the importance given by the policymakers and the workers. The results highlight the influence of explicit and implicit organizational dynamics toward sustainable practices (see Figure 3).

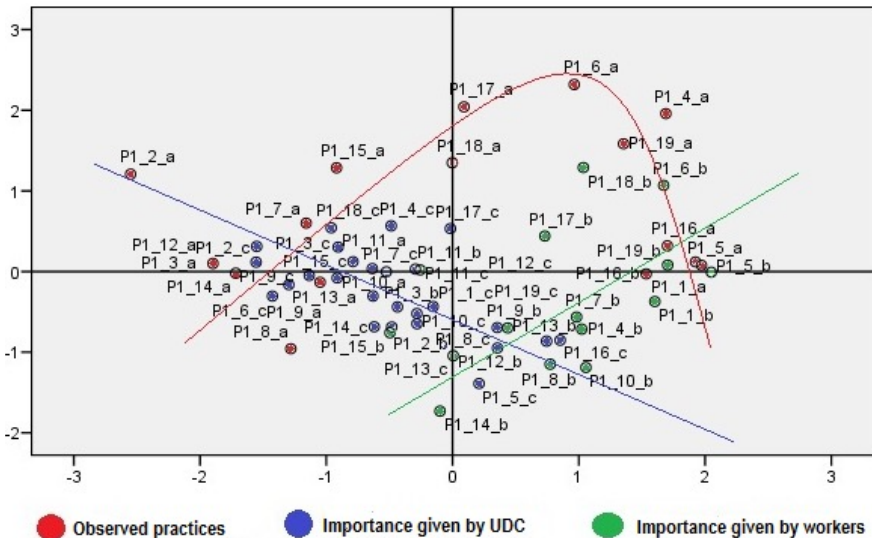


Figure 3. Solution derived by ALSICAL which shows the difference between the environmental behaviour observed in organizations and the importance given by the policymakers and the workers. The points are observed behaviours at the workplace.

External factors, such as legislation and regulation, as well as the level of standardization of procedures and rules for decision-making play a key role in promoting or hindering a serious commitment to sustainability in organizations. Organizational reputation and the existence of an internal context which supports the visibility of sustainable initiatives and behavior, adequate reward systems that go beyond hollow distinctions, the true prioritization of environmental objectives by including them in job descriptions, economic decisions and the everyday organization of work are key drivers of sustainable practices in organizations. Furthermore, going beyond top-down approaches and organizational policies that constrain all the autonomy of workers is also of key importance in integrating sustainable objectives in everyday activities in organizations. Workers are not passive participants in organizational life, and if suitably motivated, they can initiate and carry out transformative actions for sustainability. A suitable organizational environment would motivate workers to initiate sustainable practices and to come up with appraisable suggestions to transform the production process, while at the same time ensuring that their suggestions reach management in effective ways. Work satisfaction and empowerment are key elements for motivation and should be maintained. Our research has shown that if workers are motivated to offer suggestions and implement changes, as well as to initiate sustainable behaviors in the workplace, then these behaviors can be translated to other life domains such as the household (see *Figure 4*).

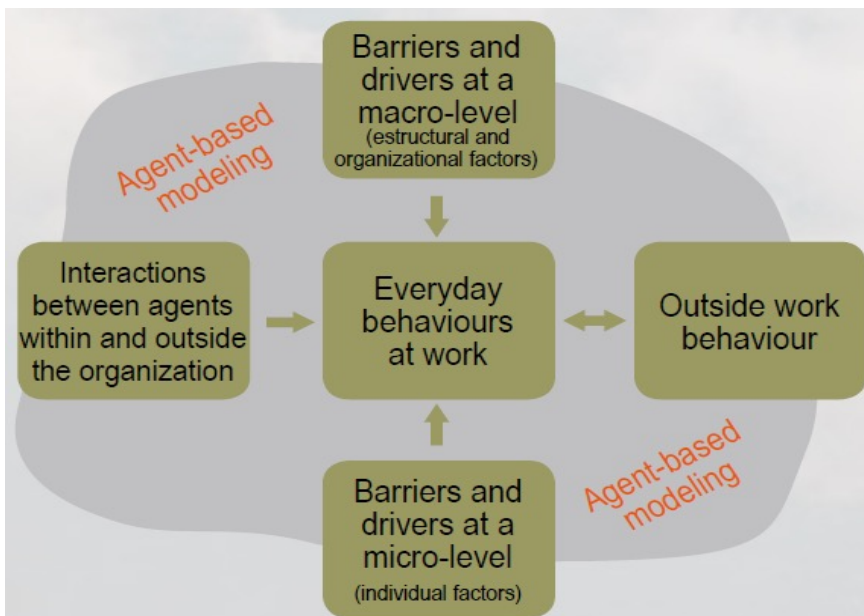


Figure 4. The LOCAW project addressed an analysis of sustainability through the observation of everyday behaviours at work: a) the analysis of practices and human behavior in everyday life; b) the analysis of interactions between agents within and outside the organization; outside work behaviour (household behavior at home); and c) an analysis of behavior at the workplace as a relevant context of everyday life.

Consciously performing pro-environmental behaviors strengthens pro-environmental self-identity and self and outcome efficacy, which in turn are drivers of sustainable behaviors. Our analysis of potential policy tracks to achieve the transition to sustainability have demonstrated that in order to be successful, organizational policy should strengthen worker participation and autonomy at all levels of decision making, should be sustained over time and should combine different measures of medium intensity for behavior change, instead of isolated high-intensity policies. Finally, our results show that policies should take into account the high influence of social networks and social norms in the workplace and should harness bottom-up participatory processes that include workers, unions and managers into becoming positive drivers of sustainable everyday practices through measures that rely on a good knowledge of the functioning of these networks. Carrying out joint visioning exercises is a good way of ensuring participation and creative worker input, commitment to goals and lower costs for behavioral compliance with organizational sustainability policies.

2.3. Transitioning towards the co-production of knowledge.

All these results invite us to reflect on how environmental psychology has fulfilled its scientific goals. In its long career searching for a specific set of theories that provide the solid foundation that it needs, environmental psychology has addressed a number of issues over the past 40 years, many of them originally formulated from approaches of applied social psychology, while others have been formulated from joint work with other disciplines, such as architecture, sustainability, social planning, geography and artificial intelligence, enabling the combination of both theories and methodologies, in such a way that the initial multi-disciplinary distance is becoming a journey towards a common approach paradigm shift in knowledge production.

Another challenge for making transitions affordable and possible, based on joint work with economists, industrial ecologists, and political scientists, is to develop models which make the generation and application of theory to new economies and production systems easier, and furthermore, to the social evolution towards sustainable lifestyles, where more sustainable practices and behavior are the social norm.

With this aim in mind, the GLAMURS project (Green Lifestyles, Alternative Models and Up-scaling Regional Sustainability) was carried out, also funded by the 7FP of EC, within its strategy of promoting sustainable lifestyles and green economy in Europe (García-Mira & Dumitru, 2017). The overall aim was to develop a theoretically-based and empirically-grounded understanding of the main obstacles and prospects for transitions to sustainable lifestyles and a green economy in Europe, as well as the most effective means to support and speed them up. The objective is to explore the complex interactions among economic,



social, cultural, political and technological factors influencing sustainable lifestyles and transformations toward a green economy. The project explored a number of comprehensive models of lifestyle change in key sustainability domains and evaluated them in terms of economic and environmental effects, providing recommendations on the best governance designs and policy mixes for a sufficiently fast-paced transition to sustainability (García-Mira & Dumitru, 2014; Vita *et al.*, 2020).

The European Union explicitly states that for transitions to be possible there is a need to address the demand side, reevaluate growth models and find appropriate ways to produce lifestyle changes and economic paradigm shifts. The result tried to develop, to test, and to assess several integrated pathways for transitions to a low-carbon society. In other words, the results developed and tested transition stages for multiple domains and social actors, with tipping points and feedback loops leading to cost-effective and socially-empowering policies. The approach of GLAMURS to lifestyles was to conceptualize it as patterns of time-use, taking place in given locations, which have associated consumption practices. We consider that understanding patterns of time allocation and their relationship to consumption is key to: (a) identifying alternative lifestyle patterns and (b) defining policy mixes for transitions to a green economy. GLAMURS explored theory, models and evidence on obstacles and prospects for the transformation to green economies and lifestyles in Europe. Multi-scale, multi-region and integrated research was used, involving psychologists, economists, industrial ecologists and policy experts studying individual and societal levels, combined with environmental impact modeling of the effects of scenarios and policy interventions on lifestyle and economic transitions. The research engaged policymakers and stakeholders at the European and regional scales, studying citizens' everyday lives in the present, and emerging initiatives: *early adopters* of more sustainable lifestyle practices and behaviors. It finally proposed a set of recommendations on the best governance designs and policy mixes for achieving a sufficiently-fast paced transition in Europe in line with the objectives established in the Europe 2020 strategy and the *Resource Efficiency Flagship Initiative*. These policy recommendations are today useful for defining a third way for European societies that goes beyond traditional dichotomies between private and public, personal interest and societal objectives and egoism and altruism as fundamental human value orientations.

The modeling approaches included the development of (a) micro-economic models of individual behavior governing lifestyle choice; (b) the study of the interactions and dynamics through macro-economic modeling; and (c) simulations of micro and macro processes using agent-based modeling. GLAMURS engaged policymakers and stakeholders at European and regional levels, with a knowledge co-production mindset. Meetings with local stakeholders, policymakers and activists were promoted in 7 case-study regions where this project evaluated the context the project created to understand how citizens, researchers, stakeholder

organizations and policymakers came to know what it is they need to do to bring about individually, socially, environmentally and economically sustainable living.

Co-production of knowledge is also a basic condition for the emergence of transformative social innovation, which requires creative partnerships between different social actors, but also between unconventional social actors – those that come from outside state and market institutions, and sometimes even from outside of the organized third sector. We are still far from fully comprehending the role of social innovation and social entrepreneurship in solving pressing problems such as climate change, unsustainable urbanism or raising inequality. We need to further develop theory on the changing partnerships and transformations of traditional roles, as well as on what determines the success of social innovation (Frantzeskaki *et al.*, 2016).

3. ENVIRONMENT - BEHAVIOR RELATIONSHIP. THE COVID-19 PANDEMIC AND CLIMATE CHANGE

The covid19 pandemic was not an isolated phenomenon. In fact, it exposed another coexisting crises such as health, environmental, economic and social ones, which showed that we are all part of socio-ecological systems.

Humans are social beings; we need to relate to other living beings. The effective ability to socialize is an indicator of mental health. According to the World Health Organization (WHO, 2001), mental health depends on the interaction of biological, psychological and social factors, and refers to “a state of wellbeing in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community”. We tend to gregariousness, to group ourselves. That is why the isolation imposed by quarantine costs so much, affecting our health and well-being.

The pandemic was expressed more severely in the cities, especially in the marginal sectors, due to the precarious conditions in which they live, such as overcrowding and lack of infrastructure for hygiene. It is in the cities where the economic power, social progress and cultural movement are concentrated. The global city that Sassen (1991) described, where transnational decisions are made that affect all of humanity, like a pandemic. However, the management of the pandemic has demonstrated the strong cultural bias of the measures adopted to alleviate it in each country.

Globalization has flourished thanks to urbanization and the development of information and communication technologies. These ICTs that provided us with an impressive tool to help us through these difficult times, but at the same time it revealed the digital darkness in which half of the population lives.

The present pandemic should not have surprised us. Scientific antecedents already warned of the danger of certain “ancient” dietary practices in China, increasing the risk of transmission of zoonotic diseases (Cheng, Lau, Woo & Yuen, 2007). Although the cause of the pandemic remains unknown, climate change has much to tell about. The environmental crisis was and still be as real and current as the Covid19 pandemic. From all scientific disciplines there was a call for sustainability, specifically from Environmental Psychology it was urged to modify our behavior in a structural way regarding modes of production, consumption and lifestyles, given the emergency of climate change. To the point that during the quarantine, the environment ostensibly improved in response to human absence. And this is positive feedback that should be noted.

According to Future Earth's June 2020 newsletter (Future Earth Newsletter, 2020), the partial shutdown of the global economy has resulted in a drop in daily carbon dioxide emissions by 17% during the peak of lockdown measures in early April, compared to the average daily levels in 2019. This dramatic and unprecedented decline in daily emission rates is unlikely to persist. Using various projections, they estimated that annual emissions for 2020 will only decline by 4-7% from the 2019 average as the world restart the normal economic activity. “Since greenhouse gases must fall by at least 7.6% each year through 2030 to ensure global warming rates at 1.5 °C, according to the UN Environment Program, this analysis showed that social responses alone will not drive the deep and sustained reductions needed to effectively combat climate change, as they do not reflect structural changes in economic, transportation or energy systems. We need systemic change, not temporary reductions in forced behavior”.

Another environment-behavior relationship is given by what we eat. In this last decade, deforestation and the consumption of animal meat increased. Satisfying this demand implied intensifying its industrial production to the detriment of agricultural traditions. Thus, macrofarms constitute a new model of exploitation in which thousands of animals are raised in crowded places. And this model also increased the risk of interspecies infections.

The quality of the physical environment is known to be an important predictor of health and well-being. The physical environment is defined as the objective and perceived characteristics of the physical context in which people spend their time, including aspects of urban design, traffic, safety and weather conditions (Cooper, Boyko & Codinhoto, 2008). Air, noise, and light pollution, population density, overcrowding, lack of access to and enjoyment of nature, safety problems, are all environmental stressors that seriously compromise public health.

Just as the covid19 evidenced the lack of access of certain groups to competent health systems, climate change has long exposed the lack of resources of these social groups to survive the extreme cold and heat, floods and droughts.

Vulnerable groups are vulnerable to everything. The lack of physical resources affects different psychosocial coping resources, due to the interaction of numerous variables such as poverty, disabling health conditions, inequity in access to formal education, etc.

3.1. Climate change and pandemic as environmental disasters. Their consequences on mental health.

The magnitude of the impact of a disaster event can be seen in terms of disruption, the degree to which the individual, the group, and the functioning as an organization is disturbed (Bell *et al.*, 2001). By tracing some disasters, a number of problems has been identified such as anxiety, withdrawal, depression, stress-related physical symptoms, unfocused anger, regression, and nightmares. According to a review by Cortés and Aragonés (1997), there are no unifying theories in the study of disasters. The authors structured the psychological literature related to social research of disasters in three axes: psychological and psychosocial repercussions of traumatic experiences; decision making in emergencies; human error-latent errors.

In the first axis, it is highlighted that the historical period corresponding to the Second World War and the post-war period was very rich for the observations and insights of social scientists, similar to what is happening at the moment with the pandemic as a large-scale social experiment (Meagher & Cheadle, 2020; Meléndez *et al.*, 2020; Tonello, 2020; Torrente *et al.*, 2021). In the cited period, the authors emphasized the work of Martha Wolfenstein in 1957, who applied psychoanalysis to the study of disasters and suggested that the set of emotional manifestations described in the investigations (stupefaction, daze, docility, inhibition of responses) resembles the clinical form of depression, which may be transitory or pathological according to previous emotional tendencies. In the reconstruction of the deep dynamics of this mental state, she postulated denial as the main defensive mechanism, and such behavioral response was also expressed in the current pandemic.

Regarding the emergency decision-making, the authors of the review relied on stress psychology to identify patterns of inertia, shift to a new line of action, defensive denial, hypervigilance, vigilance. They highlight the contribution of the concept of groupthink, which refers to the deterioration that intragroup pressure exerts on cognitive abilities. This axis explores the process of defining a situation as an emergency -as a psychological condition that mobilizes emotional and behavioral responses-, and its relationship with situational factors. And it follows that ambiguity is the condition that characterizes most emergencies, at least in their initial moments. They suggest that the characteristics of decisions in such situations are their interdependence, the changes caused in the environment

by the action of the decision maker, and the stress associated with decision-making in real time. Consequently, the stakeholders in such scenarios are asked a compromise between a good strategy and a strategy that allows some control of the situation.

In the third axis, the review recalls that the most frequent explanation of technological failures has been human error for decades. They distinguish between active errors and latent errors. The former is associated with frontline workers (pilots, control tower operators), being the consequences felt almost immediately. The negative effects of the latter, on the other hand, can remain hidden for long periods, until they become evident in conjunction with other factors. They concluded that the challenge consists in identifying latent errors before the catastrophe events, neutralizing the effects of failures because the postponing of preventive actions, locating and specifying erroneous decisions that translate into acts that endanger technological systems.

The aforementioned review summarizes the studies in the area into:

- 1.** Regulatory intra-psycho processes (rationalizations, expression of fantasies and phobias, affective ambivalence, feelings of omnipotence and invulnerability, denial of danger).
- 2.** Intra-psycho cognitive processes (problem solving, stress and decision-making in emergencies, risk perception; human error; decision-making in complex environmental contexts from simulations of dynamic situations).
- 3.** Inter-personal processes (rumors; altruism; definition of an emergency situation based on situational factors; human factor; resource management).
- 4.** Group processes (leadership, group polarization, groupthink).
- 5.** Inter-group processes of social differentiation (social categorization in civil disturbances).
- 6.** Organizational, institutional and community processes (training and therapy for workers and disaster victims; latent errors; safety culture).

A study on echo-anxiety investigated people's response to the adverse effects of climate change in terms of denial, high awareness or distress, and a high percentage of the world's population expressed worry (Verplanken, Marks & Kobromir, 2020). They deepen the latter and affirm that concern for the environment can take various forms, which differ between individuals, nations and cultures. A distinction is made between constructive worry and non-constructive worry. The first focuses on solving problems through a commitment to the situation that triggers the worry, by means of solutions to reduce or interrupt anxiety, and this can motivate pro-environmental behaviors. On the contrary, non-constructive worry implies generalized and repetitive worry, which is often experienced as intrusive and uncontrollable and is believed to contribute to the manifestation of pathologies related to a state of generalized

anxiety in which any event or situation could trigger thoughts of worry and anxiety. Unconstructive worry tends to be associated with unhelpful solutions, as well as superstitious thoughts. The authors argued that the distress caused by climate change, or eco-anxiety, can be a constructive and powerful response to the climate crisis.

Psychological distance is another psychological construct that is often used to understand the more concrete or abstract perception of climate change. It refers to the fact that an object or event can be perceived as psychologically close or distant. When it is perceived as psychologically close, it is represented as more concrete, while when it is perceived as psychologically distant the representation is more abstract. Individuals tend to perceive climate change as more severe in areas far from where they live, and they also tend to perceive the most serious consequences of the impact of climate change as if they would occur in the very distant future. The psychological distance, consequently, explains the commitment to engage in mitigation and adaptation attitudes and in a greater implementation of pro-environmental behaviors to face climate change (Maiella, *et al.*, 2020).

Then, constructive worry and psychological distance towards global warming include key concepts from psychology such as coping, mitigation, adaptation and resilience.

Mitigation consists of reducing greenhouse gas emissions and / or increasing the absorption of carbon dioxide from the atmosphere. Adaptation refers to activities carried out by individuals or systems to avoid, resist or take advantage of changes and effects of the climate, current or anticipated. Vulnerability encompasses a variety of concepts and elements, including sensitivity or susceptibility to damage and lack of ability to cope with climate change and adapt. For this, it is necessary to identify vulnerable groups not only in terms of demographic variables such as age, socioeconomic status, or education, but also in terms of cognitive, emotional and behavioral psychological resources, experience, motivation, and social support. All this will contribute to the decision of adaptive and intervention strategies (Oficina Cambio Climático Chile, 2014). The construct of psychological resilience has been studied to better understand why some people face or even thrive in stressful situations or under pressure. The construct influences the entire stress process, from the initial stress assessment to the selection of coping strategies and has two dimensions: exposure to adversity and the positive adaptive response to adversity (Fletcher & Sarkar, 2013; Ortunio & Harold Guevara, 2016).

All these concepts are re-signified in the current pandemic. According to the World Health Organization, mental health depends on the interaction of biological, psychological and social factors. There is some evidence about the zoonotic origin of the pandemic, which is closely related to climate change as

it tells us about our relationship with the environment. We can say that the approach to both climate change and COVID-19 requires a broader vision, beyond the virus-vaccine scheme, reminding us of the Singer notion of syndemic. It has become essential to review our models of consumption and economic development to promote an effective behavioral change in our relationship with the socio-ecological environment.

4. CONCLUSIONS

To start formulating a conclusion, we could say that the role of Environmental Psychology in giving responses to key societal and public health challenges is becoming more widely recognized within the broader field of Environmental Sciences. However, more needs to be done in order to improve the co-production of knowledge and collaboration through trans-disciplinary approaches. We have learnt that several areas of research have proven very useful in providing both conceptual frameworks for the understanding of key aspects of global problems and methodologies for exploring human-environment interactions: (a) Research on the experience, meaning and management of the urban and organizational space, with its policy implications; (b) The development of public participation models for decision-making in the planning and management of sustainability, new models of organization of decision-making and ecologically responsible behavior has also received consideration; (c) the analysis of human factors involved in transitions to sustainable societies, the analysis of environmental risk, and the study of psychological processes involved in spatially and temporally situated human behavior has been an important matter in environmental psychology over the last decade. By analyzing these different trends in research, an overview of some of the projects that contribute to building up theoretical frameworks has been given, taking into account their contribution to the advance of knowledge about sustainability. This advance should reinforce the connection between scientists and policymakers at local, regional, national and international levels. This requires support and collaboration from international institutions and organizations, a powerful link for providing the necessary international impact. All this work is a part of the development on sustainability research in the agenda of environmental psychologists, highlighting some of the contributions that environmental psychology research is making to take on the theoretical and methodological aspects of the change towards sustainability. We have tried on the one hand to show both the growing necessity and also some of the advantages of inter- and trans-disciplinary collaboration in solving the multi-faceted problems of climate change. We have also tried to show certain initiatives of environmental psychology that develop a fresh and stimulating dialogue not only with other social sciences (economics, sociology etc.), but also with other hard sciences (e.g. engineering, computing science...), tackling issues of sustainability from different perspectives (Sánchez-Maroto et al., 2015). On the other hand, the purpose is to remain as part of the sciences engaging

with other relevant social actors in producing relevant, open and democratic solutions to these problems. These inter- and trans-disciplinary dialogues require reflection on issues of power in the production of knowledge, with normative implications for how the search for solutions should be structured. The examples provided here will possibly illustrate well how these issues are playing out within the environmental psychology research agenda, with its social and political implications.

Finally, epidemics and pandemics cause mood alterations as a direct psychological effect, altering the functioning of an individual or group, their social interactions and work life. In turn, culture can influence this experience and the expression of symptoms, also helping to explain certain community behaviors in facing the pandemic. Just as sensitivity to environmental exposures varies between individuals, in this case of pandemic some get sick more seriously than others, so too stress factors vary between individuals, and both personality attributes and life-styles can act as moderators of this effect (Küller, 1991).

The Covid-19 pandemic shocked the world, and this evidenced a low perception of global risks, both from the coronavirus and the climate emergency, and this tells to the scientific community that perhaps the evidence is not being effectively communicated in such a way to influence public perception of risk. Or perhaps it is the eternal gap between research and practice, in this case between basic science and science applied to public health. And this is essential to rethink our relationship with the environment, in order to include a structural change in peoples' behaviors. Policies are unavoidable to establish the climatic emergency as a limit to all economic and social development. As a community, we can act assertively by appropriating this goal. As individuals, we can redirect our habits towards less hedonistic modes of existence.

This pandemic is showing us in real time that we can contribute to the reduction of carbon emissions with direct benefits for public health, for example, by working from home we reduced the frequency of local trips.

Finally, we must remember that the environment can be also a coping resource as it provides us with access to nature and biodiversity, which contributes significantly to people's health and well-being.

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05 / CONSTRAINTS ON COMMUNITY PARTICIPATION IN SUSTAINABLE SOCIAL HOUSING UPGRADING CAUSED BY THE COVID-19 PANDEMIC

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ABSTRACT

During COVID-19, there have been significant constraints on community participation. These have to be critically reflected upon, as they hinder the process of sustainable housing upgrading. In this context, energy-efficient retrofitting and the age-appropriate renovation of existing rental housing are indispensable measures. The entire process has been made especially challenging by COVID-19 due to social and physical distancing. Two issues are particularly worth highlighting here: firstly, residents are prevented from meeting with others in their community, which affects their opportunities for participation. This makes it difficult or even impossible for residents to prepare for and discuss planned refurbishments and their effects. Secondly, investments in upgrading can lead to higher rents. Low-income households in particular are afraid that they will not be able to afford them because of income restrictions, which is additionally exacerbated by COVID-19. To combat this, intensive community participation from the very beginning of the refurbishment process is essential in order to resolve uncertainties and concerns, and establish trust.

This paper focuses on the social aspects of sustainable housing upgrading. On-site empirical investigations are necessary to address this topic with the aim of identifying conflicts and finding appropriate solutions. It is essential to be in close contact with the residents' community, as well as with the housing companies, in order to understand their intentions, expectations and perceptions. This requires a sensitive approach and personal contact, which is an important basis for building trust between the researchers and all the stakeholders involved. However, social distancing regulations during the COVID-19 pandemic have placed limits on empirical research designs. Communication is restricted to phone calls, video conferences and email exchange. Additionally, it should be noted that not everyone has access to these channels. Co-creation and cooperation

are difficult to achieve. However, we adapted our research design to the circumstances, and pursued the following research hypotheses:

H1: Constraints on community participation result in the risk of landlords using the COVID-19 situation to pursue their upgrading goals without considering the interests, doubts and concerns of the residents.

H2: Constraints on community participation result in the risk of upgrading measures being restricted to the lowest levels, which do not meet the needs of the residents.

H3: Constraints on community participation result in the risk of 'voiceless' residents not being heard, causing a weakening of social cohesion on a neighbourhood level.

It turns out that opportunities for participation depend primarily on the landlords and their strategies, although the COVID-19 pandemic has exacerbated certain constraints. When it comes to municipal housing companies, the level of upgrading and the consideration of the residents' needs are intertwined with financial issues. In all cases, however, building trust - while time-consuming - is crucial for successful community participation.

Keywords: Covid 19; Participaction; Trust; Refurbishment.

1. INTRODUCTION

There is a strong call to transform neighbourhoods into more sustainable environments. Energy efficiency measures and age-appropriate renovation are key components of this process. In order to achieve this in an appropriate way and to meet the expectations of residents, intensive community participation is necessary. This includes information sharing, consultation and collaboration between all the stakeholders involved.

When it comes to sustainable housing upgrading¹, special attention needs to be paid to the existing housing stock, as there remain major sustainability deficits which are particularly concerning in the face of climate change and the energy transition. In 2020, the European Commission published a 'Renovation Wave Strategy'. This formulated the Commission's aim "to at least double the annual

¹ The term 'upgrading' is used here as an overall term for renovation, refurbishment and retrofitting.

energy renovation rate of residential and non-residential buildings by 2030 and to foster deep energy renovations” (European Commission, 2020, p. 3). This is especially significant given that buildings are responsible for around 40% of total energy consumption in the EU. The result will be 35 million renovated building units, which represents one step on the road towards reaching EU-wide climate neutrality by 2050 and fighting energy poverty. The strategy names seven key principles for building renovations (European Commission, 2020, pp. 3-4). The first one is “energy efficiency first”. Another, “high health and environmental standards”, involves accessibility for all, including persons with disabilities and the elderly. In addition to climate change, demographic change poses another major challenge. In an ageing society, the demand for accessible housing (e.g., with lifts, floor-level showers, no door thresholds) is increasing. In Germany, there is currently a deficit of around two million “low-barrier apartments” (Housing Europe, 2021, p. 66), which indicates an enormous need for renovation. Another key principle for renovation mentioned by the European Commission (2020) is “affordability”, which aims to make sustainable buildings available to households with medium and lower incomes, as well as to vulnerable population groups. In sum, residential buildings need to be sustainable, accessible and affordable.

Within the framework of sustainable housing upgrading, we understand sustainability as a multidimensional concept: environmental, economic and social. This triad was discussed in the context of public housing renovation and neighbourhood redevelopment in Sweden (Gustavsson & Elander, 2016; Lind et al., 2016). Golic et al. (2020) point out that for renovation projects to be socially sustainable, residents’ interests must be taken into account from the very beginning. Another aspect of the social sustainability of refurbishment projects is affordability, meaning that households should not be “forced to move to other areas because they cannot afford the new rent level” (Lind et al., 2016, p. 3). In the case of energy retrofitting, the conflict between social and environmental goals is often highlighted. On closer examination, this turns out to be a conflict over the distribution of costs in the wake of the energy transition (Grossmann, 2019).

Affordability plays a decisive role in the context of social housing (SH). In Germany, the share of people living in households renting their home is the highest in the EU (50%)². SH represents only a small portion of the total housing stock (about 3%, Housing Europe, 2021, p. 63). Here, SH refers in particular to subsidised housing that is combined with rent and access regulations. The SH system aims to provide low-income households with affordable housing based on specified eligibility criteria. In addition to this de jure SH, lower priced offers by housing cooperatives and municipal housing companies that take an approach to socially responsible housing provision can be described as de facto SH (Droste & Knorr-Siedow, 2014). This applies, for instance, to large housing estates that were built in the 1970s and 1980s. Many instances of this kind of rental housing stock are currently facing a new wave of renovations.

² According to Eurostat, 30% of the EU population lived in rented housing in 2020, with the lowest shares in Romania (4%) and Slovakia (8%). For more information, see: <https://ec.europa.eu/eurostat/cache/digpub/housing/bloc-1a.html?lang=en>.

Nowadays, a strong focus is placed on the construction of new neighbourhoods and buildings with innovative architecture and materials. There are various obstacles to upgrading existing housing stocks, such as complex ownership structures, lack of political pressure and funding opportunities, historic building preservation, and a shortage of skilled workers among construction companies. The necessity and urgency of these upgrades has been recognised (see the ‘Renovation Wave Strategy’), but implementation is difficult in many cases.

A particular challenge facing the existing housing stock is that it is already occupied, and the residents remain living in the building during the refurbishment process. This has major social consequences in terms of restrictions and burdens that impact residents’ everyday lives (Gee & Chiapetta, 2013; Geissler-Frank *et al.*, 2017). In these cases, “collaboration between tenants and the real estate company is crucial to the success of the project” (Pauli *et al.*, 2020, pp. 1-2). Community participation should therefore be an integral component of all refurbishment projects (Suschek-Berger & Ornetzeder, 2010). This is not always the case, however, and the COVID-19 pandemic poses an additional barrier to intensive resident involvement.

Our objective, therefore, is first to examine what constraints exist on community participation in sustainable social housing upgrading. In this context, we pay particular attention to the conditions caused by the COVID-19 pandemic. In doing so, we formulate the following hypotheses:

- H1: Constraints on community participation result in the risk of landlords using the COVID-19 situation to pursue their upgrading goals without considering the interests, doubts and concerns of the residents.
- H2: Constraints on community participation result in the risk of upgrading measures being restricted to the lowest levels, which do not meet the needs of the residents.
- H3: Constraints on community participation result in the risk of ‘voiceless’ residents not being heard, causing a weakening of social cohesion on a neighbourhood level.

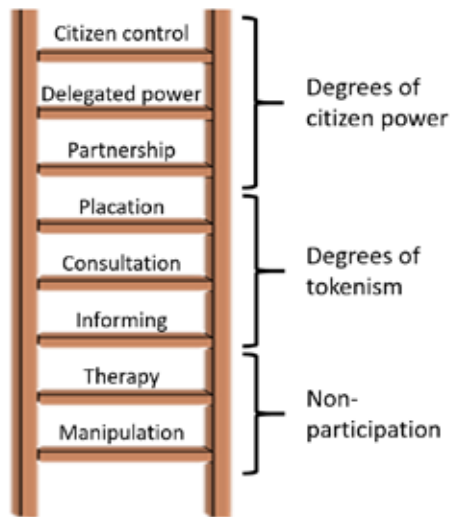
2. COMMUNITY PARTICIPATION

We consider community participation as “[a] process during which individuals, groups and organisations are consulted about or have the opportunity to become actively involved in a project or programme of activity” (Wilcox, 1994, p. 50). Here we emphasise the processual nature of participation – in other words, serious participation takes time (Golic *et al.*, 2020; Wilcox, 1994). The terms ‘participation’ and ‘involvement’ are often used interchangeably (Caixeta

et al., 2019; Damodaran, 1996; Pawson et al., 2012), and for the purposes of simplification, we make no distinction between them in this paper.

Different typologies of participation can be found in the literature. One of the most popular is the 'Ladder of Citizen Participation' developed by Arnstein (1969), which comprises eight rungs of involvement (Figure 1). While it has been criticised for being overly simplified and outdated (Caixeta et al., 2019), the concept is still useful as a descriptive analytical tool (Gustavsson & Elander, 2016). Nevertheless, ladder-based approaches should be viewed with caution; we cannot assume that one level of involvement is better than another and that more participation is always the desired objective. Rather, "different levels are appropriate in different circumstances" (Wilcox, 1994, p. 8).

Figure 1. Arnstein's "Ladder of Citizen Participation" (adapted from Arnstein, 1969).



'Informing' or 'information' and 'consultation' are two levels that are included in a variety of approaches (see for example Arnstein, 1969; Caixeta et al., 2019; Damodaran, 1996; Redmond & Norris, 2007; Wilcox, 1994). 'Information' means that people are simply told what is being planned. 'Consultation' means people are listened to and give feedback. Further forms of involvement depend on the context. In the case of housing, a distinction can be made between participation in building design (technical or aesthetical aspects) or in housing management, which refers more to general decision-making and governance. The latter is central to various studies that explicitly address SH tenants (Pawson et al., 2012; Preece, 2019; Suszynska, 2015; United Nations Economic Commission for Europe [UNECE], 2021).

In this paper, we understand 'community' to mean the residents of the buildings in our case study area. We do not consider them a monolithic entity, however, but as individuals with their own specific interests, needs and values (Wilcox, 1994).

2.1. Participation in refurbishment projects

In the context of housing, extensive community participation can have several benefits. These include increased acceptance of projects and measures, improved process efficiency, identification with the residential area, strengthening of social cohesion and inclusion, and empowerment of the residents (Golic *et al.*, 2020; Gustavsson & Elander, 2016; Tappeiner *et al.*, 2004). Another argument in favour of participation is that residents have local knowledge, which makes them experts in their living environment (Suschek-Berger & Ornetzeder, 2010). Tappeiner *et al.* (2004, p. 141) describe resident participation as an “innovation engine”, taking into account the ecological, economic and social dimensions of innovation.

Nevertheless, the involvement of residents in refurbishment projects often remains limited. In most cases, they are only informed about the planned measures once the decisions have already been made (Golic *et al.*, 2020; Gustavsson & Elander, 2016; Stenberg, 2018). One obstacle to participation is, for instance, that objections by residents have the potential to disrupt the entire project (Gee & Chiapetta, 2013; Suschek-Berger & Ornetzeder, 2010; Tappeiner *et al.*, 2004).

Two major factors that strongly influence the extent of community participation in the context of housing are the housing companies and their attitudes towards residents on the one hand, and, on the other, the legal regulations (Pawson *et al.*, 2012; Stenberg, 2018; Suszynska, 2015). It has been argued that private companies are more “consumer-focussed” and housing cooperatives more “resident-focussed” (UNECE, 2021, p. 41). Resident participation in decision-making processes is an integral principle of cooperatives (Pawson *et al.*, 2012). Stenberg (2018) relates the limited opportunities for resident involvement observed in Sweden to the liberalisation of the housing market. In Sweden, as well as, for example, in the Netherlands, landlords require the consent of the residents to carry out large-scale refurbishment projects (Oorschot *et al.*, 2018; Pauli *et al.*, 2020).

In Germany, the law (German Civil Code §§555b-f) states that in the case of upgrading that does not serve maintenance purposes but leads to the improvement of the building, landlords are obligated to inform the residents at least three months before the refurbishment work starts. This written information must include details of the kind of measures, their scope, start date and probable duration, and the expected rent increase. The landlord can increase the annual rent by 8% of the costs spent on the apartment (called the “modernisation allocation”, §559). The residents must tolerate the measures, although they have the option of an extraordinary termination of their rental contract. Additional hardship regulations also apply in individual cases. In reality, this means that the residents usually have a choice between staying and paying more, or moving.

Several models and frameworks for improving resident participation in renovation processes have been developed (Golic et al., 2020; Pauli et al., 2020; Stenberg, 2018; Suschek-Berger & Ornetzeder, 2010). Since these are theoretical ideals, they are not applicable everywhere. The specific context, legal regulations and stakeholders involved have to be taken into account. Different participation approaches and methods will be suitable depending on the target group. In multi-storey housing, people with different socio-demographic characteristics and social values often live closely side by side. To be successful, community participation processes must be adapted to their respective needs. For instance, elderly people with impaired health and a limited social network are considered a “risk group” in terms of being affected by renovation processes (Geissler-Frank et al., 2017). In order to understand and address residents' specific needs and resolve uncertainties and concerns, it is essential to involve them from the very beginning of the refurbishment process. This includes providing information on a continual basis and offering ongoing opportunities for dialogue. In order to maintain trust, it is important that those responsible approach residents respectfully and proactively. ‘Living labs’ have yielded positive results in terms of overcoming known barriers to communication (European Network of Living Labs [ENoLL], 2022; Steen & van Bueren, 2017).

2.2. Strengthening community participation using the ‘living lab’ approach

Living labs are social environments designed to improve communication and collaboration and foster participation among all the different stakeholders involved in a project. They are defined as “user-centred, open innovation ecosystems based on a systematic user co-creation approach, integrating research and innovation processes in real life communities and settings” (ENoLL, 2022). They can also be understood as a methodology (van Geenhuizen, 2018). Key features of living labs include user-centred design, collaborative learning and co-creation (Steen & van Bueren, 2017; van Geenhuizen, 2018). While there is often a strong technological focus – living labs are frequently used as environments for developing and testing new products and services, for example – in this context, we are focusing explicitly on a socially centred approach (Franz, 2015). It is about learning “new ways of doing things” with the aim of “tackling urban challenges or dilemmas together” (Dijk et al., 2016, p. 4). ‘Co-creation’ is one of the main buzzwords associated with living labs. It implies that decisions are made jointly by everyone involved, that there is mutual respect for each other’s values, and that different ideas and opinions are taken into account. Trust is a decisive factor in successful co-creation (Franz, 2015; Steen & van Bueren, 2017; van Geenhuizen, 2018).

Living labs can be categorised according to who manages their activities (Leminen et al., 2012), i.e., whether they are utilizer-driven (companies), enabler-driven

(public sector stakeholders, NGOs, municipalities), provider-driven (universities, educational institutes) or user-driven (different communities).

2.3. Constraints on participation in the context of COVID-19

At the heart of the living labs concept is the fact that they take place face to face in a real-life context. However, the COVID-19 pandemic has led to fundamental restrictions on everyday life. Communication has been restricted by social and physical distancing. This has a major impact on the implementation of on-site empirical investigations and collaboration within living lab environments. As mentioned above, participation is a time-intensive process that requires continuous contact and interaction between all stakeholders. To overcome communication barriers caused by the pandemic, digital tools have become increasingly important. Active and extensive participation in online meetings has been observed in an academic context – sometimes with many more participants engaging online than had attended in-person sessions before the pandemic. However, in other contexts, the strong focus on digital communication runs the risk of excluding certain societal groups – mainly low-income households and elderly people with inadequate technical equipment or difficulties in using digital tools (Beaunoyer et al., 2020; Köpsel et al., 2021). As a result, traditional communication channels are necessary in order to reach these groups.

3. RESEARCH DESIGN

Our research forms part of the international and interdisciplinary project uVITAL³, which involves partners from four different countries: Germany, Brazil, the Netherlands and the United Kingdom. Based on a jointly developed conceptual background, each partner pursues its own research strategy according to the specific conditions in their country. The central objective of our research in the German case study is to improve participation in refurbishment processes, with an emphasis on the values and needs of the residents. Living labs are thus employed as a methodological approach. The project started at the beginning of 2020. For this reason, the preparation phase did not take the COVID-19 pandemic into account. However, shortly after the start of the project, we were faced with completely new challenges. Below we present the results of the German case study.

3.1. Methodological approach

According to the four types of living labs introduced above, our approach can be described as provider-driven (Leminen et al., 2012). We as researchers are responsible for initiating the living lab and bringing all the stakeholders together.

³ uVITAL stands for 'User-Valued Innovations for Social Housing Upgrading through Trans-Atlantic Living Labs', 01/2020-06/2023, Trans-Atlantic Platform on 'Social Innovation', BMBF (DLR-PT): 01UG2025.

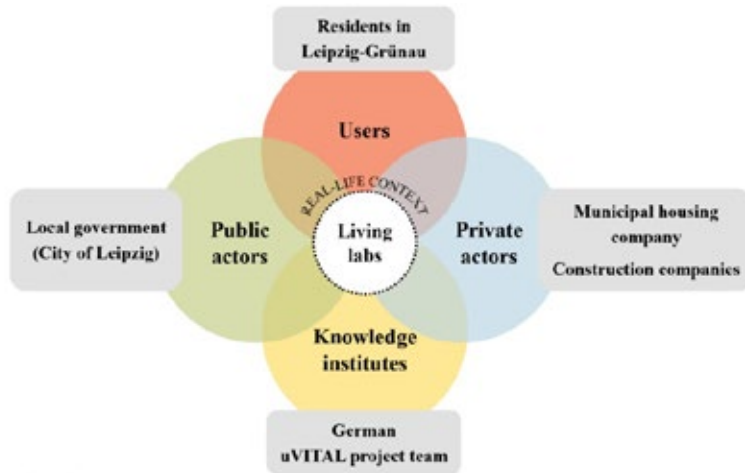


Figure 2. Stakeholders in the living lab (diagram adapted from Steen & van Bueren, 2017).

Figure 2 shows a diagram depicting the main stakeholders in the living lab that are relevant to the refurbishment process. The municipal housing company is our lead practice partner in the project. It is responsible for a large-scale upgrading project in the case study area, in which four nine-storey buildings are being gradually renovated (Figure 3). Refurbishments were completed on one of the buildings in 2020, and another followed in 2021. The refurbishment of the remaining two started in early 2022. The residents of the buildings are therefore at different stages of the renovation process and can contribute different experiences.

The first phase of the intended living lab aimed to understand the specific conditions of the case study area. In July and August 2021, we conducted face-to-face interviews to this end, respecting social distancing requirements at all times. We met with representatives of the housing company (the responsible office manager, the tenant support advisor and the project manager), representatives of three different construction companies (decision-makers and tradespeople) and a total of five residents from all buildings in the case study area. It was necessary to take into account that the latter group in particular belonged to a COVID-19 high-risk group due to their age and, in most cases, health issues. Furthermore, they were not all familiar with digital media or had no access to it. The meetings were mostly arranged by telephone and took place in the case study area (in a meeting room or at the resident's apartment).

The purpose of these interviews was to identify all of the stakeholders involved in the upgrading process, their values, interests and decision-making power. In terms of participation, it was particularly important to gain insights into the process of renovation while residents were still living in the building, and to

discover the challenges, conflicts and dilemmas that emerged. Due to the general situation, we also addressed the COVID-19 pandemic and its impact on the refurbishment process. The interviews were recorded, transcribed, anonymised and evaluated with regard to the formulated hypotheses.

At this point, it should be noted that the contact we have had with the residents we interviewed so far was mediated by the housing company. This means we can assume that they are already active and engaged in some way. The question still remains of how to reach 'voiceless' residents (who do not raise their voices to demand concrete improvements), especially when there are contact restrictions in place.

3.2. Case study area

The German project focuses on the Leipzig-Grünau large housing estate located at the western fringe of the city of Leipzig. The estate's construction began in 1976 and lasted until 1989, and was influenced by the state-socialist principles of the GDR (German Democratic Republic) government. All the buildings in the Leipzig-Grünau estate were constructed using prefabricated construction methods and have 5-16 storeys. The estate has undergone different and, at times, contradictory phases since it was first built. In the early years it was a highly sought-after residential location. After German reunification, many people moved away and there were high vacancy rates across the estate. In some locations, building blocks were demolished in the early 2000s, and since 2015, it has seen a slight growth in population numbers, refurbishments and new construction, and an increase in residential satisfaction (Kabisch et al., 2021). Today, about 45,000 inhabitants live in Leipzig-Grünau, which covers an area of around 4.6 km². The housing stock consists mainly of rental apartments, owned by 25 different housing companies (municipal, cooperative and private). The ownership structure is thus very diverse, and each of the landlords has its own rental strategy. Although there are some apartments being rented out at higher rates, the rents in Leipzig-Grünau are generally low in comparison with the inner-city districts. There is a large proportion of de facto SH provided by housing cooperatives and the municipal housing company. The latter describes their own function as follows:

"In addition to environmental and sustainability aspects, [the municipal housing company] must always keep in mind its mission to provide affordable housing and strives to strike a balance between environmental requirements and tenant needs." (Leipziger Wohnungs- und Baugesellschaft, 2021, p. 16, translated by the authors).

The Leipzig-Grünau large housing estate consists of eight housing complexes, each with its own characteristics. There is strong internal differentiation between

the buildings, even on a small scale. This includes their state of renovation and re-structuring, the surroundings, the service offerings and the socio-demographic characteristics of the population (Kabisch & Pößneck, 2021).

The uVITAL case study area is located in the northern part of Leipzig-Grünau (which has around 9,000 inhabitants). Our research focuses on four nine-storey residential buildings. The four blocks each contain around 100 apartments owned by the municipal housing company (*Figure 3*), with over 400 inhabitants in total. The buildings were constructed in the early 1980s. Since that time, only maintenance measures have been carried out.

The majority of the apartments are small one- or two-room apartments with balconies. The buildings and the apartments are accessible, with ramps at the entrances and lifts that stop on each floor. This means the needs of the elderly residents are met through age-appropriate facilities. Additionally, there are old-age care services located on the ground floor of two of the buildings, which provide various means of support for elderly people. The apartments themselves are not all accessible, as some of them feature high thresholds to the balconies and bathtubs instead of walk-in showers, for example. The hallways inside the apartments are quite narrow, which makes them difficult to navigate for people who use wheelchairs or walking frames. Outside there are green spaces with lawns, trees and paths connecting the buildings.



Figure 3. Nine-storey buildings in the case study area in different phases of the refurbishment process (photos by the authors).

It is striking that most of the residents living in the case study area are elderly. The buildings were originally built for senior citizens. Due to the infrastructure in place, it will remain a popular area for the older population. Numerous elderly or disabled people choose to move there because of the accessibility (many of them prioritise having a lift) and the special services on offer nearby. A number of the residents are in need of care. Some are bedridden and unable to leave their apartments. Others have reduced mobility and use wheelchairs, walking frames

or other walking aids. Many of the residents live in single-person households. Some of them have pets such as cats, dogs, budgies or parrots. There are some retired couples, but almost no families with children. Aside from age, the social demographics appear to be fairly diverse. Low-income residents, some of whom have relatively low levels of education, live next door to residents with high incomes (pensions) and high levels of education.

4. RESULTS

In this section, we present the initial results of our research project, starting with a description of the main stakeholders involved in the refurbishment process.

4.1. The main stakeholders involved in the upgrading process

The **municipal housing company** that owns the buildings bears responsibility for the whole upgrading process. Major decisions, such as those relating to complex refurbishment projects, are made by the executive board, in consultation with the office manager of the respective area. Specific projects must then be approved by the supervisory board. Decisions for or against certain measures are mostly made based on financial considerations, in order to avoid dramatic rent increases for the residents. The refurbishment process is coordinated by a project manager. The construction planning is handled by an external provider. The tenant support advisor provides a direct link between the residents and the housing company. He is also the central contact for concerns regarding housing upgrading. The municipal housing company as a public contracting authority is obligated to publish a call for tenders for each trade involved in the project. The cheapest quote is usually selected.

The **construction companies** are responsible for the building work and receive a precise order for each apartment, including particularities. There are about ten different trades involved in the refurbishment process (e.g. façade engineering, roofing work, dry construction, plumbing, electricity, painting and tiling), which all have to be coordinated. Some of the construction companies have been working for the housing company for several years. The tradespeople come into (close) contact with the residents. Their main interest is in completing the work and keeping to the tight schedule.

The **residents** are the ones whose living environment and daily routines are directly affected by the construction work. Their attitudes towards the upgrading process vary from anticipation to rejection. They expect improvements to their apartments or visual enhancements (e.g. of the façade). However, many of them are also concerned about noise, dirt and dust, and having strangers in the building. Some worry about their own health or the well-being of their pets.

They also fear rent increases, even before receiving any information on this topic. There are individuals that act as mediators between the housing company and the other residents. In almost every interview, some reference was made to a woman who is one of the remaining original residents: “[She] was personally very, very committed” (Interview 10, resident⁴). She takes responsibility for a letter box provided by the housing company where people can submit their requests and concerns, for instance, and she also helps convince neighbours of the necessity of the renovations.

She is also the chairwoman of a small **tenants’ association**, which has several representatives from each building. They usually meet quarterly and their main task is mediating concerns between the residents and the housing company: “And yes, that’s where we have conversations about what kind of problems there are that we might be able to solve” (Interview 3, resident). Members of the association received information about the planned refurbishment earlier than other residents. In addition, some of the requests that the tenants’ association has been receiving for several years are now being implemented.

4.2. The housing upgrading process

The construction work focuses on renovating the pipework. This means that all of the apartments are included in the process, without exception. To begin with, the kitchen has to be removed in almost all cases to enable the walls to be opened up. The upgrading process also includes renovations to improve energy efficiency (installing thermal insulation, optimising the heating system, replacing windows), age-appropriate adaptation (lowering the thresholds to balconies) and other measures (replacing doors, installing new balcony balustrades and new lighting in the corridors, painting the façade). Although requested by one interviewee, the bathrooms are not being renovated to be age-appropriate: “And the bathroom is even worse. But nothing is being done about it” (Interview 8, resident).

The whole upgrading process lasts almost a year for each building and about two weeks per apartment. Different tradespeople work on site every day from morning to evening (except on weekends).

4.3. Participation in housing upgrading

After the project has been confirmed by the supervisory board, the residents are informed. They receive a short-written notification and a date on which the project manager and a representative from the construction planning team will make their first visit. This appointment is purely to assess the apartment and to clarify what needs to be done and whether there are any particularities. Photos

⁴ All interview passages quoted in the text were translated from German by the authors.

are taken. It is a technical visit and lasts about ten minutes. The residents do not receive any detailed information: “They didn’t have a date yet for when it would start” (Interview 6, resident).

In the run-up to the construction work, when the details are known, the residents are given comprehensive written information about the refurbishment process (which is required by law). This includes the expected start date and duration, the measures planned, the amount the rent will be reduced to compensate for the inconvenience during the refurbishment, and the probable rent increase afterwards. The residents find this letter to be very extensive. Later, more written information is distributed including the complete construction schedule with dates for the work on each apartment.

A few weeks before the start of the renovations, the tenant support advisor, the project manager and the construction manager visit every household in person and explain the whole refurbishment process. This was highlighted by the interviewees, e.g.: “And he said that each tenant would be spoken to individually” (Interview 9, resident). Some residents are no longer considered capable of making their own decisions. In such cases, their caregiver is also present during these visits. The residents get the chance to voice their expectations, questions, concerns or needs: “And then we were all allowed to say what our expectations were” (Interview 3, resident).

Additional requests besides the measures that are already planned and deemed necessary are taken into account as far as possible. This depends on the financial, construction and logistical limitations. The preparations that need to be made for the construction work are discussed with each resident individually. The question of whether the resident wants to move out temporarily or go into short-term care is also addressed. This meeting lasts between 15 and 20 minutes, depending on the specific case, and the agreements are recorded in writing.

In addition to the official announcements by the housing company, the residents seek information themselves on an individual basis. They talk to their neighbours in apartments that have already been refurbished and visit them, for example. After the first of the buildings has been upgraded, many people receive their earliest information on the subject from hearsay: “And we are aware of the fact that the renovations are now being carried out step by step” (Interview 9, resident). This is also how rumours spread. In most cases, the residents just wait and take things as they come.

After the upgrading process has begun, a weekly construction consultation is held with representatives from the housing company and construction management. This meeting is not open to the residents, but the chairwoman of the tenants’ association sometimes takes part. Besides this, a contact person is always on site during the construction work: “[They] were here all the time. I was

beginning to think they lived here” (Interview 6, resident).

The construction companies also display information in the corridors, for example when the water is going to be turned off. Communication between the tradespeople and the residents is described positively and as a crucial element in the process: “The most important thing, in my opinion, is the cooperation with the tradespeople” (Interview 6, resident). Both sides highlight the respectful interactions, and the tradespeople were said to be helpful. If the residents have small additional requests, these are usually carried out directly, where possible.

Sometimes residents do not open the door to let the tradespeople in, which causes problems. It delays the whole upgrading process and jeopardises the tight schedule. In order to avoid this, to guarantee swift and smooth procedures, and to address the residents’ needs, the tenant support advisor tries to be regularly present on site.

In general, the residents of buildings where the refurbishment was already completed felt that the process had lasted a long time and had been a burden. They were glad when it was over. However, they also expressed their appreciation for those responsible: “I have a great respect for all those who are in charge of the project” (Interview 10, resident). When asked if she would have liked to have been more involved in the refurbishment process and planning, one woman said: “No, for the simple reason that I have no idea about these things” (Interview 6, resident).

4.4. Impact of the COVID-19 pandemic

There were some delays in 2020 due to COVID-19, but all in all, the pandemic did not significantly affect the work process. Hygiene measures were generally observed and care was taken to minimise contact. Some of the residents were afraid of catching COVID-19 from the tradespeople. The criticism was also made that the cleaning of the staircases and lifts was not very effective everywhere. The most serious constraint mentioned was that discussions among the tenants’ association and other informal meetings between the residents could not take place.

4.5. Challenges, conflicts and dilemmas

The biggest challenge for all of the stakeholders we interviewed was that the renovations were taking place while the apartments were occupied (*Figure 4*). One resident put it as follows: “To my mind, it was a big imposition on the tenants” (Interview 10, resident).

Below we present a few of the factors that were perceived as particularly

onerous. Above all, people complained about the noise and dirt caused by the construction work. Despite a dust protection wall, the dust gets everywhere and is particularly problematic for people with respiratory conditions. Nevertheless, many of the residents choose to stay in their small one- or two-room apartments during the work, either because they are not capable of leaving it or because they do not trust the tradespeople. Few people make use of the option (where offered) of moving to another apartment – either one in the same area that has already been refurbished or one somewhere else. Some residents go for walks while the tradespeople are there, if they are able to do so.



Figure 4. Renovation of apartments that were occupied (photos by the authors).

Before receiving any detailed information, the residents feared major rent increases as a consequence of the upgrading process. The municipal housing company seeks to avoid this, and makes its decisions accordingly. In the end, the interviewees all said that the minor increase was not a problem for them. The cost factor repeatedly emerged in the interviews as an important point from the perspective of all of the stakeholders. The representatives of the housing company explained that certain measures cannot be carried out for this reason.

5. DISCUSSION

Based on the above, we can conclude that the levels of community participation in this specific case correspond to 'informing' and 'consultation' according to the "Ladder of Citizen Participation", which Arnstein (1969) describes as a form of tokenism. The residents' influence is limited to their individual apartment (Gustavsson & Elander, 2016). As shown in other studies (Golic et al., 2020; Stenberg, 2018), important decisions are already made before the residents are informed. The tight schedule does not offer much room for flexibility, either. Nevertheless, the housing company was shown to take residents' needs

seriously and respond to them so far as they were financially and logistically possible. It is necessary for people to actively address the housing company for this to happen, however.

We identified a few 'strategies' used by the residents in the context of the refurbishment which gave them some kind of power over the process. By refusing to open their doors to the tradespeople, for example, they could jeopardise or at least delay the entire upgrading project. Others stayed in their apartment during the construction work in order to monitor the workers who they felt were invading their privacy. Two female interviewees told us about their good relationship with the tradespeople and how they took some responsibility, for example by storing keys for people who left their apartment to go to work while the renovations were taking place. This was one way of getting involved in the process.

We now return to our hypotheses, as formulated in the introduction.

H1: In the case presented, the COVID-19 pandemic has no direct impact on the form of communication between the housing company and the residents in the context of housing upgrading. Residents appreciate the extensive written information about the refurbishment process and the face-to-face meetings in which each individual household gets the chance to voice its expectations and concerns. Requests are taken into account as far as possible. However, the important institution of the tenants' association was not able to meet due to strict social contact restrictions, meaning that certain problems (for example deficiencies in cleaning the building) may not have been communicated effectively enough. In our case study, the housing company is a municipal one with a sense of social responsibility, and which addresses the needs of the residents. All in all, we ascertained that there are "systemic constraints" (Stenberg, 2018, p. 19) on community participation, but that these are exacerbated by the COVID-19 pandemic. As a result, we cannot verify the first hypothesis in the case of a municipal housing company. It would be interesting to conduct a comparative study of different kinds of housing providers, with a special focus on private landlords.

H2: The interviews showed that financial factors play a decisive role in the selection and implementation of the upgrading measures. This revealed a dilemma between energy-efficient and age-appropriate upgrading on the one hand, and the affordability of housing on the other. This situation cannot be resolved while housing is still embedded in a neoliberal market logic and lacks sufficient state support (Grossmann, 2019). Nevertheless, the municipal housing company strives to absorb additional costs arising from the refurbishment process, though resources are limited. Fundamental alterations that are not part of the current upgrading project have to be paid for by the residents themselves. One example is the age-appropriate renovation of bathroom facilities. Here, other stakeholders need to be involved, such as health insurance providers.

This makes the decision-making process even more complex. Furthermore, the refurbishment process we analysed focuses on technical and structural improvements where resident involvement is not considered appropriate due to insufficient knowledge on the subject. The interviewees are, in general, satisfied with the upgrading. However, greater involvement is desirable when it comes to aesthetic changes such as painting the building façade, as a certain level of dissatisfaction has been expressed here. This also has the potential to increase residents' identification with their living environment.

With regard to the second hypothesis, we conclude that generalisations cannot be made as residents' needs are highly individual and sometimes complex. Organised community participation, for instance in the form of the tenants' association, can help to find compromises that are more in line with the residents' interests and values.

H3: The residents described differences in the level of social cohesion between different buildings. The decisive factor here is having people who take the initiative, like the chairwoman of the tenants' association. The other interviewees were either also members of the association or took a proactive role themselves. In general, there seems to be a relatively high degree of anonymity and isolation, including deliberate self-isolation, among the residents. Community participation can take many forms, and everyone must decide for themselves what level of involvement they desire (Suschek-Berger & Ornetzeder, 2010). In all cases, however, continuous contact and trust is necessary in order to reach 'voiceless' residents and give them the opportunity for participation. Older people in particular need extensive mentoring and support (Geissler-Frank *et al.*, 2017). The tenant support advisor represents an important person of trust in this context. We can therefore confirm the third hypothesis in the sense that the absence of people making their voices heard and actively facilitating community participation can contribute to less social cohesion within a given neighbourhood.

6. CONCLUSION

To conclude, we would like to stress two points: firstly, time is an important factor in the context of community participation in housing upgrading. The refurbishment process is organised on a tight schedule, above all for economic reasons. No additional time is foreseen for intensive participation activities. However, continuous information sharing and trust-building is indispensable, especially in the case of older people living alone. Secondly, the intention of our living lab was to foster co-creation and improve communication regarding the refurbishment process. Staying in continuous contact with local stakeholders turned out to be difficult, however. Due to the recurring waves of COVID-19, there were limited time slots for face-to-face interaction. In the interviews, we realised that the residents we talked to were fairly satisfied with the

communication between themselves and the housing company. Furthermore, the opportunities for community participation in technical and structural housing upgrading are limited. Nevertheless, building trust and maintaining constant contact are absolutely necessary for implementing living labs and for successful community participation in general.

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06 / CONTRIBUTIONS FROM LIGHTING RESEARCH TO SUSTAINABILITY AND COVID-19 PANDEMIC

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ABSTRACT

Besides vision, light can impact other processes such as circadian, neuroendocrine, and neurobehavioral responses. It is called non-visual effects of light because they are not directly involved with image formation, and they became an additional dimension in the traditional objectives of architectural lighting, which should provide the proper light for visual performance, for visual comfort, for the aesthetic appreciation of the space and for energy conservation. For instance, in working environments, light must serve not only to meet task demands but also for comfort and health.

People respond to environmental exposure through a holistic process composed of psychobiological correlates. To date, the most studied light-reactive hormone is melatonin since light can have an acute suppressive effect on this hormone. As to psychological states, seasonal affective disorder (SAD) probably constitutes the best example of light's effect on mood and behavior, and the abnormal pattern of melatonin secretion in SAD sufferers is still the main hypothesis as to the genesis of this disorder.

This conference aims to show the possible contributions from the field of lighting research to covid-19 pandemic and to post pandemic economy in terms of melatonin related health and wellbeing, vitamin D production in response to ultraviolet radiation on the skin, and the concept of sustainable lighting design referred to efficient lighting technologies such as LEDs, as well as guidelines to minimize circadian disruption and to improve productivity.

Keywords: Covid 19; Sustainability; Health, Productivity.

1. INTRODUCTION

The International Lighting Commission (in French, CIE) and the Illuminating Engineering Society (IES) of North America, are nonprofit organization that develop and publish standards on the fundamentals of light and lighting. Recently (2018), the CIE released a position statement on non-visual effects of light, entitled "Recommending Proper Light at the Proper Time", in which it is recognized that much research has been done but still more research is necessary as to this field, which links multidisciplinary efforts from psychology, biology, engineering, and architecture, just to name the more involved areas. Then, CIE issued an international standard, CIE S 026:2018, that defines a system for metrology of optical radiation for light-induced responses that can be elicited by intrinsically photosensitive Retinal Ganglion Cells (ipRGCs), containing the photopigment melanopsin.

Before talking about these cells, we must know that light is defined in the Lighting Handbook of the Illuminating Engineering Society of North America (Rea, 2000) as radiant energy that is capable of exciting the retina and producing a visual sensation. The optical radiation spectrum is divided into the following components: UV, 100 to 380 nm; visible, 380-780 nm; and IR, 780 nm to 1 mm. The UV-region of the electromagnetic spectrum was subdivided by the CIE into UV-C (100-280 nm), UV-B (280 to 315 nm) and UV-A (315-380 nm), and the IR-region has been divided into three bands, IR-A (780 to 1400 nm), IR-B (1400 to 3000 nm), and IR-C (3000 nm to 1 mm). Then, light is a visible form of electromagnetic radiation, bordered in the spectrum by ultraviolet radiation at shorter wavelengths and infrared at larger wavelengths. This visible radiation occupies the wavelength region between 380 and 780 nm, which produces the perception of violet 380-436; blue 436-495; green 495-566; yellow 566-589; orange 589-627; red 627-780.

Our eyes can detect this optical visible radiation for both: image-formation or vision, and for non-visual or circadian responses. The circadian effect of light means that light has an acute suppressive effect on the secretion of a circadian neurohormone called melatonin. How it does? The retino-hypothalamic tract (RHT) projects to the suprachiasmatic nucleus (SCN) in the hypothalamus, which is the principal circadian pacemaker in mammals. Neural projections from the suprachiasmatic nucleus travel to many diverse control centres in the nervous system including other areas of the hypothalamus as well as the thalamus, midbrain, brain stem, and spinal cord. One multisynaptic pathway that carries nonvisual photic information extends from the suprachiasmatic nucleus to the pineal gland (situated deep in the brain), with connections being made sequentially in the paraventricular hypothalamus, the upper thoracic intermediolateral cell column, and the superior cervical ganglion (Golombek & Ralph, 1996). Cycles of light and darkness relayed by the retina entrain suprachiasmatic nucleus

neural activity, which in turn entrains the rhythmic production and secretion of melatonin from the pineal gland ganglion. To date, the most studied light-reactive hormones are melatonin and cortisol, whose patterns of secretion behave in a complementary way, being high levels of melatonin and low levels of cortisol secreted during night-time and high levels of cortisol and low levels of melatonin secreted during daytime (Tonello, 2001).

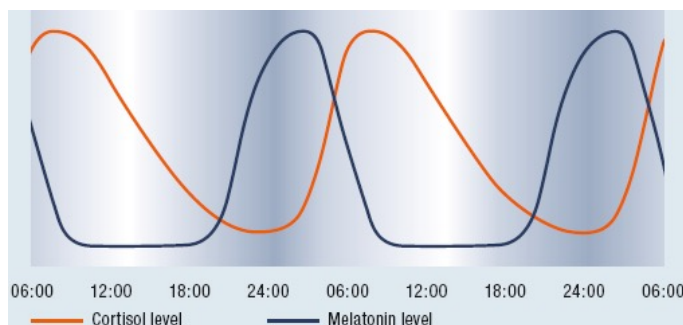


Figure 1. Melatonin and cortisol pattern of secretion throughout the day (taken from licht.de 19).

The action spectrum curves are different for the visual and non-visual systems; for the former the visual peak efficiency lies in the yellow–green wavelength region, while the maximum biological sensitivity lies in the blue region of the electromagnetic spectrum (Van Bommel, 2004). Then, the circadian or inhibitory effects of light can be achieved with high levels of illumination or with radiation in the shorter visible wavelengths. The sensitivity peak of the circadian and neuroendocrine systems has been shown to be in the blue-green portion of the spectrum (446–480nm). This finding is very important in terms of sustainability or energy efficiency since the biological effects can be obtained without the need to increase the lamp intensity. For instance, the cool white light-emitting diode (LED) produces significant light output at this visible short-wavelength. At this point, light distribution is also relevant, since the sensitivity of melanopsin-containing ganglion cells is higher in the lower half of the retina and can produce greater suppression of melatonin than the upper half, for the same light exposure. That’s why to obtain this type of responses is better the use of vertical measurement plane rather than the horizontal plane.

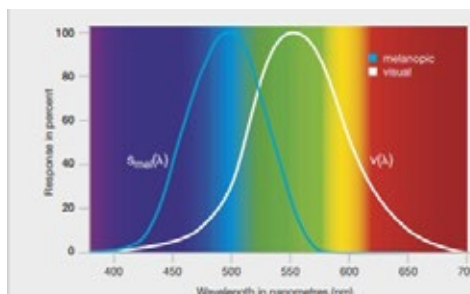


Figure 2. Visual and Non-visual spectral sensitivities (taken from licht.de19).

According to the CIE, for non-visual effects of light, the relative contribution of each individual photoreceptor can vary depending on the specific response and upon light exposure properties such as intensity, spectrum, duration, timing, prior light history, and sleep deprivation state of the individual. The workplace lighting design was almost always focused on visual performance, and due to energy saving requirements, also oriented towards increasing localized lighting, and the surrounding lighting is not considered. Thus, demands are usually satisfied by horizontal illuminance. On the contrary, for the circadian system, which is stimulated through the intrinsically photoreceptive ganglion cells, the lighting level of vertical surfaces such as walls and ceiling is especially relevant.

According to the CIE, the manipulation of melanopsin-based photoreception to get non-visual responses means:

- A high melanopic EDI during the day is usually supportive for alertness, the circadian rhythm and a good night's sleep.
- A low melanopic EDI in the evening and at night facilitates sleep initiation and consolidation.

The Melanopic EDI (Equivalent Daylight Illuminance) is a lighting dose with circadian purpose, which recommends a minimum of 250 lux during daytime (preferably from daylight), and a maximum of 10 lx in the afternoon (close to bedtime), and 1 lx at night (preferably under complete darkness).

As to the spectrum, we must try to avoid the shorter wavelengths during the evening in order to minimize ipRGC activity or keep retinal irradiance as low as possible.

In 2006, Figueiro and others suggested that if you want to be sure that you are receiving an alternating cycle of light and dark to entrain the circadian system, the light should consist of at least thirty lx for thirty minutes of white light, and dark should be low enough to take the visual system into the scotopic range. You must know that all the circadian metrics developed to account for psychophysiological effects of light use models with a peak sensitivity in the blue region of the visible spectrum at 490nm.

Based on the models of Gall and Rea, some metrics were developed. For instance, the Circadian Stimulus Calculator to evaluate the percent melatonin suppression expressed in terms of circadian stimulus (CS), being 0 when light does not cause any inhibition of melatonin in the blood) and 0,7 (when light inhibits the maximum level of melatonin).

Optical radiation has been used to treat skin diseases, hyperbilirubinemia, for vitamin D production, as well as for germicidal purposes (Di Laura, 2011).

Specifically, light is used clinically to treat the circadian - melatonin disbalance in seasonal depression or SAD, sleep disorders, to restore the sleep/wake cycle in people with Alzheimer and hospitalized patients in Intensive Care Units. But also, light can have a broader, non-clinical application for disorders such as shift work and jet lag, by means of behavioral strategies in the use of ambient light and darkness, as well as oral melatonin intake.

Currently, the climate crisis demands efforts from all areas of knowledge. The lighting field has contributed with the development of efficient lighting technologies such as the light emitting diodes (LEDs), and the design of sustainable buildings by means of the combination of daylight (as much as possible) and artificial lighting (of the best possible quality).

Our efforts as environmental psychologist who work in this field, consist in the study of behavioral changes for the better use of energy and the environmental conservation in general.

The Proper Light at the Proper Time means the translation of scientific evidence in the field of lighting into recommendations for a healthy daily pattern of light exposure, considering at the same time efficient light sources and design. And this concept is close related to the key terms of this symposium: Sustainability - Covid and Post-Covid times- Climate change- Energy conservation and energy transition- Challenges and opportunities.

Let's see how lighting research can contribute to pandemic and post-pandemic requirements. The term sustainable design in lighting implies:

The intelligent combination of artificial and natural light (in fact, the term biophilic design aims to reconnect users with the natural environment by means of the presence of green elements indoors).

And the use of efficient technologies such as LEDs as well as lighting controls. Lighting control requires luminaires that are dimmable. Daylight-dependent lighting control can reduce energy consumption by as much as 35 percent. Combined with timers and presence sensors, economies of 55 percent or more are possible (Licht, 2019).

The term healthy lighting implies not only level and spectrum of light, it is also related to behavioral strategies like:

The recommendation of spending adequate time outdoors during the day for a better health and well-being. Half an hour is recommended in adults and 2 hours outside is recommended in children to avoid myopia. Or a good quality of indoor lighting.

On the other hand, the exposure to daylight will help counteract the overexposure we have to artificial lighting, since LED was proven that it can delay or advance the circadian clock (Ticleanu & Littlefair, 2015). Then, the more we expose ourselves to daylight, the more melatonin we will secrete at night, and we saw this is important to get a deep sleep, which allows the recovery of the body and the activation of the immune-defensive system.

Since human evolution was shaped by natural light, it is also important to consider that a sustainable and healthy lighting practice involves the support of bright days and dark nights, to avoid circadian disruption. That's why is very important to reduce the use of display screens after sunset, especially close to bedtime.

The WELL Building Standard for Light (launched in 2014) provides illumination guidelines that are aimed to minimize disruption to the body's circadian system, enhance productivity, support good sleep quality and provide appropriate visual acuity where needed.

Currently, everybody realized that hybrid modalities for communication will remain for a long period of time, and this implies the reshape of our home alongside a comfortable and versatile lighting of our workspace considering both its visual and non-visual effects. For instance, the vertical lighting, which is important for circadian purposes, is also required for videoconferencing for people's faces appearance. According to the CIE "integrative lighting" is the official term for lighting that is specifically intended to integrate visual and non-visual effects, producing physiological and psychological effects on humans.

Then, a good lighting installation must consider three dimensions: the visual, emotional and biological effects – and its energy-efficiency at the same time. Even more, in order to understand the potential risk to human health, it is necessary to characterize the light stimulus in terms of its physical properties: spectrum- intensity- duration- spatial distribution- timing- and quantification of the effective irradiance for each photoreceptor independently, to later be able to relate them to specific measurable psycho-biological responses such as melatonin and cortisol secretion, heart rate, brain activation, pupil constriction, performance, subjective alertness (Lucas et al, 2014).

2. STUDY

As an example of this approach, I will show you a study we have run on office lighting with different spectrum and light level (Tonello et al, 2019). I told you that the visual effects of lighting are mostly related to visual performance, while its nonvisual or psychobiological effects involve health and well-being. Then, in this study, a holistic approach comprising visual, emotional and biological dimensions

was used to assess the lighting conditions that could favor productivity and well-being, by means of the identification of congruent relationships between objective and subjective measurements in response to light stimuli. The former included analyses of melatonin and cortisol, and the latter were psychological instruments for measuring transitory mood, somnolence, and visual comfort. In formulating the operational hypotheses, we assumed that lighting variations in terms of spectra and level during exposures of moderate duration will affect relevant psychobiological correlates. A secondary aim was to test the importance of co-variables such as the individuals' previous exposure to daylight (photic history), and their psychological profile in terms of personality type, perceived stress, and emotional state.

2.1. Set up and photometry

The laboratory set up consisted of two sets identically furnished, lacked windows, soundproof and temperature controlled. The lighting system consisted of two luminaires for each set: one located over the desk and the other was directed to the front wall. The first luminaire, with aluminum reflectors and open louvers, provided the general lighting by means of three compact fluorescent lamps of 36 W covered by a plastic diffuser. The other was a wall-washing luminaire with three tubes containing LEDs of 20 W, 21 W and 24W aimed at the wall in front of the subject. Both types of lighting, compact fluorescent lamps and LEDs, have Correlated Color Temperatures (CCT) of either 3000 K or 4000 K. They were selected because of their common use in office lighting in Argentina.



Figure 3. The lab setup: the warm (3000 K) and cool (4000) CCT at the higher level (front wall light ON).

The objective measures comprised photometric measurements such as Illuminance and Luminance levels, the spectral power distribution of each light sources as well as the spectral power distribution received at the cornea of the

participants was also recorded to calculate the melanopic lux, as well as the Circadian Stimulus.

Table 1. Average Illuminances (E) and Luminances (L) on desk and walls in the two sets at different CCTs.

Light levels	Surfaces	3000 K			4000 K		
		L (cd/m ²)	E (lx)	Melanopic illuminance (melanopic-lux)	L (cd/m ²)	E (lx)	Melanopic illuminance (melanopic-lux)
Front wall ON (higher level)	Front wall	271	923	7.12	270	900	8.86
	Right wall	172	560				
	Left wall	177	600				
	Desktop	146	796				
	Paper	170					
	Screen	117					
Front wall OFF (lower level)	Front wall	70	176	1.78	73	196	2.36
	Right wall	80	300				
	Left wall	65	297				
	Desktop	68	440				
	Paper	90					
						90	

2.2. Hormones

Another objective measurement was the Melatonin and Cortisol sampling. In this study, for melatonin detection, the collection included two samples of urine. To identify the nocturnal pattern of secretion, a urine sample was collected at home, over 12 hours. A second sample of urine was collected at the laboratory. As to cortisol, it was collected in saliva six times: at 11 pm the night before the experiment, at 07:00 in the morning of the experiment, two samples during the experiment in response to changes in light level, and two samples after the experiment: at 5 and 11 pm. Participants were screened to rule out severe vision disabilities, infections, extreme chronotypes and endocrinology disturbances.

2.3. Subjective measures

Subjective measures comprised two psychological tests: the Scale for Mood Assessment and the Epworth Sleepiness Scale. The interior lighting quality was assessed by means of a questionnaire containing rating scales to estimate the impact of lighting on the appearance of the space in terms of unpleasant–pleasant, weak–strong, cold–warm, natural–unnatural, glaring–no glaring and soft–hard. The visibility condition (readability) was also measured ranging from very poor to very well. Visual discomfort had to be reported as experienced at the end of the experiment by means of a list of symptoms related to tears, visual fatigue, dryness, blurred vision, and headache. All these aspects were computed as indices which revealed Cronbach’s reliability between moderate and high. The Photoc history, or the individuals’ previous exposure to daylight, as well as their sleep hours during the working week and at weekends were also investigated. Besides, complementary measures as co-variables were also carried out in order to investigate to what extent the impact of workplace lighting on the selected psychobiological outcomes would be mediated by the psychological profile of the participants. This construct was composed of tests of personality type, emotional state, and perceived stress.

2.4. Procedure

This study was a controlled experiment with a repeated measures design. A total of 56 evaluations were performed by seven participants, four males and three females with a mean age of 30 years. Each participant was randomly exposed to the four experimental conditions (two light levels and two spectra), during a period of two consecutive weeks in November (summer) and July (winter). In all, each participant attended eight sessions, at the same time of the day, from 09:00 to 13:00 hours. Each session lasted 1.5 hours and covered the exposure to one spectrum and one light level. The same procedure was followed the next week but under another spectrum. Task: Computers were used to fill in the psychological tests and the various questionnaires. For the performance task itself, both compute and paper were used since the task consisted of comparisons and error corrections between lists of numbers and letters into which errors had been randomly entered.

2.5. Results

Our results showed that the color temperature of 4000 K rendered most of the strong effects as to inter and intra correlations among psychobiological responses. The visual metrics in terms of illuminance and luminance were kept constant across the different experimental conditions while the non-visual metrics in terms of Circadian Stimulus and melanopic illuminance were higher for 4000 K.

Lighting appraisal: The lighting quality differentials used to rate the appearance of the experimental spaces have clearly discriminated the selected color temperature of 3000 K and 4000 K as warm and cool, respectively. The warm lighting was rated as pleasant and natural, while the cool lighting was rated as strong, and neither of them was rated as glaring. In this regard, the influence of the light level was important for various purposes, by accentuating the warmth and coolness properties, and for visibility, which improved at the lower light level under the cool lighting and at the higher light level under the warm lighting. This last finding may be explained by the spectral irradiance measurements that characterized the total light spectrum where the observer was immersed. That is, the LED system used at the higher light level expanded the blue component from 415 nm up to 480 nm even in the color temperature of 3000 K. We saw that Melanopsin, the photopigment of the ipRGCs, is particularly sensitive to blue light (wavelengths of 460–480 nm), and in addition to being involved in non-image-forming processes, it also plays a role in visual functions.

Melatonin and Cortisol: Since the experiments were carried out during the morning, melatonin was taken as a positive control and cortisol became a more reliable indicator to test the hypotheses. In this study, the expected

complementary behavior of melatonin and cortisol was confirmed. The comparison between seasonal and experimental melatonin responses showed that those individuals more sensitive to seasonal variation showed greater sensitivity to the different experimental lighting conditions as well. Thus, those subjects who did not display the expected seasonal variation showed less variability to the experimental stimulus. On the other hand, and despite the small sample, the results also suggest that low melatonin secretors might be less sensitive to the experimental lighting stimulus. Cortisol measurements covered the 24-hour cycle by means of the six measurements. A statistically significant difference was found in winter between the 11 pm before and after the experiment, when participants were exposed to 4000 K.

Co-variables: The psychological profile of the individuals was a construct developed to better understand the dynamic of the assessment since their reaction tendencies might act as mediators. Among the tests selected to characterize the psychological profile of the individuals', perceived stress was the most reliable feature. Also, the higher light level improved mood, which was mediated by a relaxed personality such as type B. According to Stephenson, quality of mood tends to reflect the level of alertness, so, as sleepiness increases, quality of mood declines and sleepiness impairs concentration and memory, which further negatively impacts performance and well-being. Participants of this study showed a positive mood throughout the experiment, nevertheless, mood was affected significantly by cortisol and perceived stress, thus, an increased cortisol concentration improved mood while the increased perception of stress worsened mood. Cortisol was a strong predictor of transitory mood, and low values of cortisol were somewhat associated with more somnolence. Conversely, an increase in melatonin affected mood negatively, and correlations showed that, under the 4000 K color temperature, the higher the melatonin level, the lower the visibility to perform the task. Then, it can be inferred that the transitory mood of persons prone to stress might be affected by the exposure to a lighting of 4000 K and a level of 800 lx (horizontally) and 900 lx (vertically) with a melanopic illuminance of 8.86 lx.

3. CONCLUSION

In conclusion, despite the differences between the two sets in terms of Circadian Stimulus and melanopic illuminance, none of the tested lighting conditions have affected hormonal secretion in acute suppressive ways, maybe due to the limited exposure time and the range of spectra used. The exposure to each color temperature lasted almost four hours while the combination color plus light level lasted for 1.5 hours. Since one of the aims was to investigate transitory mood, the stay at each office set should have been moderate so that changes in mood are due to the experimental stimuli and not to feelings of confinement. Notwithstanding, statistically significant indirect effects were identified in

the comparison of these apparently close temperatures. As to symptoms of visual discomfort that had to be reported at the end of each experimental session, the most frequent was ocular fatigue and blurred vision, under 4000 K, and perceived stress significantly predicted the number of symptoms. So, the perception of being a stressful person could have facilitated the experience of visual discomfort.

To finish, in line with what we saw, this study has identified that 4000 K lighting has the potential to provoke alertness or less somnolence, and therefore improved mood and visibility, but it was experienced as less comfortable. On the other hand, 3000 K lighting was better for the appraisal of the space, and its improvement on visibility seemed to be related to the higher light level, which was provided by the LED system. Lighting from LEDs can increase or decrease the CCT depending on the phosphors' properties. Both CCTs had a lot of spectral content in the blue area, this contribution being more noticeable in the set lit by 4000 K. Thus, this CCT should be able to modulate certain cognitive functions.

A contribution from psychology to lighting practice may be the consideration of the individuals' psychological profile, since it was suggested that this factor might explain the vulnerability to light found in many SAD studies. The psychological tests selected to characterize the psychological profile worked well in relation to the mediator role predicted in the hypotheses.

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05

SUSTAINABLE TECHNOLOGIES, SPACES, AND PARTICIPATION



07 / THE ROLE OF SMART AND SUSTAINABLE TECHNOLOGIES IN SUPPORTING ELDERLY INDEPENDENCE IN THE HOME ENVIRONMENT

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ABSTRACT

Due to the increasing population of citizens over 65 years old globally, it is essential to create smart interiors to allow all people to use regardless of their age, disability, or ability. Smart interior environments can also be named smart homes supported with technological devices and smart systems to enable automation and support sustainability development. Smart homes can monitor the elderly in their homes, improve their safety, reduce energy usage and observe their health situation without caregivers' need. This research aims to understand the elderly thoughts about smart interiors prepared to accommodate and monitor them daily to continue independently. In this study, the focus is on the concept of "smart interiors" and its possible contributions to enhancing the elderly's daily lives and supporting independence that supports self-confidence. Therefore, this research uses a theoretical framework as a base of this study, including elderly needs, design for elderly requirements, and recently innovative technology for elderly assistance. The method involves interviews with 20 participants following up with cognitive mapping to strengthening the interview technique to analyze and evaluating hypotheses to understanding the elderly needs, difficulties, and acceptance of innovative technologies. Finally, the results indicated that a small percentage of the elderly had background information about the smart home concept in general. Yet, the vast majority of the participants did not have any idea about the concept. Most of the elderly were open to learning more about technological devices, smart homes, and how they work. Although knowledge of the smart home concept and its impact on supporting the independence of the elderly is appreciated, not all participants would prefer to convert their home into a smart home if opportunity permits. The findings are believed to contribute to knowledge with the aim of enhancing independence for the elderly in their homes.

Keywords: Covid 19; Sustainability; Health, Productivity.

1. INTRODUCTION

As the population of citizens over 65 years old increases worldwide, it has become imperative to think about design for this age group. According to data from World Population Prospects: the 2019 Revision, by 2050, 1 person in 6 people will be over age 65, representing 16% of the world population, up from 1 person in 11 people in 2019 average 9%. Depending on this forecast, the number of individuals aged 65+ is predicted to reach 1.2 billion in 2025, 1.3 billion in 2040, and 2 billion in 2050 globally. Research states that, the interior environment has an essential role in improving the elderly daily lives and support them to communicate, interact, and remain living independently in their homes. Smart interior environment for the elderly is technological assistance sustained by innovation and smart systems such as sensor technology systems, smart wearable devices (Demiris & Hensel, 2008), and wireless connections that afford healthcare controlling management devices to facilitate independent existence for the elderly in their homes.

The emerging dependency between design, sustainability and technology to achieve the elderly needs in interior space is the focus of this research. It is believed that, technology may have an impact on supporting the elderly to continue living in an active, independent, and healthy way. Nevertheless, technology use varies among the elderly (Peek *et al.*, 2016), and they may face several problems using the latest technology because it does not fit their mindsets. Due to rapid development of technology, there is a need to directly comprehend elderly needs in design and the elderly's issues and challenges that are the aims of this research. The health care system took a step forward with technologies to support the elderly in their daily activities and become independent. It is imperative to provide innovative technology for the elderly, making their daily routine easier (Aslam and Latif, 2020).

1.1. Research problem definition

Depending on the increase of the citizens' population over 65 years old globally, it has become essential to think about design for this age group. Moreover, the recent COVID-19 pandemic and related lockdowns has led to increased loneliness in the elderly around the world. One of the critical factors that affects integrating technology into the daily life of the elderly is the extent to which the elderly themselves accept any technological advancements.

1.1.1. Research problem

The research focused on the following questions; 'How can technological devices improve the daily lives of the elderly and support them to continue living

independently in their homes?', and 'How can the elderly accept the concept of smart homes and adding more technological devices/ systems into their life to support them in remaining independent?'

1.2. Research aim/ objective

This research aims to understand the perspectives of the elderly regarding innovative technologies and the smart home concept that supports them in continuing their daily lives independently. This study aims to clarify the elderly opinion and acceptance of integrating more technology into their lives to maintain independence.

1.3. Research significance

The significance of the research lies in understanding the elderly views and opinions about the concept of smart homes and their knowledge of the potential impact of technology on their daily lives. As technology-induced homes can significantly impact elderly independence, developing a strategy and proposal for an integrated technological solution would decrease difficulties that the elderly face daily in their homes.

1.4. Theoretical background

This research has a critical lens that aims to emancipate the elderly habits and support them in dealing with technological devices and application in their daily activities. Moreover, the relationship of the elderly with technological devices and exploring how the elderly would participate and interact with their smart homes are studied.

2. THE AGING POPULATION AND ELDERLY INDEPENDENCE

Due to the change in demographic status globally and the increase in the aging population, the UN developed and published the critical principles needed for the elderly to remain living in their homes. The UN focuses on the necessary living conditions for the elderly and categorized them into five main sections: independence, care, participation, self-fulfillment, and dignity. These principles aim to support independence, as well as the well-being and self-actualization of the person, cognition, and skills such as creativity within a supportive and sustainable environment for the elderly (Hasirci & Demirkan, 2003; Hasirci & Demirkan, 2007). Research shows that the vast majority of the aging population prefer to continue living in their homes as they have close links and memories

in their places. Unfortunately, the standard home designs serve the young age sectors rather than those with limited mobility and sensory and cognitive limitations.

2.1. The elderly

It is difficult to define "elderly", especially when identified according to the changes that occur by the person while aging (Benyon, 2010). It is most likely to define the elderly as individuals aged 65 and over. Therefore, there are no accurate boundaries between who is considered "young" and who is considered "old adult"; it is not easy to define these age categories. Physical, cognitive, psychological, and social changing factors are the four dimensions of aging (Czaja *et al.*, 2019), and the WHO defines the elderly in three different age groups. The first category represents 65 to 74 years old is called, "younger-old"; this stage refers to the changeover from work life to retirement. The second category, called "old-old", refers to 75 to 84 years old; this period noted the start of functional losses and physical weakness. The third category refers to those aged 85 and over; needing support and care (Czaja *et al.*, 2019). Therefore, the definition of old age "elderly" is quite broad and complex, and to reflect on the meaning of aging is a way of understanding the actual definition of "old age," which might help create design strategies that allow improvements to sustain elderly independence (De Freitas *et al.*, 2010).

2.2. Elderly independence

Home design could be an issue or a supporter of the elderly aging in place. Research shows a relationship between home design and elderly well-being. The home becomes a safe and comfortable place for the elderly to maintain social relationships with the community. Interior home design must satisfy the elderly's needs for their daily activities and reflect security and independence (Demirkan, 2007). Only 5% of the elderly live in care homes and most of the elderly choose to live at their own homes (Galof, & Gricar, 2017).

The "aging in place" concept supports the elderly to reside independently in their homes and promotes socializing with friends and neighbors to eliminate the social isolation in the community (Diana, 2008). For technology to affect independent living, it is crucial to develop central principles of what creates balance and differences in the elderly's use of technologies over time. Lee and Kim (Peek *et al.*, 2016), introduced the four main characteristics of supporting elderly independence in their smart home: automation, affordance, physical support, and psychological support. Smart home systems offer computerization abilities to support the elderly's independence, which allows them to manage their interior space. Today, several types of smart home concepts are available

for the elderly—the elderly desire to live independently in their well-known space or home as long as they can. Many innovative technologies developed and emerged into smart interior environments recently, but it is essential to understand the elderly emotional and cognitive needs and aging changes to make smart homes more familiar and comfortable and to sustain a higher level of individual independence (Lee & Kim, 2020; Sixsmith *et al.*, 2014).

Fragility is the common aging symptom characterized by adverse health outcomes such as reducing the body mass index, physical deformation, weakness, frailty, lower level of physical movement, and stress intolerance that may result in death (Forman, and Alexander, 2016). 20% to 30% is the fragility rate for elderly aged 75 and over, and regarding those aged 85 and over, the rate is 30% - 45% (Schoufour *et al.*, 2014). It is vital to prevent the diseases from spreading with primary protection and effective treatment to achieve healthy aging in place. Successful aging often refers to the importance of the independence concept for mental, cognitive, and physical health (Beswick *et al.*, 2010). There are already many technological devices that help the elderly, so developing strategies and proposals for integrated, more technological solutions would decrease the difficulties that older adults face daily in their homes.

2.3. Designing interior environments for the elderly:

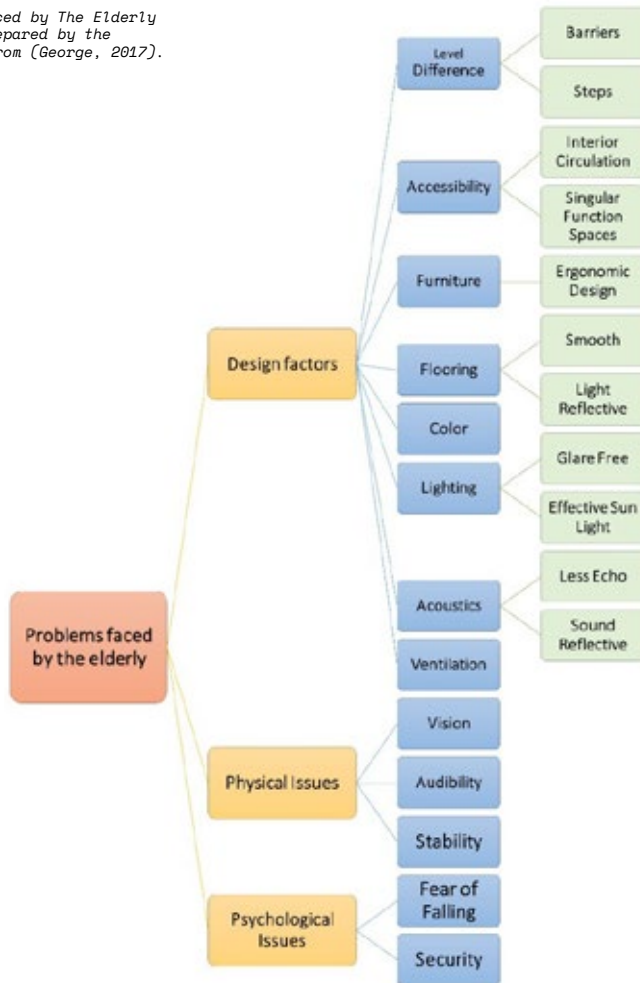
When designing for the elderly, it is vital to consider the personal ability to sense, perceive, and understand data and physically interact with it. The successful interaction between the elderly and the environment has a role in improving the quality of practicing the activities of daily living. The two conceptual models that represents the interaction between the interior environment and the individual are the competence approach, which assumes that the behavior results from how the individual's level of competence and independence meets the needs of the environment. In contrast, the congruence model developed by Kahana contends that behavior is the result of how the environment satisfies the individual's demands (Gupta, 2017).

2.3.1. Main issues in designing for the elderly

The main issues of designing for the elderly are design factors, physical issues, and psychological issues as shown in Figure 2. The aging process can be presented in four main factors; this process occurs and affects the physical, cognitive, mental, psychological, and social factors (Czaja *et al.*, 2019). The elderly are less familiar with innovative technologies, and they may also have some doubts about their ability to perform or complete their daily activities successfully. Thus, it is crucial to make the environment as stress-free and relaxed as possible, depending on the age-related changes. Physiographic aging presented the reductions in

learning, sensing, perception, and ability to solve problems; sociological aging shows the decrease of values given from society to the individuals (Ünal & Özdemir, 2019). It should be understood as a process in the life cycle in which there are changes in the physical, psychological and social levels that affect interaction with the social setting (De Freitas et al., 2010). Therefore, the main factors to be considered while designing a smart home for the elderly are design, physical, and psychological health factors. *Figure 2* shows a summary chart for the three main issues in designing interior environment for the elderly, which are: design factors, physical issues, and psychological issues. These issues should be considered while designing interior spaces for the elderly.

Figure 1. Problems Faced by The Elderly in Interior Space (Prepared by the authors and adapted from (George, 2017)).



3. SMART HOMES AND INNOVATIVE TECHNOLOGIES TO IMPROVE ELDERLY INDEPENDENCE

Traditional homes are generally not designed for exceptional cases and needs – the elderly – like monitor the home environment or the occupants' physiological conditions and activities (Noury, et al. 2003). In contrast, a smart home is embedded with innovative technologies and a smart communication network that can enable remote and automatic monitoring of the residents' home security and overall health status. A smart home is defined as incorporating various smart systems related to home needs through innovative technologies like fiber optic cable installed in the home. This fiber optic cable allows sharing information and communicating within the home. The smart home's main purpose is to accommodate an efficient, safe, comfortable, and interactive environment (Li, M et al., 2018).

3.1. Smart home and sustainable environment

In the 1990s, the smart home concept developed and defined by Staphy as a home that is smart enough to support the elderly to live independently and efficiently with the help of technological devices is described as a "smart home." In the smart home, all the technological devices are connected to produce a smart system that's with each other and interact with the elderly user to create a smart interior environment (Lobaccaro et al., 2016). The smart home aims to enable the elderly to live independently at homes as long as possible to promote their safety, health, psychological, and physical well-being. The smart home idea was initially formed to focus on developing safety and energy-saving, indicating the agreement of the smart home system with sustainability development. Sustainability development for the elderly home's environment is critical to facilitating a healthy society's global development. The elderly interior sustainable environment could infer an eco-friendly lifestyle offered by the smart home concept for the elderly (Hu, 2021). The central concept of smart home technologies has gradually expanded in the previous decade to include supporting residents with disabilities, the elderly people, and those with less physical abilities to enrich the interior environment and improve comfort and satisfaction (Ding et al., 2011). The smart homes concept focuses on improving comfort, safety, and convenience in the home and reducing energy use through enhanced home energy management (Hargreaves et al., 2017).

3.2. Smart technologies that reflect smart home features

Smart technologies that support the elderly independence concept are divided into two categories, which are smart technological devices and smart technological applications. Pervasive smart software can be helpful for fall

detection depends on the person's motion differs. Smart devices in the home, from smartphones to furniture, kitchen appliances, cabinets, and bathrooms, motivate the users to control their daily lives, like taking medications on time or maintaining exercise (Hudson & Cohen, 2003). Furthermore, healthcare technologies have become more familiar, especially for the elderly. These technologies could connect the user with clinicians (and emergency if needed) to monitor their physiological signals such as blood pressure and heart rate through wearable sensors or devices installed in their smart homes (National Research Council et al., 2004).

3.2.1. Smart technological devices to assist the elderly in their home

Technological devices may positively impact the elderly and supporting them to live more independently in their home. The elderly can follow up on their health status through some applications or devices installed in their home. The internet and technology make life more quickly, mostly, and for instance, a fast response for a sudden health issue could result from using technological devices in the home. Moreover, the technology could improve the social life for the elderly as they can connect to their relatives through the technology which could lessen the loneliness and social isolation feeling. The elderly may face some problems while dealing with technology for the first time as mostly it is not familiar to their mindsets, but if they have a familiar technological interface, this will encourage them to deal with it (Mostaghel, 2016).

Smart technological devices that support the elderly independence could be divided into two central systems: wearable devices and installed devices, as shown in *Figure 3*. Smart wearable devices have several types, such as wearable

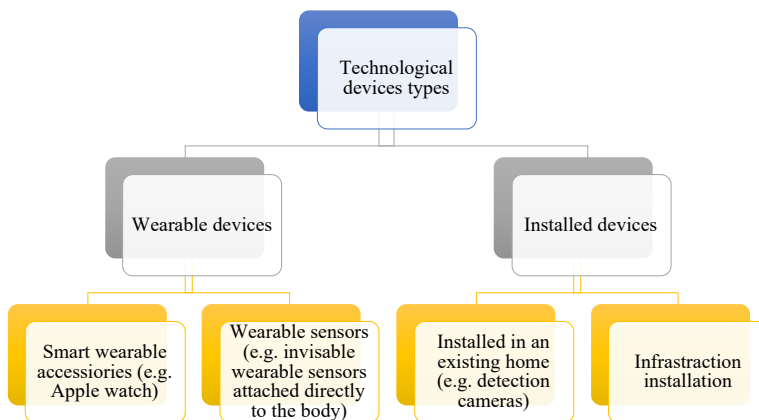


Figure 2. Technological Devices Types Map (Prepared by the authors).

accessories or smart wearable clothes; the other type is the more advanced, small, and transparent sensors attached directly to the body. The installed devices refer to the external devices installed at home, such as detection cameras or smart monitoring systems; it could be installed on an existing home to transform it into a smart home and the other type installed within the home's infrastructure.

3.3. The main challenges in applying smart and sustainable interior environments for elderly

Mostaghel (Mostaghel, 2016) mentioned that the previous studies show that age and educational background could affect the elderly technology usage and acceptance. Technological devices and intelligent software offer an opportunity for the elderly to cooperating with innovative technologies easily and quickly. Despite the recent continuous research to find the best technologies models to support the elderly in their daily lives, there are still clear challenges that may become an obstacle to implementing this concept. The elderly will use technological devices and integrate more technology in their lives if the technology is affordable, usable, easy to use as they fear from technology because it is not familiar to them and accessible (easy to reach the information and service). The privacy of the transmitted data through the smart home system represents an essential matter. Smart systems, despite their advantages, but there are still some ambiguities, especially for the user, principally for the collected data. It may contain private and sensitive information about the user that may affect their privacy. Accordingly, user data integrity must be verified, and the measures taken to maintain privacy must be clearly explained to users.

A smart interior environment should be presented to the elderly with particular thoughts of smart home advantages and possible dangers. Elderly persons do not prefer to spend much money on smart homes, as the vast majority are of retirement age and have limited income, and their concerns about whether they need these intelligent systems or do not need this change in their lives (Gunge & Yalagi, 2016). It is essential to understand the elderly's needs correctly to provide a smart home suitable for them, reflecting their requirements (Haines *et al.*, 2007). The elderly face further challenges because, as people getting old, their cognitive, physical, and sensory capabilities transform, causing the elderly to display changed attitudes toward technology (Courtney *et al.*, 2008). The elderly is currently being open to new technologies and improving their skills with younger people's assistance. Moreover, it has become even more significant to support elderly independence when human assistance became scarce during the COVID-19 pandemic as they were not permitted to have face-to-face contact with their relatives in most countries that limit infection risk. The pandemic brought unpredictable challenges, especially for the elderly's lives and well-being (Adhikari *et al.*, 2020), which clarified the role of technological devices in

supporting elderly independence without the need for human assistance to limit the risk and support their safety within a sustainable environment (Chee, 2020).

As a result of the previous studies of smart home challenges, this research categorized the issues into three main issues in creating sustainable smart homes for the elderly: financial, technical, and psychological.

3.3.1. Financial issues

Smart home technology is often expensive to obtain and sometimes causes extra costs throughout use. The high cost associated with smart network and healthcare facilities supplied by smart homes can negatively affect the elderly mindset. The elderly users consider the price to be an appropriate monetary sacrifice for their services from using smart homes (Lian & Yen, 2014). As a result, the supposed price affects the behavioral goal of the elderly to use and unpleasantly interact with innovative technologies.

3.3.2. Technical issues

The insufficient knowledge of many elderly persons with smart home new technologies is another widespread concern (Lê.Q. *et al.*, 2012). The elderly who does not use the technology or the Internet do not think the technology will add value to their lives (Gitlow, 2014). The elderly concentrate on orienting the task very well while learning new technical skills; they need to precisely understand the benefits and effects of learning these skills before they are motivated to do it (Callahan, Kiker & Cross, 2003). The elderly's acceptance of technology depends on the successful transmission of its purpose and benefits on their lives as they use technology to reach a specific outcome (SCAN Foundation, 2010). In technological devices, usability is essential because it involves user interaction; usability is significant, especially for the elderly to use technology.

3.3.3. Psychological issues

The elderly usually fears all the mixture of suspicion and uncertainty, the worry of being controlled, and fear of losing secrecy. When introducing technology to the elderly, it is vital to learn about the possible advantages (Aula, 2005). Many elderly persons feel frightened when faced with innovative technology. Studies have stated that the elderly are less self-assured and more worried when dealing with technology than younger people (Czaja *et al.*, 2006). The elderly anxiety of technology can lower satisfaction, benefits besides the limitation of the possibility of the frequent usage of innovative technologies. Technology Anxiety is described as worry, trepidation especially in the elderly, when using certain

new technology that they have not used before (Meuter *et al.*, 2003). Previous studies indicate that technology anxiety is pervasive in computer-related systems and information network systems, especially for the elderly (Kummer *et al.*, 2016; Powell 2013). The elderly prefers to use technological devices that are familiar to their mindset and which they are habituated to and using for a long time rather than swapping over to innovative technologies (Liu *et al.*, 2013), and most decisions are affected by the psychosocial need to stay independent. The elderly feels hostile towards systems that visually show them as frail, old, and need assistance (Walsh, and Callan, 2011). Improving user training programs to understand the elderly's previous experiences with existing systems could limit technology anxiety so that the elderly will build confidence while learning and adopting innovative technologies.

4. METHOD

This research study attempts to broaden the theoretical and methodological scope of the discussion that has focused on supporting the elderly's independence by merging innovative technological devices in their homes to convert them into smart homes. This study focuses on the question of how smart interior environments support the elderly to remain living independently.

4.1. Data and sampling

This study is dealing with the research problem by conducting an interview with the elderly as a target group (aged 65+) and putting into consideration the elderly needs and challenges of using technological devices by the elderly to arrive at the findings and conclusion at the end of this research.

4.2. Participants

Due to the COVID-19 pandemic and its risks, communication with the participants was through their friends and relatives. 20 volunteers over the age of 65 participated in this research through their social circles. The elderly participants of this research were 12 men and eight women and the age distribution can be seen in *Figure 3*.

4.3. Instruments

Interview and logbook techniques were used complementarily to collect data directly from the participants.

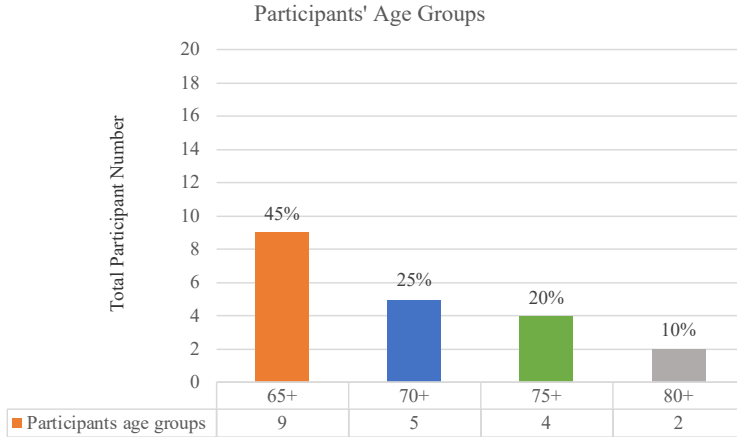


Figure 3. Participants' four age groups.

4.3.1. Interviews and logbook

Interviews used to contact in person and collect the data directly from the participants. The interviews were performed remotely by phone and online communication tools. In addition to the interview questions, there was a logbook to be filled which was used to clarify the participants' health condition and technology use.

4.3.2. Results of interviews and logbook

This research intends to develop suggested solutions to the research problem based on the use of research techniques to know the four aspects mentioned in the research problem: the elderly's health status, daily activities, their use of technological devices, and their knowledge of the concept of smart homes and their opinion of adding innovative technologies in their homes.

4.3.2.1. Participants' health status

Results showed that 65% of the participants have vision impairments from aging factors, and 35% do not have this problem. 15% of the participants recorded to have a hearing impairment, 5% were caused by accident, and 10% from aging factors, 5% were using medical ear headsets. As the physical issue is an essential factor for independence status, the participants were asked if they have any physical issues while mobility in their homes or while dealing with furniture.

It was observed that 70% of the elderly participants were in good health and did not suffer any physical problems, and 30% of them had physical problems that affected daily practicing activities. It was detected that the persons who have physical problems are frustrated as this affects their daily activities. Furthermore, it was noticed that 35% of the participants were suffering from another special health issues; it was different from one person to another, but the most common was blood pressure, as 20% of them were suffering from it.

4.3.2.2. Participants' technology and internet use

The total percentage of the elderly connected to social media is 77%, and 23% did not use social media applications. Most of the participants used the WhatsApp application, which allowed them to talk to their families and relatives; this is the most critical factor in using social media.

After asking the elderly connected to social media, it was found that 15% of them spending from zero to one hour per day, and 39% of them spending one to two hours per day. 23% of the elderly connected to social media spend two to three hours daily, and 15% spend three to four hours, and only 8 % spend more than four hours daily. Most of the elderly use smartphones to connect to social media 80% of them, and 20% do not use smartphones or other technological devices.

4.3.2.3. Participants' acceptance of smart homes concept and technological devices use

The participants were asked if they have any background information about smart home concepts, and 20% of the elderly who have a background information about smart home concepts do not have accurate information's they know some basics knowledge about the connected homes. As for 80% of the participants, they do not know any information about smart homes. When the participants were asked if they accept to convert their home into a smart home if they have the opportunity to do that, 67% of them accept to convert their homes to a smart home. The most factor they accepted using technological devices and the smart home concept is the health factors; they think the innovative technologies will support their sense of safety in monitoring their health on an ongoing basis. Most of the elderly fear a sudden illness while alone in their home, so they are welcomed to have such technology to send notifications to their relatives if a sudden accident occurred. The figure below shows the percentage of the elderly accepted to convert their traditional homes into smart homes if they have the opportunity to do, and the percentage of the elderly did not accept the convert their homes.

Moreover, three participants are using technological devices for different reasons; one participant uses a smartwatch to control health conditions, and two of the participants use a safety monitoring camera. Seventeen of the participants do not use any technological devices; most of them prefer to do not to use them as they are not needed from their point of view.

4.3.2.4. Common issues that affect the independence of the participants observed from the logbook

It was concluded from the logbook that all the elderly who participated in this research could take care of their personal hygiene independently, and only one participant wanted assistance in getting dressed and moving through the home, meaning 95% can conduct their personal hygiene, moving in the home, getting dressed, and preparing food/ self-feeding independently.

5. CONCLUSION

In this study, understanding the elderly views about technological devices and opinions about the concept of smart homes and their knowledge of the proposed positive impact of technology on their independence was investigated. One of the most important goals of this research was to determine whether the elderly, in particular in Turkish society, will accept, in one way or another, the incorporation of new technologies into their daily lives to help them remain independent, or if they prefer to live as usual in their traditional homes and if it would help more sustainable living. Another issue was the effect of technological devices on the elderly independence. Being independent is an essential issue for the elderly in their daily lives. Previous studies have shown that to continue to live at home is the most valuable aspect for the elderly especially during and after the COVID-19 pandemic. Supporting elderly independence and self-care ability is a common approach nowadays among many countries globally due to the rise in the aging population.

Consistent with previous research, it was found that elderly persons have a high probability of accepting the concept of smart homes, despite their previously unaware of the existence of these innovative technologies that would support their independence. After conducting the previous studies and analyzing the results of this study, it was concluded that the technological devices could positively impact the elderly lives in their homes and encourage them to remain independent. Depending on the findings, participants showed their interest in learning more about new technologies and technological devices after interviewing and knowing more about their positive effect on their daily lives. The elderly mainly cared mostly about the role of technology in protecting them, whether on the health level from motion sensors or at the security level.

Therefore, technological devices have a significant role in improving the elderly independence. It was not expected that 67% of the participants in this research would accept the idea of integrating more technological devices into their homes.

Acceptance of technology depends on the awareness of the particular technology; no one needs to use useless devices, significantly increasing the financial burden. The positive side of using technology in the homes of the elderly could be lost if there were no radical solutions to the main challenges in providing these technologies. The purpose of technological devices in assisting the elderly independence in their home was the main concern of this research. Based on the concluded results; further studies are needed to discover new solutions to the challenges and how the limitation of issues and challenges will affect the elderly opinions incorporating innovative technologies in their homes. According to the findings, it was noticed that most of the elderly would accept to convert their homes into smart homes; and the main reason was to benefit from the role of technology in "protecting" them, whether from the home safety perspective or the health safety perspective. This was an interesting finding that further research might explore.

Depending on these findings and conclusion, the elderly's needs to adopt innovative technologies is becoming more apparent to designers. The elderly accepted the concept as shown in the findings if it is affordable and easy to use. Design for the elderly means before thinking of the design; it must understand their mindsets, beliefs, thoughts, backgrounds, and needs. Designing technological devices that respect the elderly mental and physical health and affordability and flexibility in use will fit the elderly mindsets. Technological devices offer various options for use by the elderly to limit the challenges, whether financial, technical, or psychological. However, there is no doubt that integrating technologies in elderly homes and the use of advanced technologies are still fearful and not preferred unless there is an urgent need to use them.

In addition, to know the real impact of integrating smart and sustainable technological devices, smart systems, as well as a sustainable environment on supporting elderly independence, cognitive abilities, and creativity in their homes, real life observations need to be carried out to understand the responses of the elderly. When applied, these innovative technologies may open a discussion about new challenges as well as new advantages. Although there are several positive aspects of technology, the benefit is predominantly dependent on the ability and acceptance of the elderly to use it. In conclusion, after arriving at the results of this research, which may inspire designers when designing for the elderly, further research is recommended on proposed solutions for the challenges mentioned in this study.

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08 / RESEARCH ON THE IDEAL FORM OF OFFICE SPACE AS WORKPLACES FOR TEACHERS

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ABSTRACT

The aim of this research is to understand the actual situation of teacher's work style and environment, as well as to gain new insights into the teacher's workplace, and is to provide guidelines for a healthy working environment for teachers. The workplaces for teachers are poor, and changes in the social environment due to COVID-19 have also brought changes to the educational environment. Therefore, we investigated the actual condition of teacher's workplace. From the results, we found some relationships with the installation of each room and some factors; construction year, the system each schools adopt, and so on. In particular, the interviews to teachers revealed the staff room is an important place for teachers to share information. Moreover, we found that the function of the staff room has been becoming more multifunctional and there's a lack of enough rest spaces and storage. The survey revealed that the area per person and furniture layout of staff rooms has not changed since 2000. In order to solve these problems, staff rooms should correspond to educational method, the size of school, and the number of teachers. Furthermore, we found that COVID-19 increased the workload, including disinfecting of classrooms, maintaining sanitary conditions, and searching for learning methods that avoid the three Cs; Crowded places, Close-contact settings and confined and enclosed spaces. It is clear that there is a need to develop enough space that can be adapted to unpredictable situations. To develop a healthy working environment for teachers, we need to continue case studies to understand teacher's actual needs. This is the joint research with Okamura Corporation.

Keywords: Covid 19; Sustainability; Health, Productivity.

1. INTRODUCTION

1.1. Background

According to a survey by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) (2016, p.53), elementary and junior high school teachers work more than eleven hour a day on average. Moreover, the amount of work they bring back home has not been decreased. *Table 1 and 2* shows the results of the government research. Actually, teachers have a wide range of duties; class preparation, student guidance, division of school duties, dealing with parents and students, staff meetings and so on.

Furthermore, according to the latest data by the MEXT (2021, p.118), the changes in the social environment caused by COVID-19 have also brought changes to the educational environment, increased the workload for teachers, including disinfecting of classrooms, maintaining sanitary conditions, and searching for learning methods that that avoid the three Cs.; Crowded places, Close-contact settings and confined and enclosed spaces.

Such a tough working environment for teachers is one of the social problems in Japan, and there have been calls for correction. Although the MEXT has published guidelines for reform in "Case Studies on Work Style Reform," it showed not so many schools are actually making improvements. Especially, there were few examples about re-designing workspace layout at the guideline by MEXT (2021, p.111-114).

However, the case study showed the layout change of staff rooms would reduce the working hours, surprisingly it would save 131.2 hours per year. We focused on this point and wondered if it would be possible to promote a healthy work style for teachers by improving the environment. Therefore, the important thing is to study the actual cases of the "working environment" in schools, and understand how to create better working environment. In this study, we focused on the staff room mainly, which has not changed even the change of educational system. And also, we tried to understand the actual status of teacher's work places.

In this research, we aim to understand the actual situation of teacher's work style, as well as to gain new insights into the teacher's workplaces. We also aim to help providing guidelines for creating a healthy working environment for teachers.

Table 1. Survey on the working hours (2016).

		Elementary School	Junior High School	Average of other country
Surveyed by MEXT (Ministry of Education, Culture, Sports, Science and Technology) Etc.	Regular Working Hours	8:15 - 16:45		
	Average of Actual Working Hours	7:30 - 19:01	7:27 - 19:19	
	Hours Worked in School per Day	11 hours and 15 min.	11 hours and 32 min.	
	Average Number of Days of Paid Leave Taken by Teachers per Year	11.6 days	8.8 days	
Surveyed by OECD (Organization for Economic Co-operation and Development)	Working Hours per Week	54.4 hours	56 hours	38.3 hours
	Class Hours	23 hours	18 hours	20.3 hours
	Extramural Activities	0.6 hours	7.5 hours	1.9 hours

Table 2. Working hours in school or at home.

Working Hours in School or at Home		Elementary School			Junior High School		
		2016	2006	Increase/Decrease	2016	2006	Increase/Decrease
Weekday	school	11h15 min	10h 32min	+ 0 h 43 min	11h 32min	11 h 0 min	+ 0 h 32 min
	home	0 h 29 min	0 h 38 min	- 0 h 9 min	0 h 20 min	0 h 22 min	- 0 h 2 min
Weekday	school	1 h 7 min	0 h 18 min	+ 0 h 49 min	3 h 22 min	1 h 33 min	+ 1 h 49 min
	home	1 h 8 min	1 h 26 min	- 0 h 18 min	1 h 10 min	1 h 39 min	- 0 h 29 min

1.2. Reference review

While there are many studies on school spaces and environments, few studies focus on teacher's workplaces or staff rooms in spite of many problems in them. Compared to other countries, where teacher's workplaces tend to be organized by subject and grade level, Japan is unique in having a large common staff room where all teachers gather together, and we reviewed studies mainly on teacher's workplaces in Japanese schools.

According to Sugawara's studies (2009 and 2012), teacher's staff room in elementary schools can be divided into three categories: space for individual use, space for common use, and space with parents and local residents. She also found that regular classrooms tend to be the base for each teacher, while common teacher's room was less likely to be the base for individual. Future staff rooms should include not only individual working space, but also a communal

space, teacher's meeting and communication space, which are often lacking in today's schools. These studies were conducted in elementary schools, and not in junior high and high schools, where teachers use the staff room more often.

Fujiwara (2012) clarified the historical transition of teachers' workplaces since the Meiji Era, when the school system was started. Initially, the staff room was developed as a resting and eating space, including a waiting room, and gradually it changed the function such as office work, official business, conferences, and meetings. Then, in the 1900s, integrated staff room, as we see today, were established. Fujiwara and Takeshita (2008, 2010) compared the behavioral characteristics of teachers in junior high schools with integrated staff rooms and those with separate staff rooms. She found the separation of staff rooms caused problems due to wasting travel time and lack of communication among teachers, and discussed the advantages of "integrated staff room" as a way to have a multifunctional staff room.

Li and Mizutani (2018) compared the layout, area, and spatial configuration of staff rooms in elementary schools, and analyzed the trends in these areas. In addition, interviews were conducted with teachers and staff to clarify issues faced by teachers and staff, such as the lack of usability due to insufficient area and the need to consolidate necessary functions including printing, office space, hot water supply, and meeting space.

These studies about teacher's workplace or staff room give us very important consideration, but are lack of following studies. Therefore, our research should include them.

- No classification about the layout of the staff rooms.
- Factors (year of completion, total floor area, etc.) relevant to the installation of each room.
- Consideration of the irregular situation of COVID-19 on teacher's workplace.

2. RESEARCH DESIGN

We tried both literature survey and field survey. About the literature survey, we selected 108 schools through the articles written about staff rooms and their planning from the magazine called "School Amenity". "School Amenity" is a popular magazine to introduce various educational facilities in Japan widely. We chose this magazine because it covered all types of schools in Japan. We analyzed the surveyed schools in six areas: staff room, principal's office, conference room, consultation room, break space, and teacher's corner, to investigate the layout, actual maintenance, and issues.

About field survey, we did onsite survey on 4 schools, and online interviews on 2 schools because of the circumstances of COVID-19. The outline of the survey on schools is showed on *Table 3*. In order to select schools for the field survey, we first searched the schools that fit our research objectives and intentions on web site, by using keywords such as "staff room" and "advanced case study." We also reviewed to the magazines such as "Shinkenchiku" (famous magazine introducing most innovative Japanese architecture newly built) and "School Amenity" since 2000, and chose the schools with unique planning in staff rooms. Then we selected schools which had changed the furniture layout of the staff rooms as advanced examples shown in the web site. The survey method was to draw furniture layout in the staff rooms and interview to teachers.

Table 3. The outline of the schools of onsite research.

#	School Name*	Curriculum	Public / Private	Staff Space	Rest Space	Teacher's Station	Conference	Consultation	Number of Student	Number of Teacher	Student per Teacher	Area of Staff Room	Area per Teacher
1	RT	Elementary	Private	Distribution	•		•	•	710	68	10.44	-	-
2	RS	Junior/High	Private	Integrated	•		•	•	1816	134	13.55	1033.20	7.71
3	EG	Junior/High	Private	Integrated	•			•	1080	79	13.67	242.53	3.07
4	MU	Elementary	Public	Integrated		•	•	•	865	38	22.76	137.56	3.62
5	DC	Junior/High	Private	Integrated	•		•	•	1228	-	-	-	-
6	TH	High	Public	Integrated			•	•	208	16	13.00	94.77	5.92

*To protect the privacy of the school, the name of the school is abbreviated

2.1. Literature survey

Figure 1, summarizes the layout of the staff room, principal's office, conference room, consultation room, resting space, and teachers' station. About staff room, the most common type was a single-room type called an integrated staff room, and desks were arranged in an island layout in many schools. Staff rooms with independent teacher's room is not common in Japan. In some schools, only the administrative staffs had seats in a straight line, and arranged looking out all of the staffs. The area per teacher is much smaller compared to that of a private enterprise, and each office space should be expanded. Specifically, among the schools we surveyed, the staff room area per teacher was ranged from 2.07 square meters to 17.21 square meters. The reason for such a large difference in the area is due to the increase or decrease of teacher's number. Staff rooms are not enough flexible to accommodate future number of staff. This means that the planning of staff room is not adaptable to changes in social environment and cannot cope with unpredictable situations such as infections or disasters. Moreover, schools are not planned according to size, small schools' office spaces are planned same as other large schools, so the small schools tend to have a larger area per teacher and more comfortable working environment. It's very important to improve staff rooms according to school size and teacher's number. As mentioned above, there is a difference in the size of the staff room, but there is no difference in the layout depending on whether it is public school or private

school, or on the educational system (department system, special classroom type and so on). Only one surveyed school introduces a free seating system, and this school had the most flexible furniture form and layout. The free seating system is often used in offices with a 50-60% enrollment rate, but we understand that it is difficult to introduce the system in schools because the enrollment rate in staff room is generally close to 100%. On the other hand, from the perspective of infection control, the free seating system is effective in keeping distance between people, and many private companies have implemented such systems. This is a reality that schools are not ready for online operations, so we would like to continue the survey next year to understand the status of its implementation.

The principal's office was found in all schools as far as we surveyed. 73 out of 108 schools had the principal's office next to the staff room. Some schools have integrated it with the staff room; it seemed to be efficient for smooth communication with the teaching staff. From the interview, teachers said that communication and interaction among staff were an important factor for teacher's workplace. In addition to the principal's own seat, many of the principal's offices had a meeting table for guest reception or meeting with staffs.

As for the conference room, 13 out of 108 schools had no conference room. These schools were all special classroom type. Many schools arranged their conference rooms in a way that seats were faced to the center, and the number and size of conference rooms didn't have any relationships with the school size. On the other hand, staff meetings were held in the staff room, so the conference room is not necessary for meeting. In recent years, online tools have been used to save meeting time and help reduction of paper resources, and the need for conference rooms seems to be less important among teachers. In the future, the conference room space could be used for communication among staff members or as an additional space to the staff room. Additional space will also help to keep distance between people.

About the consultation room, many schools had them on the same floor as the staff room. The consultation room had a small area compared to the other administrative space, some schools had more than 10 rooms. In recent years, some schools tend to introduce counter-style consultation space or open consultation space for counseling. The open consultation space means the flexible space with chairs, desks and movable partitions in the staff room. On the other hand, it is true that many consultation rooms are enclosed space, probably because they are often used for student guidance and others need privacy. Interestingly, there might be 2 perceptions of the consultation room. Some schools had consultation rooms adjacent to the administration office for easy access, while others had them in a redundant space without any particular purpose. The necessity varied greatly from school to school.

About resting space, the installation rate was only about 40%, which means

that the rooms are still not common. Mostly it tends to be inside the staff room, because teachers reluctant to be seen taking a rest by students. In most of schools, it is difficult for teachers to find time for a break, and it is considered that taking a rest in open space is not so good. There is a possibility that students may visit the staff room for consultations or to submit assignments, and if the staff room is located on the ground floor, there is a possibility that local people can look over the staff room easily. The refreshing space should be invisible from outside for keeping teacher's privacy.

Teacher's station is often used for teaching, receiving questions, and interaction with students. The installation rate of teacher's station was about 40%, and many schools had teacher's station in different floor from staff room. This is because the function of teacher's station is almost same as the staff room. In schools, the break time between classes is too short, and it might be difficult for teacher to return classroom during breaks because the distance between the staff room and classroom is far. The area size of the teachers' station was varied up to schools, but if class materials are placed in the teacher's station, it can be very useful, without returning to the staff room for saving time. As with the resting space, the number of teachers' station is low. The furniture used in teacher's station is also varied up to schools. Some schools had walls, some had movable partitions, and some had alcoves.

Through the literature review on the rooms, the resting space and the teacher's station were rooms with fewer installations, and we examined which factor of school will influence to the installation of them. The number of schools with both resting space and teacher's station were 11 out of 108 schools, while 32 schools had only rested space and 29 schools had only teacher's station.

The following ten indicators were examined; 1) building area, 2) total floor area of the school building and educational system, 3) number of floors and total floor area of the school building, 4) number of teachers and total floor area of the school, 5) educational program, 6) public or private school, 7) number of teachers and area of the staff room, 8) number of teachers and area of the staff room per teacher, 9) number of students and teachers, and 10) construction year (Fig. 2).

About the resting space, it had relationships with the school with less than 50 teachers, the total floor area was small, private schools, and construction year. There were no relationships between school building area, staff room area, and differences in curriculum like elementary school, junior high and high school.

About the teacher's station, it had relationships with the department system, construction year, and school with many floors. On the other hand, there were no relationships with the size of the facility and the size of the staff room.

2.2. Onsite survey

In the onsite survey, we were able to learn about the use of some spaces much deeper understanding than the literature review. It's also very important to get ideas from teachers and understand their needs and their working situation in a day. And then, we will be able to reduce the number of rooms not used for their intended purpose and use them to create the space that is needed. By developing the space as a multi-purpose space, it can also be a space that can respond to unpredictable situations.

2.2.1. Teacher's needs

In this section, we will introduce about four spaces to understand teacher's needs; conference rooms, nurse's office, resting space and the staff room that changed the layout.

The conference rooms were used for a various purpose, such as taking distance among teachers under the circumstances of COVID-19, and avoiding interpersonal problems with other teachers. Conference rooms were also used for dividing teachers' working group preventing from mass gathering in large spaces. The field survey revealed that the conference room has been no longer used for conference.

Although it was not included in the literature review, there were some cases where the school clinic has been not only a place for students but also a place for teacher's mental care. For school nurse, it is easier to share information about students' mental and physical problems if school clinic is close to staff room. The closer distance between the two rooms is also effective in reducing students' resistance to visiting the school nurse's office and the staff room, because if it's far from the area students use most often, it will take courage to visit the infirmary. As in these cases, we can reaffirm the importance of the room and its relationship with other rooms corresponding to the education system and social conditions change. Now that more and more online meetings are held anywhere, the needs for conference rooms will decrease.

There were also interesting comments about resting spaces. One surveyed school introduced a space for staff refreshment in the school building with a good view, but the room was now being used as a reception room. It was because the access from the staff room to the space was a little bit far, and the good view increased the visibility of the room from students and local people. In one of other schools, the administrators were not so favorable against an enclosed space, because they thought it was the space to hide. Some of them said that they needed private space but were not willing to have a resting space to be enclosed much. In the future, it would be nice to have a lounge-like space where students and teachers can sit each other on the couch.

And about changing the layout of the staff room, one school had changed the 4 layouts of the staff room according to teachers' opinions, including widening the aisles, clarifying the location of documents and common items, and removing other spaces that had become difficult to operate as originally intended. The school was very concerned about the working style of the teachers but it was hard for the school to change the environment on their own. Another school in the survey was renovated with the participation of an office furniture manufacturer. This renovation indicated the change of staff room grown the teacher's interest of how to work efficiently and healthy. The school focused on the number of belongings each teachers have, and categorized their possessions into "hot", "warm", and "cold." The teachers were encouraged by the consultant to divide the items into three categories. The "hot" category is for things used frequently and should be kept close by, the "warm" category is for things not used as frequently as the "hot" category things but should be kept close to the work area, and the "cold" category is for things that are used less frequently and are not needed much. Each teacher owns their individual locker, and by storing their belongings that fall into the "cold" and "warm" categories, they were able to save space in the staff room. This was not only for promoting the paperless system, but also for improving the efficiency of office work and the overall environment of the staff room.

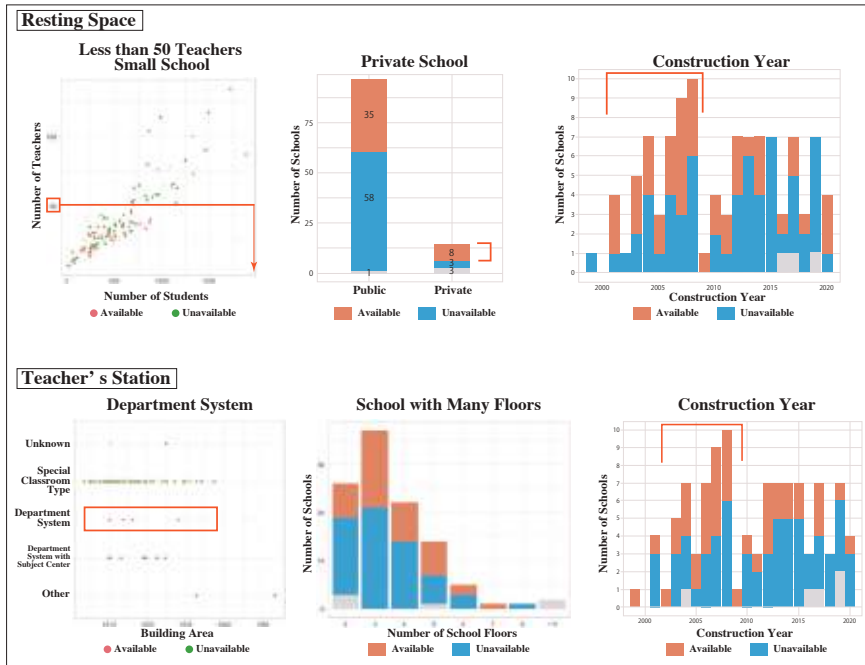


Figure 2. Relationship with some factors about resting space and teacher's station.

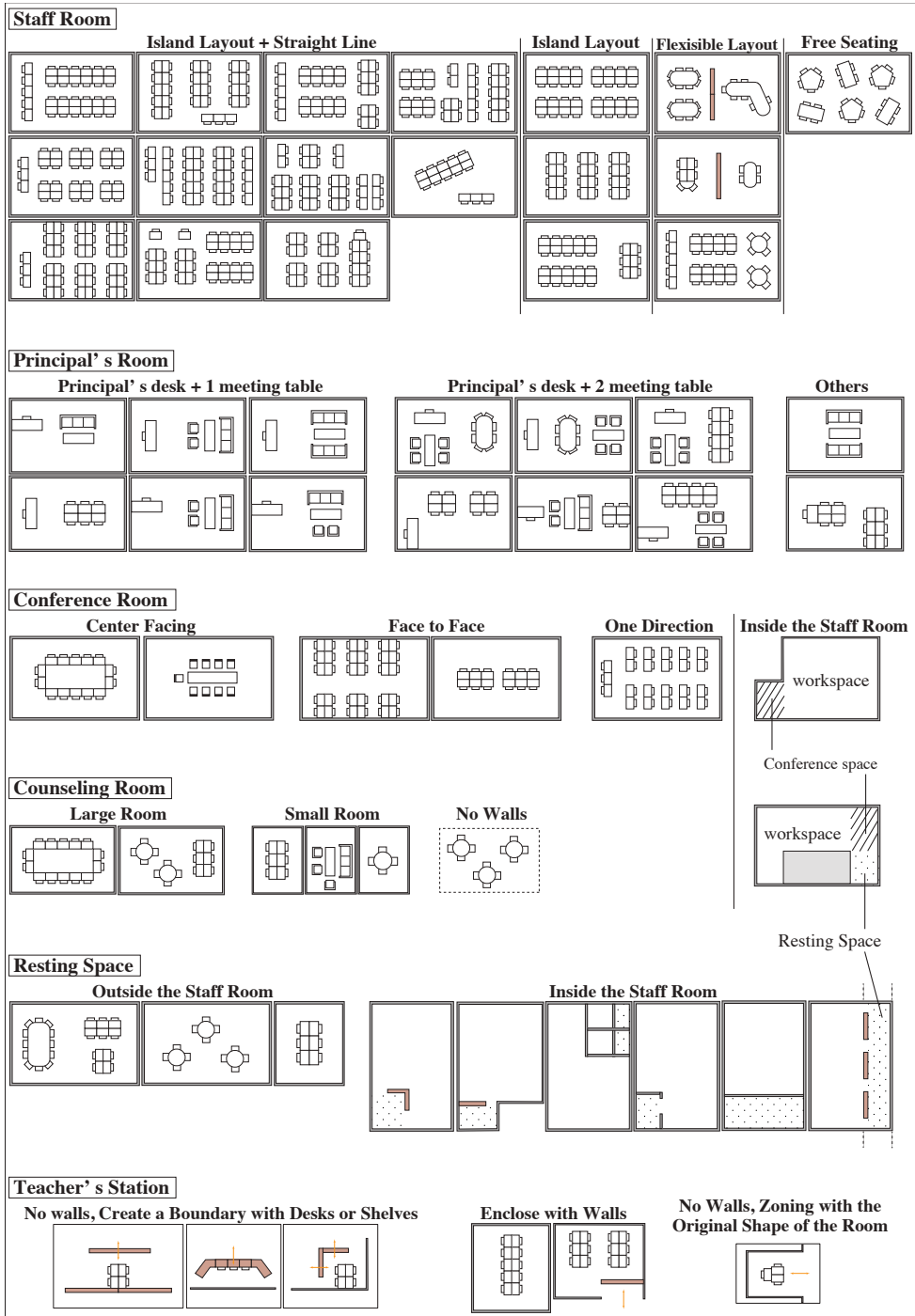


Figure 1. Layout of the installation of each space.

2.2.2. Rooms not used as intended

We also learned about the existence of rooms that were not used as originally intended. For example, we found the case that the teacher's station was not being used as designer's original idea, and used as a storage or teaching materials or a storeroom. In other school, we saw a simple resting space in the staff room using partitions. This partition was installed by teachers themselves after the school opened, and didn't show up in the drawing. We also found that the actual needs of teachers showed in these small changes that they had made.

As we mentioned in 2.1, it was difficult for teachers to take a break in the resting space when students are present, and it was also difficult for them to take a break during the after-school hour because they were usually teaching club activities, or dealing with individual students' care. In order to promote the active use of the resting space, it should be necessary to reconsider the operation of such after-school activities. In recent years, teachers' job tends to be diversified and growing, so increasing burden on teachers are serious problem. The data also showed that teachers spend more time in doing office work besides class hour than in class. Many teachers are stressed by the spread of infections, which has created situations they have not experienced before. For making teacher's workplaces better and secure, it is necessary to review the office work itself that teachers need to deal with.

2.2.3. Adjustable space

One of the surveyed schools has movable partitions in their staff room. This allows for expansion of the staff room if the number of teachers increase in the future. In addition, more desks were placed than the current number of teachers, creating space not only to accommodate an increase in the number of teachers, but also for the purpose of expanding the teachers' workplace. We believe it is necessary to continue to plan staff rooms in this way with a long-term perspective. The school's plan to secure a larger staff room from the beginning is now helping to keep distance between teachers well and helping to prevent infections.

3. ANALYSIS

There are three major findings from the above survey.

1. The functions of the staff room have become multifunctional (*Fig. 3*). In Japan, it is common to set up one large room as an integrated staff room and have all staff work in that space. From the interviews to teachers, the informal communication among teachers and sharing information

about students were the most important things in the staff room. Usually, teachers spend most of their time teaching and moving from classroom to classroom during the day, and the time when they return to the staff room is only for a few minutes. So that they do not have many opportunities to interact with other teachers during the day. On the other hand, especially in junior high schools and high schools, it is not enough for only the homeroom teachers to understand the status of the students. Therefore, by using notice boards and creating spaces for meetings and interaction, the staff room should serve not only a working space but also has multiple functions.

- To ensure multifunctionality, it is necessary to plan not only for the space needed, but also for the space at one's disposal. It was noted from the literature review that there has been no change in the planning of staff offices over the last 20 years, but the emphasis on student places has resulted in a fixed work area for teachers. In addition, only the minimum necessary space has been planned, making it difficult to enhance that area.

In this day and age, when anything can happen at any time, planning from a long-term perspective will help create a sustainable educational environment.

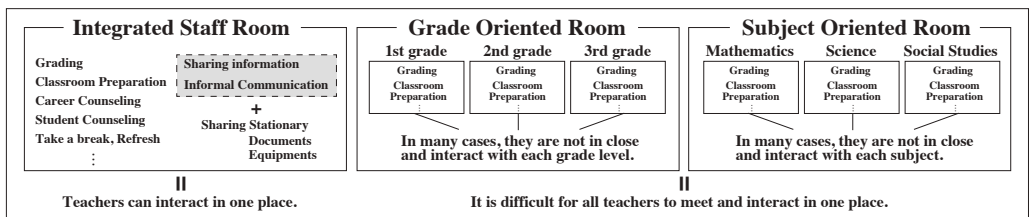


Figure 3. Comparison of integrated staff room and others.

- There is a lack of adequate rest areas. In Japan, there is a tendency that not good to take a rest during working, and resting spaces are often small and located not visible from the staff room. However, it is very important to provide a space for refreshment for all types of workers, and it is desirable to provide a proper resting space rather than a simple hot water supply space. In the schools we did field survey this time, only private schools had improved their resting spaces including those with simple partitions. It will be an issue in the future to determine how to improve resting spaces in existing schools as well as in new schools.
- The number of office-like staff rooms is increasing. As mentioned in Section 2.2.1, in recent years, office furniture manufacturers have often participated in the planning and renovation of staff rooms, and there

seemed to be an increase the number of case schools with "office-like" staff rooms. There are some examples to introduce ideas of working space at private company. The introduction of the free seating system is one of the examples which follows the private companies. While there is much to be learned from private company's examples, it would be better to develop the working space corresponding to the characteristics of educational facilities.

4. CONCLUSION

From the "3. Analysis" section, it is necessary to reconsider the use of resting space, conference room and teacher's station. The aforementioned method including creating a simple rest area with partitions showed the needs of the teachers. So that it is necessary to consider the importance of spaces such as conference rooms which has never been attached much value. It is also difficult to maintain a certain way of using the teachers' stations, since the ways of installation are varied up to schools. The purpose of teacher's stations is to facilitate their work, meetings with teachers of same grade level, and storage of teaching materials near the classrooms, so it is possible that teacher stations are used in the original way. I hope that the space will be used in a more favorable way for both teachers and students.

Probably the most important and difficult things in planning staff rooms are to understand the teacher's actual needs and realize them in the space. Moreover, the process of implementation should not interfere with their work. The cooperation of teachers is essential for our research, and we should develop our research that to be useful for them. This research is still ongoing, and I hope that this research will contribute to future research in the staff rooms.

In this study, using both literature review and onsite survey, we found that there has been no significant change in the planning and layout of the staff room since at least 2000. Despite the fact that the social background and educational affairs have changed significantly in the past 20 years, the school space has not been able to change easily, which may be due to the lack of clear guidelines. I would like to continue this research and contemplate what kind of improvements can be made to create a healthy working environment for teachers, especially in the case which improved the environment of the staff room.

For example, as educational policies continue to change, staff rooms should be set up in a different way according to the number of teachers, educational method and the size of the school (*Fig. 4*).

To ensure a sustainable workspace, we also need to take a long-term perspective and be willing to accept change.

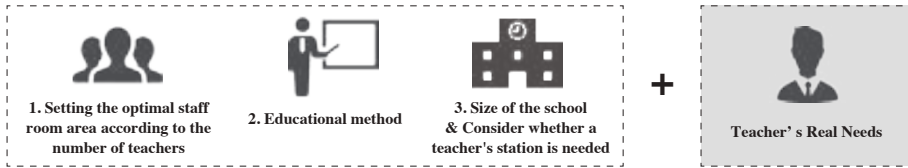


Figure 4. How to create the ideal staff room.

5. SUGGESTION

We found the trends and problems in the staff rooms and teacher's workplaces in Japanese schools. We proposed ideal staff room as follows.

1. Secure a minimum space for all staff members to gather
2. Effective use of space including free use of the space, variable furniture and fixtures
3. Connection between the staff room and other administrative offices
4. Establishment of enough rest space
5. Assessment on the staff needs and improvement of the work environment in response to those needs

Conflicts of interest

This is the joint research with Okamura Corporation.

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09 / REGENERATION STRATEGIES FOR AN ANCIENT TEMPLE OF NORTHWEST CHINA BASED ON RURAL COMMUNITY PARTICIPATION

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ABSTRACT

China has seen a rising trend of urbanization in recent years, with the rural area facing the greatest transitions away from its historical and cultural roots. Numerous traditional Chinese villages faced the destruction of their architectural heritage sites in the 1960s and 1970s during the backdrop of socialism, and many remaining heritage sites were subjected to "constructive" destruction. Among all the built heritage, temples in rural communities are spiritual symbols in local people's minds, which help unite the public and empower the community. However, heritage conservation in China nowadays is still a "top-down" approach where local people could hardly participate in the process of decision-making. The success of preserving and managing cultural heritage highly relies on local communities. This article aims to demonstrate how inspiring residents to participate in the process of heritage conservation brings a positive impact on the health of public life in the rural community.

Action Research was proposed by Lewin in 1946, aiming to "carry out in a spiral process, each step consists of a cycle of planning". Participatory Action Research, which is developed based on Action Research, emphasizes the equal dialogue between researchers and respondents. While the production of knowledge is both the method and the purpose, which indicates the transformation from a standardized, "top-down" paradigm of "things" to a diversified, "bottom-up" paradigm of "people". Participatory action research (PAR) also reflects a circular and non-linear way of the process. It includes the process of social learning and researchers need to organize the whole process. At present, the research on community participation in China is mainly focused on the urban environment. Although some kinds of literature have proposed that rural communities' needs should be paid attention to in rural development, the efficacy of participatory action research in

the process of rural heritage conservation in China needs to be verified by specific cases.

Based on participatory action research, this paper takes a traditional village as an example and uses methods such as questionnaire, interview, mapping, and charrette to analyze the role transformation, participation methods in the process of heritage conservation, aiming to improve the quality of life of locals and enhance the awareness to participate in public affairs, explore new ways for architectural heritage conservation. Based on the results of the previous research in 2019, an in-situ workshop was conducted at Guandi Ancient Temple in May 2020. The workshop was set at the hall of Guandi Temple so that locals could present the settings that occurred in history through storytelling. Ordinary citizens, community officials, and researchers had relatively equal opportunities for communication and social learning, meanwhile understanding the value of architectural heritage in the community.

In the participatory action research planned and organized by the researcher, the researcher and locals participated in the decision-making process and made consent of the regeneration strategies of Guandi Temple. The paper points out that the researcher becomes the organizer and coordinator of the process; Instead of passively accepting the scheme, the locals are active participants and advisors. The researchers and the locals cooperate accordingly to form a more balanced coordination mechanism.

The following conclusions are drawn: 1) The locals' needs: the locals' spiritual and functional requirements for the Guandi Temple reflects the continuity of the traditional culture of the rural community in traditional villages; 2) The efficacy of the research method: the locals can intuitively perceive the environment, and through the exhibition of restoration maps and planning schemes, the evaluations and suggestions of locals are collected, which would enhance their awareness of participation in the public affairs of community; 3) Theoretical value: through an equal way of participation of the researchers and the locals, the living value of the architectural heritage can be discovered. The research process reflects the transactional relationship between people and the environment, as well as the comprehensive and dynamic design methodology.

Keywords: Participatory action research; Rural community participation; Built heritage; Regeneration strategies; Ancient temple.

1. INTRODUCTION

The increasing focus and application of community participation in heritage regeneration domains have been stressed by many scholars, pointing out its strength in generating understanding of the historical depth of built heritage, and delivering knowledgeable problem-solving approaches in alignment with locals' expectations (Greer, Harrison & McIntyre-Tamwoy, 2002). Speaking of the heritage and community, the ancient built heritage in the community, such as temples and ancestral halls, play an instrumental role in uniting the public. Numerous Chinese traditional villages were faced with destruction in the 1970s and many remaining heritage sites were in a critical situation by urbanization process and the development of rural tourism. The success of regenerating the heritage highly relies on the support from local people of the communities (Crooke, 2010; Neal & Roskams, 2013).

However, the conservation of the built heritage in a Chinese reality is generally a "top-down" initiative in which residents have little chance to participate in the process of heritage regeneration, thus leading to a deficit in relevant heritage regeneration attempts. To this end, the paper aims to use a crucial stage of the Liuzhi action research to illustrate how inspiring local people to participate in the participatory planning process for heritage regeneration and elicit the strengths to help improve the quality of life in a rural historic community, as well as testing the efficacy of action research in a Chinese context to enhance the public participation culture.

The participatory theories and methodologies have been widely documented since the 1940s, aiming to reach the object of decentralization and pluralism in a globalization era. Lewin brought forward the theory of Action Research in 1946, an approach to building a spiral research process that consists of cycles of planning (Susman & Evered, 1978). Then in the early 1970s, Participatory Research was developed to emphasize the participation of the researcher, as well as demonstrate a paradigm shift of "things" to "people" (Khanlou & Peter, 2005; Chambers, 1994). Based on the previous theories, Participatory action research emerged to present a process that researchers and the respondents have an equal dialogue platform, which also includes the process of social learning (Leeuwis, 2000). In the process of the action research exercise, researchers and local people cooperate to discover the critical issues in the community, jointly draw out the regeneration strategies and evaluate the effectiveness of the implantation of the project. The regeneration of rural communities is achieved through mutual learning and attempts to implement "public participation" in the realistic scenario of the community.

This paper discusses one major stage of the Liuzhi action research process, namely the workshop that took place at Guandi Temple in Liuzhi, aiming to propose the strategies to tackle the problems that locals are concerned about,

reunite the public by fulfilling the needs of the spiritual quality, improve social justice towards sustainable development, and explore approaches to regenerate built heritage in a historic community.

2. METHOD

2.1 Study area

Liuzhi, an ancient village with over 800 years, is located in Hancheng city, Northwest China, which is a significant transportation node along the Yellow River, connecting Shaanxi Province and Shanxi Province. As of late 2017, 507 households are living in Liuzhi, and pepper planting remains the main source of livelihood. The young people in the village generally choose to work in cities nearby, while most of them still live in the village with their children. Built heritage in Liuzhi, for example, ancient ancestral halls and Guandi Temple protected by local people, have been degraded for a long period. Since February 2019, we have been studying to conduct action research with local people and authorities to regenerate historic sites through participatory planning and design.

The process started as qualitative research, such as questionnaires and semi-structured interviews at the early phase. While the exercise gradually emerged into an action research process when deeper relationships with locals were built (Bodorkós & Pataki, 2009). The core question of this paper mainly focuses on the analysis of the workshop at Guandi Temple that helps to recall the local knowledge and draw out the proposal of the regeneration strategies of the temple.

2.2 Process and method

The Liuzhi action research started from the perspective of a “top-down” approach in February 2019, with the method of semi-structured interviews, participated by government officials and community leaders. As the trust had been built with local people, more “bottom-up” participatory methods, such as mapping and in-situ exhibition, were used in the later stages. The designed methods and tools were used in different stages to deal with specific issues to engage more local people to participate in the process (*Table 1*). The participatory action research in Guandi Temple took place from May 2 to May 4, 2020, in which 11 villagers attended the workshop, including community leaders, community elites, and other representatives. There were the following two purposes of the workshop. First, the workshop enables the elderly and young people in the village to share the equity to participate in the process and unveil the important historical value of the Guandi Temple through the guided tour and the in-situ exhibition. Second, the workshop attempts to inspire the local people to envision the ideal future of

the Guandi Temple so that it can be adapted to the modern everyday life of the community.

3. RESULTS

3.1 Preliminary research results

In the previous stages of the research, local people in Liuzhi village participated in the questionnaire in which the respondents were invited to select the three most concerned issues of the community. The average comprehensive score of each option is equal to $(\sum \text{frequency} \times \text{weight}) / \text{the total number of valid questionnaires}$, while the weight is determined by the position where the options are arranged by the respondents. For example, if there are 12 options to be ranked, the weight value in the first position is 12, the second position is 11, and the third position is 10. Based on the results elaborated from the questionnaire shown in *Figure 1*, the drainage facilities are the most urgent issue to be solved (10.08 points), namely the management and planning of the sewage from the residential. Meanwhile, the venues for collective activity (4.93 points) and the outdoor public space for the elderly (3.70 points) are the issues that should be discussed in later stages as well. After the questionnaires, on August 25, 2019, 15 representatives from different locations of the village, participated in the poster mapping exercise to identify the selection of drainage facilities and the most suitable public space for outdoor recreation (*Table 1*). The results from the poster mapping indicated that most people selected the Guandi Temple as the place to be renovated because of its good accessibility and familiarity. The venue of the next workshop was selected after the results of the mapping, namely the Guandi Temple, located in the central area of Liuzhi.

Table 1. The framework of Liuzhi action research.

Time	Method	Participants	Main Target	Results
February 21-23, 2019	Semi-structured interview; behavior observation	Government officials, community leaders, researchers, and the key person (Mr. Sun)	Conduct early research on local traditional villages and establish contacts with local authorities	Liuzhi village was identified to be the place to conduct the action research
April 22-26, 2019	Questionnaire	Community leaders, community elites, researchers, residents	Understand the local context and locals' requirements of living condition	Three most-concerned public issues were identified
August 24-27, 2019	In-depth interview; poster mapping; VR simulation	Community leaders, community elites, researchers, and a total of 15 representatives	Understand villagers' demand for drainage facilities and the selection of public space for regeneration	Guandi Temple was defined as the most appropriate public space for collective activities
May 2-4, 2020	Guided tour; storytelling; in-situ exhibition; photo-collage	Community leaders, researchers, and a total of 11 representatives	Facilitate the locals to realize the multiple meanings of Guandi Temple	Jointly make the consent of regeneration strategies of the temple

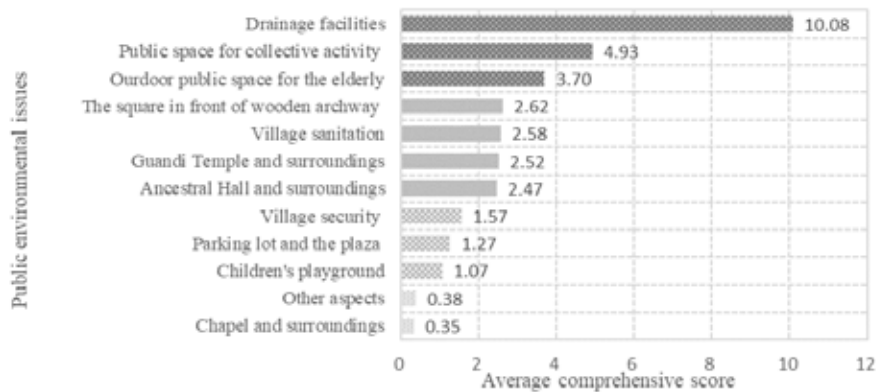


Figure 1. The most concerning issues from the local people in Liuzhi.

3.2 Workshop at Guandi Temple

Based on the previous results, the workshop was placed at Guandi Temple in which the participants could make comments and recall the collective memories. The workshop at Guandi Temple was divided into three stages: preparation, phase 1, and phase 2 (Table 2). In phase 1, the elderly guided the local people and the researcher to visit the square of the temple in which the researcher could exchange knowledge with locals. After the guided tour, the participants visited the exhibition of historical materials of Liuzhi at the dedication hall of Guandi Temple and were invited to recall the history of the temple by storytelling. The collective memories from locals were recorded on the corresponding position on the map of the canvas, which depicted the lively history of the past (Figure 2). In the review of collective memory, the percentage of locals' descriptions of spirituality and functionality was almost the same. While more spiritual memories were recalled by the elderly, for example, the worship and burning incense in front of the temple.

After the guided tour, in-situ exhibition, and storytelling, the participants were invited to put forward their expectations for the future development of Guandi Temple by selecting the suitable images prepared by the researcher, sticking them on the current map of the temple (Figure 3). For example, one of the participants selected the image with a ritual scenario depicting people praying for happiness by hanging the red charms on the wooden shelf. The results illustrated that locals had less spiritual needs than functional needs for future visions, while the young generation's memories and prospects for the Guandi Temple mainly focused on functional aspects. For instance, most people around 30 have the memory of playing after school in Guandi Temple, which is why they hope their children can enjoy a better playground for recreation in the future. Concerning the proposal of the ideal future, the locals had a strong demand for the functionality and spirituality of living patterns, hoping that Guandi Temple can be better utilized in the future, meeting the needs of everyday life and

modern lifestyle. From the results of collective memories to the future vision of Guandi Temple, the locals' descriptions can be summarized as both spiritual and functional (Table 3). It can be concluded that spiritual descriptions contain a higher percentage in the collective memories, while functional descriptions appear to be more significant in the future vision.

Table 2. The process of the workshop at Guandi Temple.

Stage	Preparation	Phase 1	Phase 2
Time	May 2, 2020	May 3, 2020	May 4, 2020
Place	Village committees and villagers' homes	Guandi Temple and villagers' homes	Guandi Temple
Goal	<ol style="list-style-type: none"> 1. Discussion with the community leader 2. Inviting the villager representatives 	<ol style="list-style-type: none"> 1. Exhibition of the historical documents 2. Proposal of the ideal future of Guandi Temple 	Collecting the comments and suggestions on the concept plan of the temple from local people
Main Content	<ol style="list-style-type: none"> 3. The community leader introduced the current status of the drainage facilities project, investment, construction plan, and schedule, etc. 4. Discussion with leaders about the specific process, participants, and schedule of the participatory planning process 5. A door-to-door visit to villager representatives' residences to send invitation letters 6. An invitation to Mr. Sun (the Key Person) to invite him to attend the workshop 	<ol style="list-style-type: none"> 1. The elderly guided the locals and researcher to visit the square and the researcher introduced the architectural features of the temple 2. Sharing of the collective memory of Guandi Temple: In-situ exhibition of the historic materials of the temple and Liuzhi village; Storyboard depicting the collective memory of the Guandi Temple 3. Proposal of the future development of Guandi Temple by photo-collage 4. Collection of comments of other villagers who could not go to the workshop 	<ol style="list-style-type: none"> 1. Analysis of the villagers' suggestions; completing the concept planning and making preparation of the planning charette 2. Elaboration of the results of the previous day's workshop; Introduction of the intention of the concept plan 3. The suggestions of the plan were recorded on the corresponding position of the planning of Guandi Temple with note papers 4. Freetalk about the ideal future of Liuzhi

Table 3. The participants' description of the Guandi temple.

Aspect	Classification	Content
Spiritual	Collective memory	Burning incense (6), worship (3), bells in the morning and drums in the evening (3), architectural form and details (2), deities in the temples(3)
	Future vision	Burning incense (5), worship (2), praying with red charms (3)
Functional	Collective memory	1. Student classrooms (6), teachers' dormitory (4), villagers' meetings venue (3), traditional festivals & ritual activities (2)
	Future vision	2. Landscape (5), elderly activities (6), children's playground (4), toilets (2), office management (1), cultural heritage conservation (2)

Note: The numbers in brackets indicate the number of times that each item was mentioned by the participants.

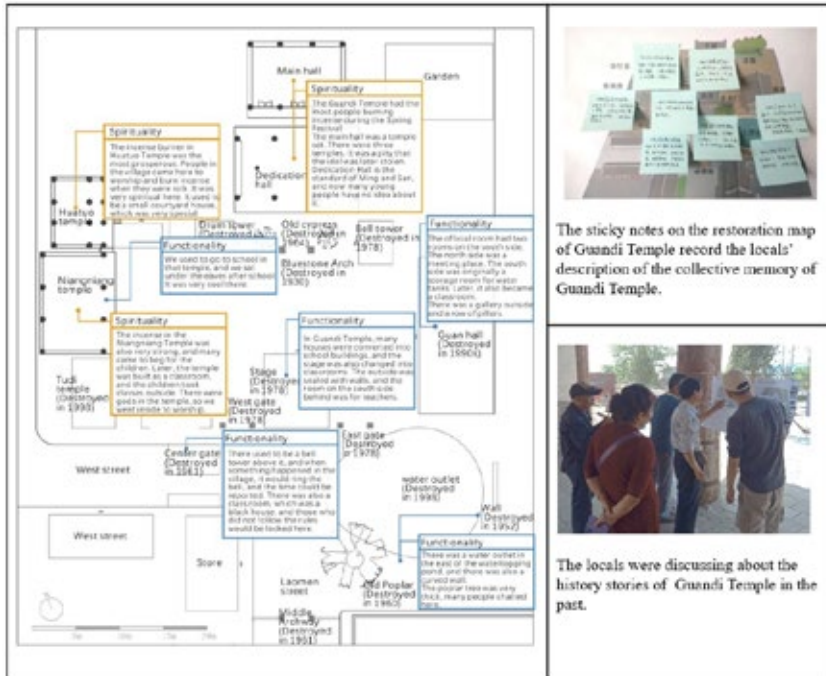


Figure 2. The collective memory of Guandi Temple based on the restoration plan.

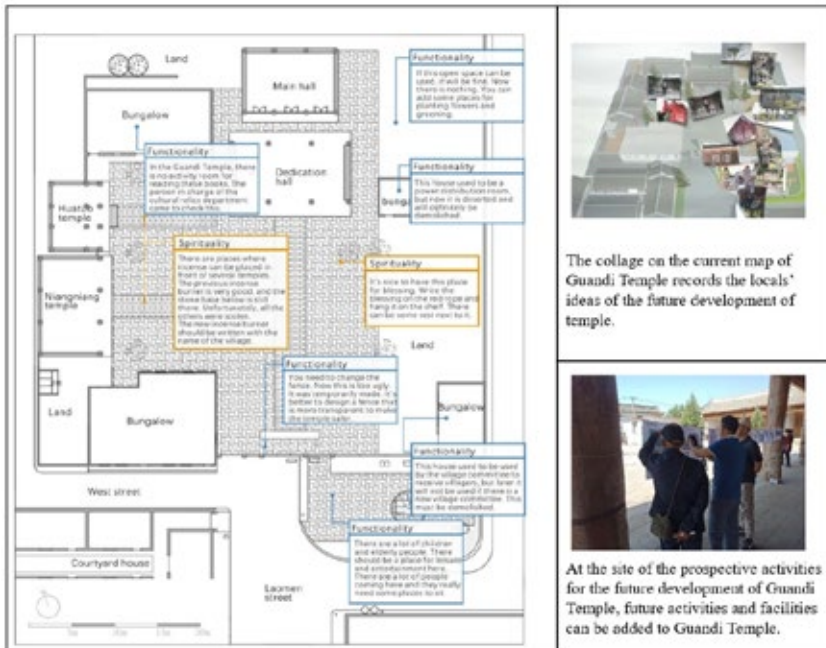


Figure 3. The Future vision of Guandi Temple based on the current situation.

4. DISCUSSION

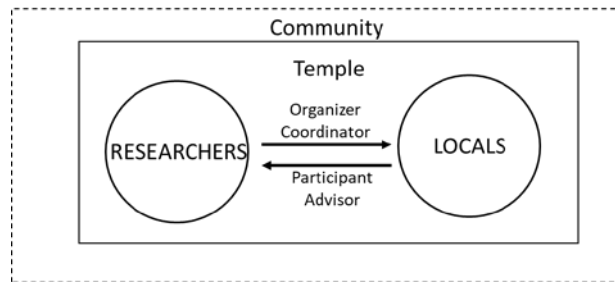
Guandi Temple, Laomen street (the main street in Liuzhi), and Ancestral Hall had constituted the central axis of Liuzhi where traditional festivals, everyday life, social interaction took place in the past. Thus even been degraded for a long period, Guandi Temple remains a symbol of spiritual belief in Liuzhi Village nowadays. As one of the locals said, "We still need temples as the spiritual sustenance in modern times." Guandi Temple demonstrates the concept of identification of a place for local people in which people have unique cognitions and experiences (Norberg-Schulz, 1980). In ancient times, Guandi, a Chinese god of war, was instrumental as a symbol of protecting the residents (Duara, 1988). Hence Guandi Temple, as a "temple that preserves peace", could be seen in almost every county capital and village in northwest China, not to mention the place like Liuzhi that is used to be a significant transportation intersection. To this end, the theme of the workshop is "Guandi Temple: our homeland", aiming to establish an equal dialogue from the perspective of local people. In this paper, the "place" indicates the interpenetration between human activities and the physical and cultural environment, rather than only corporeal terrains. While Guandi Temple is such a "place" for locals to worship the god of war, wish for happiness, and enhance social interactions, which maintains the cultural identity of the historic community.

The temples in the past played an instrumental role in uniting the public, which is a materialization of the spiritual symbol of a community. However, many ancient temples were abandoned or destroyed due to the reform of modern society and the villagers' public life has been increasingly shrinking since the 1990s (Yan, 2003). The paper introduced the action research to Liuzhi village, aiming to shed a light on the understanding of the multiple meanings of "homeland", and to reconstruct the cultural identity of the community. The participatory methods and tools help discover solutions in which Guandi Temple can be a "place" unveiling social and cultural practices, a homeland to satisfy the people's spiritual requirements. The temple contains the multiple meanings of a place, such as the traditional festivals, ritual activities, public recreation, and other social interactions in everyday life. Thus instead of being an object to be preserved in a museum, Guandi Temple is a living heritage that continues to grow with the development of Liuzhi in which the temple should have a profound influence on the everyday life of locals.

In the Liuzhi action research, the researcher developed the participatory framework and methods to help the public to engage in the regeneration process. Rather than controlling the whole process of the exercise, the role of the researcher has transformed to organizers and coordinators; while the locals are actively participating in the process as advisors and participants. The researcher and locals interact through a coordination platform in which the relationships between people, individuals, and the community are strengthened

(Figure 4), providing a reliable social relationship and resilient conditions for the regeneration of the community in the future. The temple of the community emerges as a crucial element in the coordination platform in which locals and the researcher share a realistic context to exchange knowledge. The researcher applies simplified techniques to transfer the professional language to the knowledge that the public can easily understand, while the public, as advisors, reflects the local knowledge to the researcher so that they can make the decisions that fulfill the public's expectations.

Figure 4. The coordination platform of Liuzhi action research.



5. CONCLUSIONS

As discussed above, the researcher designed the specific participatory methods and organized the workshops for each stage in which the locals participated in the process of decision-making of the regeneration strategies. The planning process has engaged locals of different age groups to be actively participated in regenerating the heritage of the community, unveiling the multiple implications of the built heritage.

The following results can be discovered. First, the spiritual aspects of the temple remain a constant from the past to the future development, revealing the implication of the traditional culture, which is also the core quality of a historic community. Second, the locals could intuitively perceive the environment through designed participatory methods and tools in a workshop that took place in a realistic and familiar context; with the methods of the in-situ exhibition of historic archives and guided tours, the comments of locals were analyzed to improve their participation culture in the community. Last but not least, the multiple meanings of living heritage in the community, such as a place for social interaction and ritual activities, could be unveiled with the participation and interaction of the researcher and locals. The transactional relationship between people and the environment was also discovered through the interaction at Guandi Temple during the process of Liuzhi action research (Stokols & Shumaker, 1981).

Heritage regeneration and management highly rely on the participation of local people in communities in which young people can discover more interest in the

traditional culture and the elderly can interpret the local knowledge through storytelling. Fulfilling the expectations at each phase had to deal with a range of problems, for example, developing relationships between the researchers and participants before the action research process, designing the simplified visual language for locals in rural communities to understand, and a lack of participatory culture that locals had no relevant experience of participatory planning. Despite the difficulties encountered and the time-consuming process, the community participation in Liuzhi proved to be an applied experience of action research in the Chinese rural context, facilitating the public to be reunited through the exercise. It is believed that the field of heritage regeneration will grow in new directions if designers and scholars of related domains develop a critical analysis using the action research process as a guideline, learning from the local knowledge and innovative techniques of historic communities.

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04

SUSTAINABLE LIFESTYLES, ATTITUDES AND ADAPTATION

10 / MOTIVATIONS TO ENGAGE IN SUSTAINABLE AND CONSCIOUS FOOD CONSUMPTION. ADVANCES FROM MULTIDISCIPLINARY EMPIRICAL RESEARCH ON COLLECTIVE FORMS OF CONSUMPTION

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ABSTRACT

The present study focusses on the social and psychological dimensions that interplay in people's patterns of consumption, studying the different human motivations, aspirations and desires underlying conscious and responsible consumption behaviour at both individual and collective levels. Following a qualitative approach, a multi-method design was used, which combined participatory observation, document analysis and twenty-six in-depth interviews with participants in eight local food consumption initiatives located in the Galician region (Spain). In terms of motivations for organic food intake, the findings of this study show strong linkages between health concern and environmental awareness and place attachment, while the desire to perform a more healthy and sustainable consumption has strong influence on the decision to join a local food coop. The results show also three principal motivations underlying people's willingness to engage in collective forms of consumption (e.g. being a member of a food coop), which related first to the accessibility and affordability to organic, low-carbon and fair-trade groceries provided by the food coops; socio-political goals and transformative ambitions shared by these organizations; and, third, the individual aspiration to satisfying social and psychological needs such as the need for connectedness to like-minded people or a desire for autonomy and increase their control over their purchasing decisions, becoming independent of global corporations and supermarkets.

Keywords: Sustainable consumption; Motivations; Organizations; Psychological needs.

1. INTRODUCTION

Climate change adaptation and mitigation requires the coordinated action of institutions and citizens, who must develop profound transitions towards low-carbon societies, which should turn into a dramatic reduction of greenhouse gas emissions in domains such as transportation, energy use or the global food system. Nevertheless, despite the urgency to face these socio-environmental challenges and the evident public awareness about global warming, such concern does not translate into daily life actions, for instance, by reducing CO₂ emissions at the individual collective level. It is well-known that energy-related individual behaviours are affected by a diversity of sociocultural and psychological factors (Craig *et al.*, 2019; Lacroix *et al.*, 2019; Clayton *et al.*, 2016; Gifford, 2011; Gifford *et al.*, 2011). Further, geophysical and structural conditions, as well as the institutional, normative and political contexts may also enhance or inhibit energy transitions or sustainable social innovations led by both citizens and organizations [Lema-Blanco & Dumitru, 2019; García Mira & Dumitru, 2014], shaping also public acceptability of energy-relevant innovations and their successful replication across contexts (Dumitru, Lema-Blanco *et al.*, 2022; Sánchez Maroño *et al.*, 2022).

In an extensive review of the personal and social factors influencing or explaining pro-environmental behaviour (or lack-of), Gifford and Nilsson (2014) point out that the effective performance of a specific behaviour is influenced by attitudes, personal values and beliefs, individual capacities, well-established habits, as well as the sociocultural context in which each concrete behaviour is developed. In terms of climate-friendly behaviours, the limited cognition about the problem, personal worldviews and political orientations, identity, lack of trust in institutions or perceived risks of change have been found in numerous empirical studies as the main psychological barriers that inhibit individual and collective climate action. For example, the lack of knowledge or misunderstanding about what specific behaviours are most effective, or sceptical and passive attitudes about the competence or the actual capacity that individuals must articulate responses to the global warming crisis, are significant barriers to climate mitigation and adaptation.

Due to climate change is a global and complex problem, which involves numerous people or entities, many people can resonate that, as single individuals, they have little ability to influence or control the solution of the problem, holding, consequently, a passive or inactive behaviour. However, if individuals perceive that their action is important and have the capacity to provoke the desired change, the feeling of efficacy increases, which reaffirms the performance of the socially desired behaviour. Self-efficacy is considered a key aspect of a person's sense of competence and agency, and a powerful sense of self-efficacy is related to the adoption of green lifestyles (García Mira & Dumitru, 2017).

Grounding on the need to increase understanding about the different motivations and factors underlying people's patterns of consumption, the aim of this article is to show light on the diversity of social and psychological dimensions influencing sustainable and conscious consumption in the food domain, as well as to have greater knowledge about the reasons underlying people's engagement in grassroots innovations and collective and cooperative consumption alternative at the local sphere.

2. FACTORS INFLUENCING SUSTAINABLE AND CONSCIOUS CONSUMPTION

Consumption becomes a central aspect of people's lifestyles. It concerns not only the satisfaction of basic needs (e.g., food or housing), but also psychological and social needs. Goods play vital symbolic roles in people's lives, and are used as instruments to communicate, for example, their status or identity. According to the scientific literature, people's values, worldviews, personal norms, or the perception of self-efficacy are psychological factors that strongly influence people's choices and behaviours. Furthermore, consumption decisions are deeply embedded in social and organizational contexts, for example social groups, as well as urban and rural settings. For instance, structural and technological constraints, the lack of accessibility or existing social norms and local cultures, appear to inhibit or influence sustainable behaviour in several domains like food intake, energy use or transportation (Lema-Blanco & Dumitru, 2019; Pilgrimiené et al., 2020).

Food choices have great significance in terms of mitigating climate change. According to recent IPCC reports, extensive meat production accounts for 18% of global GHG emissions, an impact that is increased by emissions derived from its transportation and distribution. However, recent studies (Vermeir et al., 2020; Gifford & Chen, 2020) reported a notable gap between people's positive attitudes towards sustainable and organic food and their dietary routines. Eating habits are notoriously difficult to change, as they are deeply culturally and structurally embedded and influenced by a wide range of social, cognitive, socioeconomic, and contextual factors. For this reason, it is essential to increase the understanding of the factors and the individual and collective dynamics that influence society's lifestyles and, in specific, sustainable and conscious consumption choices.

Following, a literature review of the main factors and variables influencing food consumption behaviour will be presented. First, socio-demographic variables, individual's values and environmental awareness, habits, routines, social norms and identity appear as the factors commonly associated to consumption behaviour. Second, a series of specific conditions and features influence people's food intake, such as product-specific attitudes, health-orientation, the perceived

availability, or affordability and willingness to pay. A third line of research explored intrinsic motivations and aspirations underlying not only consumers' sustainable consumption, but people's willingness to engage in new social movements and grassroots innovations in the food domain.

2.1. Factors conditioning sustainable consumption behaviour related to food choices

As studied in different regions and cultures, buying decisions of organic products seem to be strongly influenced by sociodemographic variables, including educational level, gender, age, and the consumer's level of income. Concerning education, most studies have found a positive relationship between educational level and ecological consumer behaviour. For example, people with university levels usually present greater preferences for organic food, electric/hybrid vehicles. In terms of gender and age, women are more likely to buy organic products (Bryla, 2016) or adopt energy-saving behaviours in households (Thøgersen & Grønhøj, 2010). In Spain, organic products are often consumed by youngsters, motivated by health reasons, as organic food is perceived as healthier, higher quality and nutritional properties and better taste (MAPAMA, 2017). Millennials are the main buyers of organic food in the United States (Organic Trade Association, 2017). In terms of level of income, many studies showed that the price and the affordability of organic products in the market strongly influence consumers' decisions. However, research found that sociodemographic variables play just a secondary role in consumer decisions and other social and psychological dimensions should be considered.

The role of individual factors has been also researched in the field of green consumption, focusing on the influence of values and beliefs, personal capacities, skills and competences. Empirical research has shown that people who reveal altruistic or prosocial values are more likely to maintain a more responsible behaviour with the environment (Craig et al., 2019; García Mira & Dumitru, 2014). Few studies have found that vegetarianism can be positively related to altruistic values and negatively to traditional values [Dietz et al., 1995], while biospheric values underly the purchase of organic food or ethical and fair-trade products (Vermeir et al., 2010; Thøgersen & Ölander, 2002).

Consumers' behaviours and attitudes are positively influenced by environmental knowledge and awareness. The information that a person receives on environmental issues and the understanding of the effects of their behaviour on the environment favours the acquisition of organic products. Then, a few studies suggest that people's environmental concern becomes a significant factor in predicting the purchase of organic products (Kostadinova, 2016). However, several authors have criticized the tendency in literature to overestimate the influence of attitudes, values or beliefs on consumption. They suggest that

the percentage of consumers who consume organic for strictly environmental reasons is limited, and other of a social or emotional reasons come into play (Thøgersen & Ölander, 2002).

Research has also shown that habits and routines play a key role in people's daily choices and contribute to the maintenance of consumption patterns over time, being identified as one of the most important obstacles to mitigating climate change. For example, eating habits are extremely resistant to permanent change, since they are a central aspect of people's lifestyle, which may imply the confrontation with very internalized values and routines (Maio *et al.*, 2007). If the cost of adopting a new behaviour is higher than the benefits, there will be resistance to change, due to modifying habits and routines always involves a series of costs. This is one of the reasons explaining that specific climate-relevant behaviours become extremely resistant to permanent changes. In concrete, energy use, food intake (especially meat) or motorized transportation by private car.

Furthermore, people attribute a series of symbolic or affective connotations to certain material goods (such as the car) that can be motivations even more influential than the more instrumental or practical functions of the concrete goods. Several studies have examined whether the identity could be related to food intake (Cook *et al.*, 2002; Jastran *et al.*, 2009). These studies suggest that the concept of identity may have additional explanatory value beyond constructs such as attitudes. Thus, people develop their food identities based, for example, on the eating habits acquired in childhood, on personal characteristics and by comparing their eating patterns with relevant reference groups. There is also evidence that suggest that vegetarianism, as well as meat consumption, are closely related to people's self-concept or identity (Jastran *et al.*, 2009).

Literature suggests that social norms have a powerful effect not only on food choices but even in terms of quantities consumed, especially in social or public situations (Cruwys *et al.*, 2015; Higgs, 2015). However, on contrary, Chekima *et al.* (2019a) found that social norms are not a non-significant predictor of organic food intake. It could be explained by the fact that the purchase of organic products becomes a relatively new practice still adopted by a minority of people, depending on geographical conditions and local cultures in which the studied population is embedded. In consequence there are still no subjective norms in many countries or regions that support or prescribe a decision to consume organic food. Then, if the "green social norm" does not exist or is still not strong enough, consumers will experience little or no discomfort at the dissonance between their attitudes and behaviour. In other words, consumers would not feel pressure from those they consider important to purchase sustainable options because this practice is not widely extended and does not constitute a social norm to be followed to obtain other's approval (Checkima *et al.*, 2019a).

2.2. Specific factors affecting food choices

Recent studies point to the influence of product-specific attitudes towards organic food. This product-specific attitude is defined as a predisposition to respond favourably or not to a product consistently. Thus, although the maintenance of a favourable attitude or disposition towards the performance of a behaviour is an essential prerequisite, in the context of the purchase intention of organic food the influence of attitudes is inconclusive, as a weak or little significant has been reported (Moser, 2015, 2016; Rodríguez-Barreiro, *et al.*, 2013). The positive attitude towards sustainable products appears to be affected by other relevant variables such as the perception of the quality of the specific product (e.g., pesticide-free, more nutritious, healthy, safety).

Health orientation is defined as an individual's motivation to maintain healthy beliefs, attitudes, and behaviours (Kushwah *et al.*, 2019). Consequently, the health orientation is known as the awareness and inclination of an individual to move towards good health regarding lifestyle and diet. There is extensive empirical evidence showing that health concerns are particularly relevant drivers for organic food consumption (Vermeir *et al.*, 2020) or lower meat consumption (Malek *et al.*, 2019). Recent studies conducted in Spain (Tomé *et al.*, 2019; MAPAMA, 2017) also point out that the main motivation for the consumption of organic foods relates to health-orientation factors. Organic groceries are perceived as healthier, as they are not exposed to harmful chemicals, they are free of GMOs, as well as have higher quality and flavour of the product.

Research also found that sensory appeal and functionality characteristics are influential factors for buying organic products and foods. A relevant number of people places a high value on the "hedonistic benefits" like sensory characteristics that stimulate a deeper association with the product. For example, a study conducted by Chemika *et al.* (2017) found that consumers of organic products reported a strong influence of sensory attractiveness and people are stimulated by the sensory characteristics, which means "a consequence of the functional and psychological benefits provided by the product and exerts its effect on the choice of food through the negotiation of values by the consumer" (*ibid*, p. 1445). Thus, although the predominant approach in organic products marketing strategies stresses the health or environmental benefits, an emphasis on the hedonic aspects (e.g., taste) of these foods could be a more effective approach.

The perception of availability of organic goods can become a strong determining factor for people to make a conscious and responsible consumption. The perceived availability is positively associated with the consumption of organic food. However, this could also function as a barrier if these products are not easily visible in supermarkets. The empirical evidence reveals, also, that organic products are usually perceived as more expensive than conventional ones, representing a higher cost than most consumers would not be willing to pay. Even

though people manifest a high environmental awareness and pro-environmental attitudes, price is still one of the most important barriers to purchase organic products, arguing that their higher prices make them unaffordable (Checkima *et al.*, 2017, 2019). Nonetheless, other studies suggest that a higher price can increase the perception of the value of the product, since higher prices can indicate a higher acceptable quality and reliability (Gottschalk & Leistner, 2013). The willingness to pay a premium for organic food becomes critical and depends on the balance that the consumer makes between the added benefits (e.g., on health) that this product brings and its cost (Checkima *et al.*, 2017).

2.3. Intrinsic motivations and social and political aspiration underlying ethical and conscious consumption

Intrinsic and transcendent motivations, as well as hedonic aspirations, can positively influence the consumption of sustainable food. Some studies on local organic agri-food networks present evidence that conscious consumers are guided by altruistic motivations, social values, attachment to the territory or the search for more supportive, ethical, and sustainable production food-systems (Zoll *et al.*, 2018; Seyfang, 2006, 2007). Recent studies on grassroots food initiatives show that perceived high-quality of organic food, environmental concern, and the desire to strengthen the local economy represent the main motivations for people to purchase organic, “kilometre zero” food or Slow Food products (Vita *et al.*, 2020; Zoll *et al.*, 2018; Papaoikonomou, 2013). Community activities related to food can stimulate the satisfaction of intrinsic motivations, such as the aspiration to be more autonomous in accessing food products and less dependent on external actors. For example, in a study on the Slow Food movement, Dumitru, Lema-Blanco *et al.* (2016 a, b) found that the opportunity to connect with other like-minded people means the main attraction for many activists, since interaction with other people reinforces their sense of connection, experience of happiness and self-esteem, which represents a psychological reward for participating in these initiatives.

3. METHODOLOGY

3.1. Contextualization of the study

The study is contextualized in the Galician region, located in the Northwest of Spain. Galician culture revolves around local gastronomy, strongly rooted on high-quality locally produced meat, fresh seafood and vegetables. Although local markets are still alive, buying practices in youngest and families are often performed in supermarkets, while mostly minority groups and senior population choose organic and small shops for shopping their groceries and other goods. Like other regions in Spain, alternative agri-food movements became popular since the 2000s, coincident with the emergence of the anti-globalization

movement, whose activists seek to link the global struggle with their daily practices. Galician food movement is organized around the Conscious and Responsible Consumption Network. This informal network is formed by twenty-five collective food buying groups and consumer cooperatives engages a total of 1.500 families across the region, which jointly organize their food purchases by establishing agreements with farmers and local producers, with whom they organize regular deliveries of seasonal products (see Lema-Blanco et al., 2015, for a description of the Galician transformative movements).



Pictures. Árbore organic food shop (left). Zocamiñooca's shop (right).

3.2. Research objectives, methods and sample description

The study adopted a qualitative-interpretative approach (Flick, 2014; Taylor & Bodgan, 2010) to conduct a holistic and inductive-based research on the complex and dynamic phenomena of the Conscious and Responsible Consumption Network. A multi-method design was used combining participatory observation, document analysis and twenty-six in-depth interviews with participants in eight local food coops located in the Galician region (Spain). The topics covered in the empirical study revolved around the motivations for conscious consumption, activist's consumption styles and participatory and learning practices fostered by these food initiatives. For the purposes of this paper, the motivations and expectations underlying people's consumption decision are explored, with a specific focus on those determining engagement in food alternatives such as organic consumer's cooperatives (see Lema-Blanco, 2022, for a full description of the study).

The empirical design was structured in four phases. Phase I consisted of a documentary review of the Galician food initiatives. Phase II consisted of participant observation that extended throughout the entire empirical phase of the study. Phase III consisted of exploratory interviews with a sample of fourteen activists of three local initiatives located in the cities of Vigo (Árbore, Aldea) and A Coruña (Zocamiñooca). In phase IV, twelve semi-structured interviews were conducted with current and former members of seven different entities and informal initiatives (A Gradicela, Agrelar, Árbore, Millo Miúdo, Panxea, Semente and Zocamiñooca). A total of twenty-six participants were interviewed in the study.

Figure 1, below, illustrates the distribution of the sample in terms of the food initiative they belong or belonged in the past.

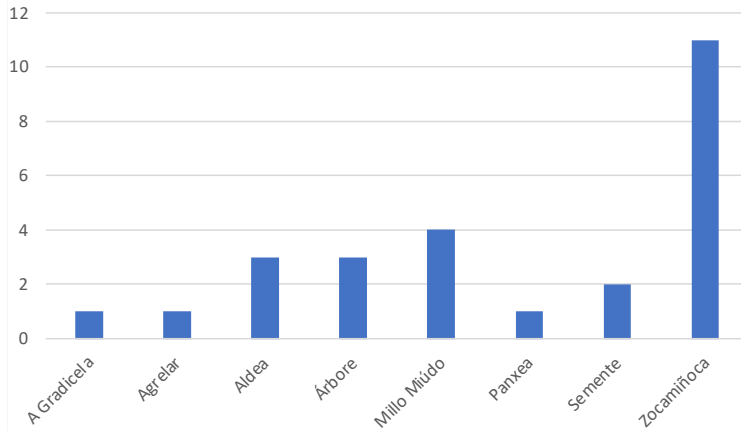


Figure 1. Sample distribution considering the initiative to which they belong (or belonged in the past).

As Figure 2, below, shows, the age of the participants in both phases III and IV range from 35 to 65 years old. The sample was characterized by high-level of educated people, as 80% had a university degree.

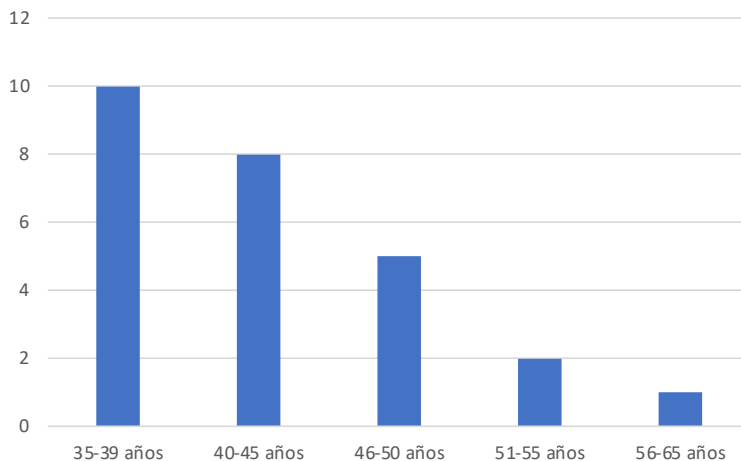


Figure 2. Sample distribution considering the age of the participants in both exploratory and semi-structured interviews.

3.3. Data analysis procedure

All interviews were audio-recorded and later literally transcribed. A rigorous coding process and data analysis and interpretation was conducted supported

by Atlas.ti V.9 software. An inductive coding process was followed in each interview, whose results informed the consequent empirical phases, and allowed to delve into the themes, processes, dynamics, and recurrent patterns rising from the interviews. Likewise, the use of Atlas.ti software allowed determining the relevance and groundedness of the codes and categories. A triangulation of methods, sources and theories was conducted, which augmented the consistency, rigour and robustness of the study.

4. RESULTS

4.1. Underlying motivations to organic and sustainable consumption

In-depth interviews explored the different factors driving consumption of organically produced fresh groceries and other goods, and, secondly, people's motivations to join a local consumption initiative. When asked about their reasons to purchase organic fresh food and other products, the participants in this study argue that their decisions are motivated by a combination of factors that have been grouped into main five categories (see *Table 1*): (i) Environmental concern; (ii) Personal health and well-being; (iii) awareness-raising; (iv) Altruistic and social justice values; and (v) attachment to rural areas.

The findings show that self-oriented motivations are particularly significant for organic and sustainable food consumption for most of the participants in the study, independently the type of organization and the locality in which they live. Participants report the desire of sustaining healthy diets based on the high quality of seasonal organically produced groceries. Organic products are thus perceived as safer, healthier, better tasting and more nutritive than conventional food, confirming previous studies in the field (MAPAMA, 2017; Cruwys et al., 2015; Moser, 2015, 2016). Moreover, participants are well educated people who show a profound acknowledgement on the impact of food production and transportation and, coherently, report the desire to reduce the ecological impact of their daily practice. However, awareness-raising on the need to actively reduce the ecological footprint appears to be a consequence of a specific situation, life event or personal experience that became a trigger for a change in individual lifestyles.

As illustrated in the *Figure 3*, strong linkages exist between environmental concern, health-oriented motivations and awareness-raising, on the need to reduce the ecological footprint, due to a specific context or personal experience that become a trigger for a change in individual lifestyles. Organic food consumption appears also associated with altruistic and socially oriented values, aligned with solidarity and social justice, building new types of relations between both the global North and South (e.g., endorsing animal welfare or the fair-trade movements).

Finally, feelings of connectedness with the rural territory motivates the desire of protecting these specific environments by supporting organic and local agriculture and primary sector of the economy. In addition, a relevant number of interviewees report their desire to maintain and preserve Galician rural lifestyle, to which they feel attached by an emotional bond, although they do not ever live in these areas or they do not do it anymore, but they still have family roots that enhance this sense of attachment to the land.

Table 1. Motivations underlying conscious consumption.

Code	Description
Environmental concern	Environmental concern about environmental risks, climate emergency and impact of food system.
Health and personal wellbeing	Desire to consume healthy and organic food (free of pesticides or GMOs), personal health and that of your family acquires a priority role.
Altruism and socially oriented values	Altruism concerns , desire to improve the lives of those who are in disadvantaged situations. Socially oriented values are aligned with solidarity and social justice, building new types of relations between both the global North and South.
Attachment to rural	Sense of attachment to rural areas dedicated mainly to primary sector of economy; and desire to dignify small farmers/producers and sustain (Galician) traditional lifestyles.
Awareness-rising	Awareness-rising due to an event or personal experience that acts as a trigger for a change in individual consumption styles and that understands eating as an essential part of a set of desirable pro-environmental behaviours.

4.2. Motivations for participation in a conscious and responsible consumption initiative

Concerning the decision to engage in collective forms of consumption (e.g., being a member of consumer's cooperative), most of the participants in this study argue a combination of different motivations (see *Table 2*) which relates, first, to the identification of these organizations as the most suitable spaces for satisfying their desire to sustain a "green" lifestyle". Thus, the perceived accessibility and affordability to organic and fair-trade groceries becomes one of the major reasons to join a local food coop, followed by the manifestation of socio-political ambitions and the desire to support Social and Local Economy sector. Interviewees explicit a desire for autonomy and control over their purchasing decisions, becoming independent of global corporations and supermarkets.

Galician food activists do share common social and political ambitions and conceive food coops as grassroots movements with the capacity to change the dominant social paradigms challenging the unsustainable practices that characterize the dominant system of food production and distribution. Consumption is interpreted as "a political act", a new way of engaging in political activism, appealing to large structural changes such as the democratization of the economy. Food activists do experience political action when they create or

shift the entire purchasing environment and co-produce, together with farmers as well as variety of actors, more sustainable and democratic structures in economy. Despite these political ambitions, the Galician food movement presents differences comparing to other networks in Spain. For example, the participants in this study report a clear distance with the libertarian discourse that impregnated the Catalan grassroots movement (Papaoikonomou, 2013; Suriñac, 2012) and various interviewees maintain a critical stance regarding radical positions while welcome a diversity of profiles and lifestyles in membership.

Food coop practitioners are found to be driven by both environmental and social reasons. For instance, to socialize with like-minded people, to expand their social network or friendships, or to experiment a sense of belonging, which lead to the desire to engage in collective projects. A limited sample of participants reported that the decision of joining a consumption initiative relies on the desire to socialize with like-minded people, expanding their social network or friendships. Besides, they do often report a sense of belonging as a consequence of being involved in collective consumption, which leads to the desire to engage in community-led projects and social innovations who share common values, goals and concerns. Also, these participants stress their ambition to change the relationships between consumers and producers, fostering mutual respect, proximity, and empathy, recognizing, and dignifying the work of the farmer/producer. These results are coherent with recent studies that researched grassroots initiatives in the food domain (Dumitru *et al.*, 2016 a,b; Suriñac, 2012). The conceptual map of motivations for conscious consumption in the frame of the consumers initiatives (see *Figure 3*) illustrates the types of relations between the distinct categories of motivations described in this chapter.

Table 2. Motivations for becoming a member of a conscious consumption initiative.

Code	Description
Green lifestyles	Identification of the CRCI as an enabling space for climate-friendly, fair and ethical consumption.
Accessibility	Accessibility, availability and affordability with respect to environmentally and socially responsible food
Socio-political ambitions	Aspirations for social transformation. Desire for been involved in sociopolitical and/or socially transformative movements
Local economies	Support locally based economic alternatives based on the articulation of short market circuits
New relations in economy	New relationship models in the economic context, fostering models of prosumerism and co-responsibility in the food system
Autonomy	Self-management aspirations in the economic and consumer sphere
Relatedness	Affective or relational needs: connecting with people who share common principles and values

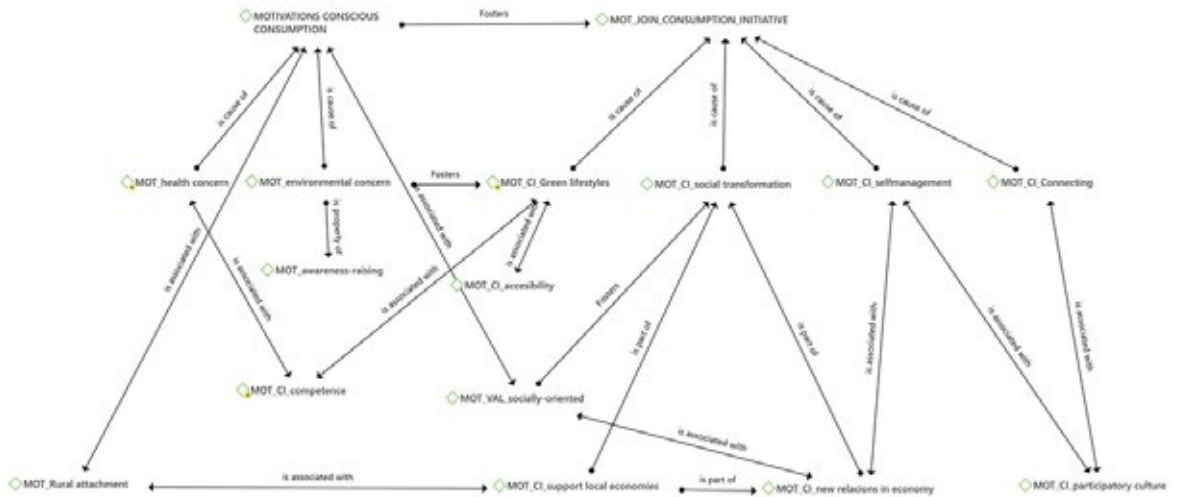


Figure 3. Conceptual map of motivations for conscious consumption in the frame of the CRCIs.

5. CONCLUSIONS

Green consumption has become central for research on climate action and green lifestyles. This study explored the social and psychological dimensions that interplay in people's patterns of consumption. It contributes to the understanding of the different human motivations, needs and desires underlying green consumption behaviour stressing the existing close relation between health-orientation motivations, environmental awareness-rising, and the performance of conscious consumption practices in households. Although previous research stresses the positive relationship between the values and attitudes that support organic food and purchase intentions, the Galician food movement hosts a diversity of consumer profiles who share different lifestyles and perform their consumption patterns according to a variety of reasons. Findings of this study point that sustainable consumption is strongly influenced by health orientation reasons and affective responses to food, as well as situational factors, such as the availability and accessibility to green and fair-trade products.

The results of this study suggest that awareness of the environmental, social, and economic impact of consumption is a direct antecedent for responsible behaviour. Galician food activists are guided by altruistic motivations and socio-political ambitions, searching for more supportive, ethical and sustainable food-systems. The Galician Conscious and Responsible Consumption Network endorse transformative discourses and practices in economy that support organic farming and social and solidarity economy networks and claiming also more fair relationships between the Global North and the Global South. Hence, collective forms of consumption are perceived by these food activists as effective means

of “putting utopian discourses into practice”. Food coops are perceived as “real manifestations” of bottom-up, community-led projects, which have the capacity for achieving real impact on the field.

Feelings of connectedness with the rural territory also motivates action to protect these specific environments by supporting local economies. Such connection is often motivated by their family roots, which persist even although they do not live in these rural environments This is consistent with place-attachment research, which has examined people’s feelings of connection to specific physical and natural environments (Ariccio *et al.*, 2022; Hernández, 2021).

The findings of this research highlight the relevance of intrinsic motivations, like the desire of autonomy and connectedness. Galician activists explicit the desire to achieve a certain "social happiness" based on establishing meaningful relationships working with like-minded others in common goals. Activists experience pleasure in doing what is right, aligned with their moral personal values, while experience community life (Vita *et al.*, 2020). These results stress the need to study not only individual behaviours but explore the factors underlying the willingness to join a local initiative (e.g., agri-food alternative, food coops) or a community movement.

Considering the limited availability of scientific evidence on the contribution of local and grassroots initiatives toward sustainable lifestyles, this research provides empirical data on the motivations and aspirations for people to join collective forms of consumption. Notwithstanding, a more profound comprehension is still needed on the determining social dynamics and conditions for behavioural change in each specific climate relevant behaviour, since the factors that can influence the adoption of desirable behaviour in a concrete domain may not affect the execution of different ones, as the empirical evidence on sustainable food consumption demonstrates.

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MOTIVATIONS TO ENGAGE IN SUSTAINABLE AND CONSCIOUS FOOD CONSUMPTION. ADVANCES FROM MULTIDISCIPLINARY EMPIRICAL RESEARCH ON COLLECTIVE FORMS OF CONSUMPTION

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11 / A COMPREHENSIVE MODEL OF STRESSORS AND ADAPTATION ON SHIFT WORKERS DAILY WORK LIFE: CONSEQUENCES FOR SUSTAINABLE LIFESTYLES

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ABSTRACT

Environmental psychology has long been interested in the effect of different environments on the health of users (Gifford, 2007). Work environment has also started to be studied as a promoter or hinderer of health and as part of green lifestyles support (García-Mira, 2017).

Shift work is a particular type of work schedule that has been studied as one of the work contexts in which several health problems occur. These issues might concern physical and mental wellbeing (Figueiro & White, 2013; Gameno, 2010) as well as the hassle to manage family balance (Costa, 2016; Vera-Martinez & Martin, 2009). How people structure their everyday life, how they make decisions regarding their work and leisure time have important consequences on sustainable lifestyles.

This study aims to explore workers' perception of characteristics on the work environment that affect their QoL the most, within the context of shift work as a part of promoters or hinderer of green lifestyles. The questions "What are the QoL barriers from the shift-worker's perception?" and "What are the dimensions that defined the shift-workers' QoL?" will be answered in depth.

A multimethod approach consisting of both qualitative and quantitative analysis was used. Firstly, the collected data is the result of 3 different focus groups arranged in the most important cities of the province of A Coruña (Galicia-Spain). The sample included 19 shift workers. Atlas.ti was used to analyse this qualitative data. Secondly, a specific questionnaire gathering the focus group data collected was developed and applied in a factory located in Ferrolterra's area (n=115). The SPSS was used to analyse the data.

Results obtained through the qualitative data analysis show relevant dimensions to be taken into account as it could characterize a healthy

organization promoting healthy workers. As it was previously pointed out (Fraga et al., 2014), 15 dimensions were derived from our analysis within 3 focus groups; considering the shift workers' point of view.

The second part of the study identified 8 dimensions, from the previous ones, classified in 3 factors. Factor 2, named "hourly organization", contributed to explain the labour satisfaction in a 35,6%.

In light of the results, the previously established research questions can be answered. Firstly, regarding "What are the QoL barriers from the shift-worker's perception?", 13 potential QoL barriers were obtained, six of them directly related to the work environment and the other seven referring their life outside work. Secondly, on "What are the dimensions that defined de shift-workers' QoL?" 8 dimensions, classified in 3 factors, were identified.

Factor 2, the biggest one, contributed to explain the labour satisfaction in a 35,6%. Shift workers time poverty affects people's civic engagement, physical health and family involvement with implications for sustainability.

The conclusions for this study will be used to formulate recommendations to improve working environments and the shift worker's daily life; to provide trade unions with information that will support them in their efforts to achieve better workplace environments and to support corporate social responsibility policies in organizations.

Keywords: Environmental perception; healthy organizations; workplace quality of life; shift work.

1. INTRODUCTION

Environmental psychology has long been interested in the effect of different environments on the health of users (Gifford, 2007). Work environment has also started to be studied as a promoter or hinderer of health and as part of green lifestyles support (García Mira, 2017). Shift work is a particular type of work schedule that has been studied as one of the work contexts in which several health problems occur. These issues might concern physical and mental wellbeing (Figueiro & White, 2013; Gameno, 2010) as well as the hassle to manage family balance (Costa, 2016; Vera-Martinez & Martín, 2009). Healthy Organizations

and shift-work schedules are connected together, in a way where both of them could cause positive or negative effects, so a specific type of organization could determine how to establish more suitable shift-work schedules, and vice versa. Shift-work schedules planification could affect the healthy work environment management. How people structure their everyday life, how they make decisions regarding their work and leisure time have important consequences for sustainable lifestyles.

Nowadays, the concept Quality of Work Life (QWL) is still in a progressive development, because it is a complex phenomenon. A lot of perspectives are influencing the concept, so a wide diversity of researchers and organizations are around the definition. Authors as Nadler and Lawler (1983) already showed this situation, that has not changed up until now. There is not a generally accepted definition but a list of the main characteristics. Now, it can be noted that QWL is a multidimensional concept that must be analysed keeping a range of aspects in mind, as employment objective characteristics, specific work characteristics, and worker's subjective evaluations (Royuela et al., 2009).

In the field of research, applied to working environments, the term Healthy Organization (HO), in relation to Healthy Work Environments, was coined by Rosen and Berger (1991). Using this concept, they tried to identify organizations that share a group of common values in order to identify a set of environmental and organizational common practices (Pulido et al., 2009). A HO is characterized by its intentional efforts, systematic and participatory, in order to maximize employees' wellbeing and productivity, providing well designed and meaningful jobs, social and organizational support, and accessible and equitable opportunities for career development and improvements in the quality of working life (Wilson et al., 2004).

Wilson et al., (2004) proposed and developed a comprehensive model to illustrate a HO; in their model they introduce six components or factors: Job Design, Organizational Climate, Job Future, Core Organizational Attributes, Psychological Work Adjustment, as well as Employee Health and Well-being. Gimeno et al. (2008) propose ten theoretical dimensions like a group of the most important components to help us identifying a HO. This ten-dimensional model arise as a reference in a HO, including these factors: Job security; Equality and non-discrimination; Training and employability; Participation in work organization; Healthy and safety conditions; Competitive strength; Recognition and reward; Autonomy and responsibility; Identity and loyalty; Involvement and motivation.

Moreover, it is important to study the Quality of Life (QoL) of employees inside organizations to promote healthy workers. Characteristics of shift-work schedules have an influence in three different life areas: physical well-being, mental well-being and work-to-family conflict. Specifically, rotating night shift

work disrupts circadian rhythms and it is related to sleep disturbances (Akerstedt *et al.*, 2002), coronary heart disease (Brown *et al.*, 2009), gastrointestinal disturbance, reproductive dysfunction, as well as decrease in psychological well-being (Harrington, 2001). Besides social, family and marital relationships could be disrupted (Costa, 2003). Some authors point out that people engaged in shifts and night work are out of phase with society. This kind of schedule can lead to social isolation (Table 1). In fact, how people structure their everyday life, how they make decisions regarding their work and leisure life have important consequences for sustainable lifestyles.

Table 1. Some relevant authors in the quality of shift workers' QoL from the psychosocial perspective.

Authors	Research results
Costa, 2016; Costa, 2003; Bohle & Quinlan, 2000	People engaged in shift and night work are out of phase with society, and shift work can lead to social isolation or marginalization.
Gracia y Kalmijn, 2016; Tuttle y Garr, 2012; Root y Wooten, 2008 y Gee <i>et al.</i> , 2007	Results clearly support the notion that family, shift worker and work place form and interdependent unit. The inclusion of social coping strategies combined with family involvement significantly reduced work-family conflict.
Walker <i>et al.</i> , 2020 & Takahashi <i>et al.</i> , 2006	More variable workload was associated with an increase daytime sleepiness and that reduced job satisfaction and more symptoms of depression were linked to elevated daytime sleepiness.
Tamagawa <i>et al.</i> , 2007	Results indicate that tolerance of shift work was significantly associated with personality traits and mood states.
Albuene <i>et al.</i> , 2015; Conway <i>et al.</i> , 2008	People who work by shifts inform to have more stress than other people that do not.

In Spain, a 23% of workers work in shifts and an 8,9% of them work in the night shift or in rotating schedules (INSHT, 2015). Shift work is a special schedule organization, in which the worker must do his work in 3 different rotating time periods: morning (from 6 a.m. to 2 p.m.), evening (from 2 p.m. to 10 p.m.) and night (from 10 p.m. to 6 a.m.). Shift work has negative consequences, but it is necessary in some institutions, so arguments in favour are related to productivity and maximizing costs.

2. AIMS

This study aims to explore workers' perception of characteristics on the work environment that most affect their Quality of Life (QoL) within the context of shift work as a part of promoters or hinderer of green lifestyles. The questions "What are the QoL barriers from the shift-worker's perception?" and "What are the dimensions that defined de shift-workers' QoL? will be answered in depth.

Data was also analysed in order to formulate recommendations for policy-making that would contribute to decrease the negative effects of shift work from an individual and social perspective. So, we were able to answer the key question:

“What can we do to improve the work environment, with especial focus in labour health, safety and sustainable lifestyles from shift-workers’ perspective?”

3. METHOD

3.1. Participants

We used a multimethod approach consisting of both qualitative and quantitative analysis. Firstly, the collected data is the result of 3 different focus groups arranged in the most important cities of the province of A Coruña (Galicia, Spain). The sample included 19 shift workers shared out in three locations: 8 people in Ferrol, 7 people in A Coruña and 4 people in Santiago de Compostela. The appropriate size for a focus group is among six and nine people, small focus groups among six and four people are becoming more popular lately because it is easier to convene and keep the group together (Nyumba et al., 2018, Krueger & Casey, 2000). The range of age was from 25 to 61 years (\bar{x} 43.2), and the range of time that they had been working as shift workers was from 5 to 30 years (\bar{x} 15.5). The distribution by sex was well-balanced including 11 men and 8 women. Atlas.ti was used to analyse this qualitative data.

At the second part of the study, an specific questionnaire from focus group results was developed and applied in a factory located in Ferrolterra’s area (n=115). Response rate: 69 %. The sample is made up of middle-aged married men, the mean time being shift workers: 18,18 years. They were working in rotating shifts: 2Morning-2Afternoon-2Night (4Rest) or 2Morning-2Afternoon-2Night (2Rest). The SPSS was used to analyse the data.

3.2. Procedure

For the qualitative data collection, a participant’s selection was carried out in order to get a representative sample according to our aim. Shift workers were contacted through the most representative trade unions in A Coruña (CCOO, CIG and UGT), at first, by e-mail, and finally by phone. There were among 10 and 12 workers in each meeting place, in order to guarantee a minimum attendance.

Focus groups were arranged respecting different author criteria (Canales & Peinado, 1998; Callejo, 2001; Bisquerra, 2004; Murillo & Mena, 2006) about sample, size, introduction, screenplay and the key question to begin the discussion.

A questionnaire was applied to detect and evaluate the levels of stress in shift work, which has been called CETUR, to the study population in a company selected for convenience, thanks to the collaboration of the unions with the

greatest representation in Galicia, as well as the first part of the study. The company belongs to the industrial sector and mainly employs shift workers for the development of its production. It is located in Ferrolterra's area.

3.3. Analysis

The gathered information was analysed with the qualitative software Atlas.ti. This software was used to simplify the group's analysis of discourse and get more objective information through quotes, codes and families.

Atlas.ti allowed the identification of the main dimensions of shift work and QoL.

The SPSS was used to verify the reliability and validity of the information collection tools (self-made questionnaire) and the data obtained, as well as their statistical relevance in terms of relationships between the work variables.

4. RESULTS

Results obtained through the qualitative data analysis show relevant dimensions to be taken into account as they could characterize a healthy organization promoting healthy workers. As it was previously pointed out (Fraga *et al.*, 2014), 15 dimensions were derived from our analysis with 3 focus groups; considering the shift workers' point of view.

These 15 dimensions were synthesized in 13 (*Table 2*), seven of these dimensions are directly related to the work environment, and they are the key elements of this study. These dimensions will be explained in order of importance.

The first dimension was **human relationships**. Shift workers reported that work depends on a group of people working side by side with you; if you trust in your colleague the shift will be better, more bearable because you work feeling peaceful. Something important for shift workers is the possibility to arrange shift changes with colleagues, but this is impossible in some factories because staff is not enough. Specifically, the discussion confirmed the bad image that workers have about managers and board of directors because workers think that "they move only looking for immediate benefits; they don't bear workers' opinion in mind". As workers said, this theory is real in factories, the human capital is important because its application is well viewed, but factories don't carry it out to practice.

Commuting was the second dimension, it is important to emphasize that covering long distances from home to workplace suppose the extension of schedule, and time that worker expends in the journey depends on the means of transport used. The most used transport by workers is the car, their own or shared with

Table 2. The dimensions that affect the most the shift workers' quality of work life.

Family	Codes	Quotes
Family Life	14	72
Feeding	8	31
Human Relationships	5	19
Commuting	10	28
Labour Legislation	11	72
Performance and Productivity	5	19
Personal Variables	10	69
Well-Being	10	43
Safety and Occupational Health	4	17
Hourly Organization	9	54
Sleep and Rest	16	62
Social Life	3	10
Work Space and Environment	3	13

colleagues. Public transport is not used because lines and timetables are not adapted to workers' schedules. Going to workplace on foot or by bicycle is impossible for most workers because distance is too long (Figure 1). Workers think that having more public transport lines would be better for their lives because driving after long working hours involve a big effort. They need to clear their mind after a long work day before driving home. When they get home, they need to be relaxed in order to have a good rest. From an environmental point of view, favouring public transport would be more sustainable. So, it would be doubly positive to reinforce it.

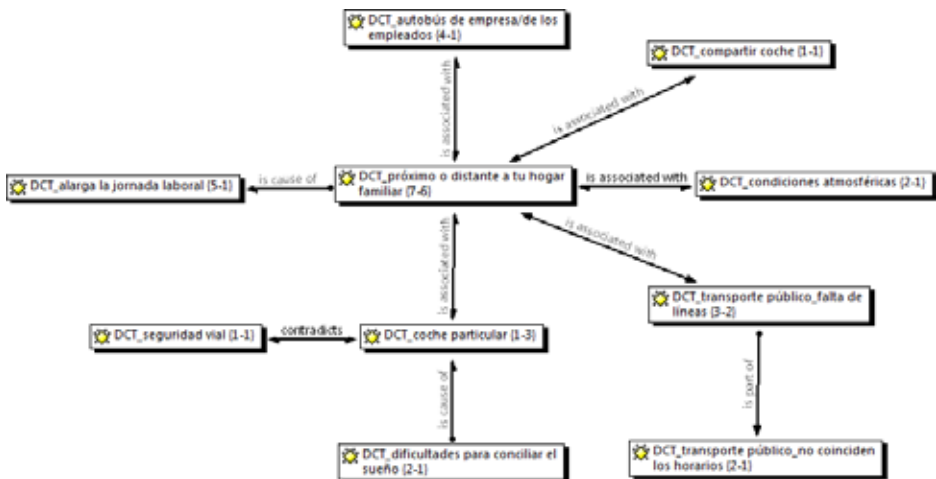


Figure 1. Elements to highlight in relation to the commuting made by shift workers.

Third dimension was **Labour Legislation**. Participants think that present legislation is really limited to protect this kind of work conditions; legislation recognize the night shift work as “drudgery” but it is not enough compensated with a salary increase. Moreover, the practical application of legislation must be under control because it is not specific and it permits a high level of autonomy for its application in factories; workers said they perceive big differences between working in the public sector and working in the private sector. About this matter, it is said that “factories have no interest in recognizing the “drudgery” due to the improvement and costs associated”.

About **performance and productivity**, the fourth dimension, workers confirm they feel under pressure because of the board of directors, who are always looking for a better performance. Workers inform that their performance would improve if work conditions were better (for example, considering a bigger size for work teams within shift). Therefore, workers think that board of directors do not pay any attention to workers’ performance, “the work approach is in the hours of work, not in the production; so many hours, more productivity. Conclusion, managers do not think about the performance”

The fifth dimension, **safety and occupational health**, remarks that what participants did in relation to safety in work environment was focused in the night shift. For them, it is important to be relaxed at night, motivated by the manager staff absence. There is an increase of injury risk perception, within the last hours of shift, because workers are exhausted. Workers accused people implicated in the decision-making process of being responsible of accidents because they scheduled too many hours for night shift.

Hourly organization, it was the sixth dimension. There are clear differences between shifts organization and the kind of rotating shifts that are established when the effective work timing, breaks and leisure time are assessed. Workers highlight that most of their leisure time is dedicated to have rest and not to spend time in other daily duties.

The seventh dimension was **work space and environment**. In some factories there are no resting and eating areas, as workers’ rights dictate. This is especially relevant because during the night shift there is a lack of appetite or lack of desire to eat, which leads to postponement of meals and postponing them to the work environment; making them, usually, based on fast and/ or unbalanced food. This has a special impact on healthy lifestyles. When factories did not have these special areas, participants affirmed that they will be grateful for having this area, being able to have a rest in the middle of the schedule and relax; this break would be a great help to develop a better job in the last hours. About the environment, participants do not know more information than the environmental actions related to the legislation, but one of the participants spoke about the organizational environmental consequences.

Finally, it is important to emphasize that shift workers spoke about the importance of personal variables for coping shift work, because their attitudes help them to cope with this type of schedule organization.

In the second part of the study, after the application of the self-made questionnaire, 8 dimensions were identified, from the 13 previous ones, and classified in 3 factors. Factor 2, named "hourly organization", contributed to explain the labour satisfaction in a 35,6% (Figure 2).

	Component		
	1	2	3
9.Relationship with co-workers	,887		
10.Sense of security	,873		
8.Workers' decision-making	,838		
6.Labour rights		,782	
5.Shift work structure		,770	
7.Management decision-making	,413	,636	
2.Needs and daily rythms		,607	,540
4.Meal times		,602	,531
1. Free time			,802
3.Sleep and rest			,753
Extraction method: principal component analysis. Rotation method: Varimax with Kaiser normalisation.			

Figure 2. Representation of the model. Rotated component matrix of the CETUR scale.

Factor 1. It groups very well those items related to the work environment, talks about relationships with colleagues, the participation of workers in decision-making within the company and the feeling of lack of security at work (39,96% of the variance).

Factor 2. It is the densest factor of the three and includes items related to the organization of hours: it talks about the work schedule, how it is established by the management and if it adapts to the needs and daily rhythms of the employees, workers, as well as the recognition of labour rights by the company (18,41% of the variance).

Factor 3. Groups items that speak of the free time that shift work leaves for activities related (sleep and rest) or not to work (10,83% of the variance), which is why it has been called: free time.

5. DISCUSSION

In light of the results, the previously established research questions can be answered. Firstly, "What are the QoL barriers from the shift-worker's perception?" 15 potential QoL barriers were obtained, six of them are directly related to the work environment and the other seven refer to their life outside work. Workers perceive their work environment as a strange environment, unconnected with their necessities and preferences. This point of view is probably under the influence of some dimensions obtained, focused in two different ways: the circumstances that occur inside the work environment and the circumstances that occur outside. And under the participant's perspective, these two environments engaged are disconnected, so they are in conflict. As it was previously introduced, the work-life balance conflict has been studied (Gracia & Kalmijn, 2016; Tuttle & Garr, 2012; Root & Wooten, 2008 & Gee *et al.*, 2007), and according to the authors, results clearly support the notion that family, shift worker and work place constitute an interdependent unit. A way for exploring workers' perception is using "focus group" because this technique produces a specific kind of qualitative data, very difficult to obtain in a quantitative way. Listening to the shift-workers and considering their perspective is a way to construct an integrative approach in the general work planning and in the healthy workplace design. This particular idea has some connections with other aspects that will be explain later in the conclusion part.

Fifteen dimensions that never have been found before our research were obtained. Probably because the topic is too specific, but there are some previously similar proposals like Royuela *et al.*, (2009) or Gimeno *et al.*, (2008), but both of them were focused on inner work dimensions, without a focused interest in the outer dimensions, so this affects the workers' perception of quality of work as much as the others. A future way to improve this research would be to explore in more detail the ponderation between those two kinds of dimensions, inner and outer, in order to know how it affects the workers' quality of life inside the workplace.

Secondly, "What are the dimensions that defined de shift-workers' QoL? 8 dimensions, classified in 3 factors, were specified. Factor 2, the biggest one, contributed to explain the labour satisfaction in a 35,6%. Shift workers time poverty affects people's civic engagement, physical health and family involvement with implications for sustainability.

In general, it can be concluded that a hypothetical bad psychological environment of work is caused by the lack of participation to improve the factory and its processes. The study show that employees want to be more implicated in the decision-making process. This is related with previous investigations that demonstrate that participation in work tasks organization is linked to the dimensions that characterized a HO (Gimeno *et al.*, 2008). Moreover, research on the psychosocial environment in work contexts is increasingly important due to

the effects that stress has been shown to have on the health of workers (Navinés *et al.*, 2016), as well as the benefits that the company can obtain (Pérez, 2016).

Finally, results show how the study of workers' perception about the work environment will be a potential way to promote a transformation within the organization. Managers' point of view could be closer to workers than they think. We support the idea that the right way will be the one that puts all the studied elements in common applying them to the planning and every day practices.

6. CONCLUSIONS

The results of this study led us to analyse data in order to formulate recommendations for policy-making that would contribute to decrease the negative effects of shift work. Workers confirmed that they perceive their work environment as a strange environment, unconnected with their necessities and preferences. So, to act accordingly, we can guide the personnel implicated in the decision-making process. Listening to the shift-workers and their proposals is a way of integrating the workers' perspective into the general work planning and into the healthy workplace design. These are the key to ameliorate the work environment, because of the data, clearly, the psychological working environment was mediated by a lack of participation and employee involvement in decision-making and actions to improve the company. These results have shown to be useful for organizations, as they provide further evidence of the beneficial effects of looking at the human experience in order to improve working conditions. The conclusions will allow us to formulate recommendations to improve work environments and the workers and shift-workers daily life; to provide trade unions with information that will support them in their efforts to achieve better workplace environments and to support corporate social responsibility policies in organizations.

The implications of the results may involve the guide for future research on the study and evaluation of the presence and intensity of psychosocial risks in organizational environments, and policy development of human resource management models more effective and efficient to promote adaptation and optimal and healthy fit between the employee and the organization. It is important to highlight the importance of analysing the reality of each company, as well as the opinion of its workers to guide the most appropriate actions according to the context.

Furthermore, new research needs to be conducted to determine the relative importance of different predictors in quality of work life, and to guide the implementation of programs to improve it.

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12 / APPLIED SOCIAL SCIENCE RESEARCH FOR HOUSING UPGRADING IN TIMES OF A PANDEMIC*

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ABSTRACT

Applied social science research, that investigates the environment/people relationship, uses tools and methods to observe, question, and engage people in and about specific built environments. Stakeholders involved in producing, refurbishing, and upgrading these environments are often part of such studies. Visual research methods are preferred to overcome language barriers and the different levels of familiarity of participants with the investigation topic. Surveys, interviews of various kinds, and post-occupancy evaluations (POE) are often part of such research to underpin or complement visual methods. Mental maps, stated choice experiments, attribute constellations, diamond ranking, floor plan evaluation, and comparisons, and semantic scale image evaluation are typical methods found in the literature. A number of these visual research methods are discussed in this paper, and the challenges, difficulties, and opportunities related to their application in environmental design and psychology studies are presented. The Living Lab (LL) concept is an important procedure to create shared understanding, discover hidden agendas, mitigate conflict, validate innovations collaboratively, and support decision-making processes in participatory processes. The LL concept is increasingly used to promote sustainability, particularly in urban planning and social housing refurbishment, through the engagement of various stakeholders around a common issue. Many topics addressed in such LLs are not only complex but also abstract. The topics of climate change, environmental vulnerability due to Covid-19, possible and even necessary environmental and changes in lifestyle responses should be part of LL engagements. These topics must be approached in creative

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ways. Triggering questions are necessary to start and focus debates and make participants aware of their role in resolving problems associated with these topics. In the LL, context-specific methods may be applied in the form of Boundary Objects. Visual methods or tools may include Virtual and Augmented Reality, games, models physical and digital with possible walkthroughs, and the participation of cartoonists to transform topics of discussion into diagrams and illustrations. Also, engagement conversations apply methods and interpretive approaches such as in-depth and reflexive interviews as well as traditional brainstorming and focus group techniques. Each method, tool, and approach needs structuring, specific materials, and application protocols, including ethical concerns. During the pandemic, this type of research has been greatly affected. Direct contact with participants is not possible and digital means of access are used to promote engagement, adding new research challenges. How to reach participants with poor access to the internet, how to conduct adequate group debates, how to observe behavior, how to increase the perception of specific issues, how to read body language, how to come to decisions, and how to analyse meeting results are the questions that emerge. Some challenges are technical depending on equipment and software; others demand new ways of thinking and presenting ideas in visual languages to be shared online. This paper contributes to this debate with procedures adapted for the new research pandemic environment. Contributions come from recent publications and the authors' experience through a social innovation partnership project in four countries (Brazil, Germany, the Netherlands, and the UK). The specific contexts play an essential role in using and adapting the right tools as well as interpreting research results to create new knowledge and contribute to the resolutions of new problems related to sustainable lifestyles and supportive environments, particularly in social housing in times of the pandemic..

Keywords: Visual research methods; Living Lab procedures; Social Housing.

1. INTRODUCTION

The quality of urban settings and architectural configurations of social housing (SH) around the world is frequently criticised concerning its fit to user requirements, values, and desires (Ortiz & Johannes, 2018; Kowaltowski & Granja, 2011). Projects, mostly produced through Mass Housing (MH) for SH programmes, often do not meet sustainability performance goals (Rirccardo et al., 2017). SH models also adapt very slowly to the dynamics of social and

technological change, which is a cause of user dissatisfaction and the models do not incorporate building construction standards over time (Portinga *et al.*, 2017). SH programmes should deliver intended socio-economic benefits which is (Thomson & Thomas, 2015). In developing countries, such projects can deepen socio-spatial differentiation in large cities (Burckley *et al.*, 2016; Dohnke *et al.*, 2015). Research shows that shortcomings of SH models can be traced not only to inadequate consideration of user needs but planning failures and lack of collaboration between stakeholders. In order to meet process deadlines, many SH programmes may induce the production of projects not fully developed, causing later perceived deficiencies (Kowaltowski *et al.*, 2018).

The purpose of most SH programmes is to reduce housing deficits and mainly focus on new construction projects, in line with political and economic goals (Burckley *et al.*, 2016; Mouratidis, 2020). There is a lesser interest in housing upgrading (HU), which includes maintenance; refurbishment; retrofit, or improvements of existing SH.

Upgrading has traditionally been the focus of fewer research studies, although user/environmental incongruence relating to low-income families' homes can cause social costs (Zavei & Jusan, 2012; Muianga *et al.*, 2021). These relate to health issues (illnesses, mental health and poor cognitive development, stressful lifestyle, and low social engagement among family members), family and neighbourhood conflicts; neighborhood safety issues limiting children's outdoor activities, residents' dissatisfaction with the social environment, financial implications (cost of maintenance, transportation due to location), and environmental sustainability impacts. On the positive side, minimal investments towards improving the physical environment (upgrading) potentially increase users' physical and social activities with health benefits (Swope & Hernández, 2019). Improving existing housing can reduce housing deficits, with added urban advantages, avoiding peripheral growth, and the resulting mobility problems (Jensen & Maslesa, 2015; Burckley *et al.*, 2016).

Upgrading the existing housing stock is essential to users, should be of importance to governments, to the housing research community (Watson *et al.*, 2016). Opportunities exist to improve the existing SH stock to alleviate social costs, reduce housing deficits, and increase sustainability performance, as well as improve general comfort conditions for low-income tenants and owners. However, upgrading programmes should avoid social exclusion and gentrification. Careful planning and execution of renovation and refurbishment of SH at the building and neighbourhood levels should avert social polarization and stigmatization (Juan *et al.*, 2009).

To investigate SH upgrading processes we developed an international study, called uVITAL¹, conducted in four countries (Brazil - BR, Germany - DE, the Netherlands - NL, and the United Kingdom - UK). Our primary drive for this

¹ uVITAL - User-Valued Innovations for Social Housing Upgrading through Trans-Atlantic Living Labs, FAPESP: 2019/02240-5, NWO, BMBF (DLR-PT), UK-AHRC.

project relates to user values, and the need to improve the planning and execution of upgrading programmes, to create a shared understanding between the various agents involved. We use the term upgrading, focusing on residents' wellbeing, and improving sustainability performance.

The study explores the concept of living labs (LLs), to stimulate Social Innovations (SIs) through collaborative upgrading processes. LLs are seen as environments to allow SH users to express home-related values. Other agents, such as housing associations, real estate stakeholders, and construction companies, as well as planning and design professionals, academics, NGOs, city government agencies, and politicians, should bring their expertise, goals, and risk visions to upgrading debates within LL settings.

The primary research questions of the uVITAL project are amplified to include the specifics of LL as follows: How can LL settings be enriched for decision-making in SH upgrading projects? Do exchanges from different transatlantic experiences create new insights stimulating higher levels of innovation? Can knowledge be extrapolated to instantiate SIs for replication on broader scales? Can innovations reduce social costs, tensions, and risk perception in SH upgrading? What are the SIs that can be brought about?

To answer these questions research goals were set to evaluate the LL concept to support effective decision-making in SH upgrading processes and to test specific tools or Boundary Objects (BOs). A major objective that runs through the project is the development of social and technological innovations, capable of mitigating social costs through SH upgrading programmes and the consolidation of a protocol designed to solve dilemmas and conflicts in participatory processes within LL settings as well as to achieve educational gains for all stakeholders involved.

In this research, we explore the LL concept for a specific context and time with context-specific methods in the form of BOs. Visual methods are preferred and tools may include virtual and augmented reality, games, models physical and digital walkthroughs, as well as the participation of cartoonists to transform discussion topics into graphic illustrations. Interpretive approaches such as in-depth and reflexive interviews as well as traditional brainstorming and focus group techniques to extract and analyze the information and connect participants were used. Each method and approach, needs structuring, specific materials, and application protocols, including ethical considerations depending on context. In the case of this article, the Brazil case study of the uVITAL is explored. The specific circumstances of the ongoing pandemic were included to reflect on the impact of this moment in time on the type of research that was possible.

Our specific research questions related to the goals of LLs, the methods used, and the impact of the pandemic on conducting LLs for a specific context. Can the

LL concept create effective solutions for upgrading of SH in a Brazilian context? What are effective research methods to gather and analyse user requirements? What are effective participatory engagement strategies for SH upgrading? How can educational gains be achieved through SH upgrading LLs? What are effective methods to mitigate conflict in SH upgrading discussions? As our research was affected by the pandemic, we added a further question, on how this immersion into reality can be achieved in these special circumstances?

2. LIVING LABS, DEFINITION AND MOTIVATIONS

A general definition found in Papadonikolak (Juan *et al.*, 2009) states that LLs are: “User-centred sessions focusing on co-creating meaning with the participants, exploring scenarios and evaluating propositions”. The motivations to conduct LLs are primarily to value user participation in decision-making, while technological issues are being solved. Case studies exist that show the advantages of conducting participatory decision-making and co-design through this multi-agent method are the mitigation of mistrust, reduction in information gaps, and making all participants part of the solution. Projects are open and shared, and opportunities are given for SIs as well as new business models. As technical, operations, legal, administrative, research and users participate, technology is applied when the need for support tools are perceived. The participation on an equal footing of governmental organs and institutions, reinforces that the solution, and actions are integrated with city development and maintenance works.

A lack of collaboration is common in participatory processes. Some participants may dominate the process and others may avoid participation, failing to voice their opinions. Risk factors exist in SH upgrading processes and these are specific for groups of participants. Mitigation is therefore important.

Shared knowledge may be lacking as well as a knowledge level disparity exists, due to the different levels of technical and local knowledge among LL stakeholders. Users bring their local experience to the table, not always shared among all users and in many cases lacking a statistical survey. Construction companies and design professionals dominate the technical side of renovations. While government agents are motivated by regulations as well as political gains. Academic participants seek to gain knowledge to advance the science on SH and develop SIs for upgrading processes. Understanding each participants' role and behavior in LL processes is of significance to enable successful decision-making.

What are SIs and what are they in relation to SH upgrading? The sociotechnical systems in SH upgrading procedures must be understood and supported (Schweber & Harty, 2010). Financial restrictions that indicate what is priority for minimum positive change in SH conditions are overriding. Interactions between

people and technology in housing must be understood, although technology in LLs should not be a controlling factor but cannot be ignored.

According to the OECD² SIs “refers to the design and implementation of new solutions to improve the welfare and wellbeing of individuals and communities”. In the case of SH upgrading, conceptual, process, product, or organizational changes are SIs. These may include management and surveillance systems, and sensors for necessary upgrading actions. Physical innovative technologies should also be considered such as: solar energy systems, window and glazing technologies, insulation methods, water and energy-saving systems, security surveillance and communication systems, space-saving and cost reduction technology, as well as Universal Design (UD) technologies. For neighborhood upgrading, specific innovations are essential.

Knowledge gains include: boundary-spanning know-how for mitigation between disparities among stakeholders, effective communication tools, and physical upgrading options in the form of design and construction technologies. End-users should gain information on efficient ways of improving their specific living conditions, and understand transformations that will occur. In the case of countries where upgrading conforms to sustainability mandates, users need to comprehend how the process will affect their lives and what choices they have. In developing countries, like Brazil, families act on their own, transforming their houses or apartments, based on individual needs and ideas, mostly without technical support or legal approval. To support such self-conducted upgrading, a SI outcome of a LL is seen as an important contribution to determine priorities and maximise cost/benefits of interventions. Public stakeholders are essential partners in this process to mitigate conflicts between neighbours and create a cooperative spirit to introduce improvements for the benefit of the community. NGOs need to be part as well to facilitate the process.

LLs apply BOs to engage participants. According to Star & Griesemer (1989), a BO is an analytic concept of those scientific objects which occupy several intersecting social worlds and satisfy the informational requirements of each of them. The creation and management of boundary objects is a key process in developing and maintaining coherence across intersecting social worlds. Various types exist, such as: Repositories; Standardised forms; Ideal Types; Coincident Boundaries; Explanatory BOs; Recording BOs; and Generative BOs.

In the case of SH upgrading, the main BOs are in the form of participatory, visual research methods, Virtual Reality (VR), reflexive interviews, focused surveys, Building Information Modelling (BIM), and co-design methods. For the preparation of our LL, several methods were investigated; besides reflexive interviews, the ones applied in this case study are: Brainstorming, which focuses on idea generation, using a focus groups interaction (Koziorowska & Długosz, 2016); The value Card Game Method, used to classify and prioritize concepts

² OECD - <https://www.oecd.org/regional/leed/social-innovation.htm>.

presented through value theme cards (suits) (Rowley et al., 2012; Carvalho et al., 2019); and Walkthroughs as part of POEs for an analysis of actual conditions. They can be applied by users on their own using a detailed form and path definition for instance (Mahatody et al., 2010).

3. METHODOLOGY

In order to establish SH upgrading activities, this study uses the LL approach to engage users and stakeholders in a collaborative process. The LL approach has a dynamic and flexible structure that allows for progressive adjustments. Methods that are both traditional and context-specific are applied (Tang & Hämäläinen, 2014).

3.1 Study design

Our case study is a provider-driven LL, structured in three phases as shown in *Figure 1*, using various research and development methods. Provider-driven LLs are often organized by universities, promoting research and the search for solutions to specific problems (Leminen et al., 2017). Innovations generate knowledge for all stakeholders involved. By focusing on improving users' everyday life and allowing all participants to benefit from the resulting innovation. Problems engaging enablers may compromise the outcome of such LL and must be addressed carefully.

Our livina lab is built around a single project. The understanding phase.

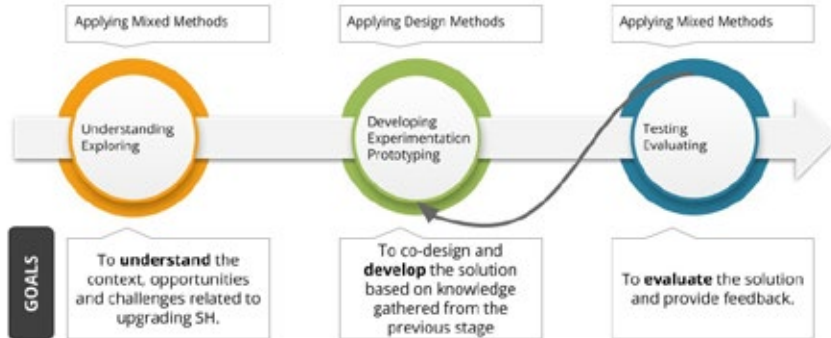


Figure 1. Outline of the structure of the Quilombo case study LL (Source: Authors).

investigates upgrading opportunities through context, fact-finding, and engagement activities. For user engagement, the reflexive interview method was used. This is essentially a dialogue that takes place between people, in which one of them wants to know something and the other(s) has/have the experience and knowledge that interests the researcher (Szymanski et al., 2019). Empathy, trust, reciprocity, expectations, and constitution of meanings are goals. Listening is an

essential condition for a dialogic relationship. A specific kind of “listening” that seeks to put aside previous knowledge is important to confirm this. Awareness of the study’s social context is essential. Listening must involve respect for the interviewed people and their knowledge, as well as a desire to understand and build common knowledge. Reflexing, means considering what the interviewed group is talking about and what has been understood in a dialogic circle that presupposes skills and specific steps.

In the process of an interview analysis, a transit between the parts and the whole of the text exists, through the transcription. This is called the “hermeneutic circle”. For Gadamer (2015) “The task is to expand, in concentric circles, the unity of the understood meaning” (p. 72). Once the interview is transcribed, the issues that are similar are agglutinated on the same topic. This group of ideas is named “constellation”, as the image resembles a group of stars that forms a perceived outline or pattern to guide us at night (Szymanski et al., 2019). The set of constellations gives an overview of what is understood about the studied phenomenon. Finally, the moment called “the return” is fundamental. A second meeting should be scheduled to show the interviewees what was understood from their narrative as a whole.

In our case study, the first user engagement proved difficult, and a kit with 5 activities was developed to increase our reach-out phase. 20 kits were distributed among the families of the case study housing project. The distribution during the pandemic was done through the delivery service of motor boys, handed to one of the participants of previous WhatsApp interviews, who distributed the kits at random among neighbours.

The primary interview activity is an introductory question to get to know participants with a first question on how they liked living in their house in the case study development (Quilombo). The second activity involved end-users observations of their own environment and pointing out positive and negative elements of the home environment. For this, the kit included tags to be attached to the places to be pointed out. The participants were asked to photograph these places with tags and send these pictures with descriptive observations to the research team. The third activity involved giving a pictorial description of their house or neighborhood through drawings.

For further activity, a value card game was created on the topic of upgrading and the introduction of improvements to the home and neighborhood. Part of the card game is shown in *Figure 2* for houses. The topics addressed are personal security, internal layout, environmental comfort, general maintenance, plumbing maintenance, electrical repairs, aesthetic improvements, privacy issues, sustainability, building security (fire safety, etc.), building layout issues, building general repairs, building facade aesthetics, building sustainability, accessibility, general infrastructure. For the neighborhood, general maintenance

and infrastructure and sustainability issues such as outdoor lighting, urban drainage are listed. Another activity involved the free expression of the user's perception about their neighborhood or house.



Figure 2. Value game example cards for upgrading apartments and houses (Source: Authors).

The fifth activity involved the register of interventions executed by homeowners. For this activity, each kit contained a simplified original floorplan of the house types with a 1m x 1m grid to help participants to draw the changes in a simple way.

Once the families completed the task activities the same participant that distributed the kits, picked them up and sent them to the research team through a delivery service. The results were analysed and the results are shown below.

3.2 Case Study

The case study underway in the city of Campinas, Brazil is called Quilombo I and II, managed the municipal social housing agency COHAB - Campinas and was built in 2009. The developments consist of a small number (96) of one-story and two-story row houses, as shown in *Figure 3* in its original state in 2013 and today. Houses are grouped along two cul de sac streets with some public land reserved for recreational activities such as a playground and a small football field. The families of this development came from a risk area near a small stream called Quilombo.

Since 2013 many of the residents have introduced transformations to their houses. In some cases, adjacent public land was occupied (*Figure 3*). These interventions

are not always beneficial in relation to the environmental comfort conditions by blocking original openings for instance. Adapted roof configurations may cause leaks and structural problems may occur. Extensive interventions can also cause conflict between neighbours and the community as a whole.



Figure 3. Brazilian LL public social housing case study Quilombo I and II in 2013 and today (Source: COHAB Campinas).

Housing transformations are common phenomena in developing countries like Brazil (Tipple, 2000; Kowaltowski & Pina, 1995). Often continuous changes are introduced, without legal approval, which may cause problems to owners when trying to sell a home. Most transformations add space. The main reasons for such transformations, as indicated by owners, are changes in ways of living, new family structures, and people increasingly working from home, enabled by technology. The ongoing pandemic amplified such activities especially for families with school-age children, where the small room dimensions and reduced number of rooms of the design model does not support such functions (Lendet, 2017; De Paris & Lopes, 2018).

4. RESULTS AND DISCUSSION

4.1 Reflexive interview

From the case analysis four constellations were found: “Suburb or Condominium: infrastructure issues”; “Neighborhood”; “The incomplete house” and “Challenges from Covid-19”. In order to organize data, *table 1* shows an extract of the analysis, including some of the interviewees’ speech excerpts.

The reflexive interview was important to introduce the research team to the user community. However, due to access difficulties during the pandemic, only a few families participated in these discussions.

Through the reflexive interview method, some conflicts came to light and major concerns about living in this neighbourhood were exposed. Conflicts related to three major issues. The illegal occupation of public land by some families with house and garden extensions reduces available space for playgrounds, green areas, and playing fields. The question of security, a common concern in cities

in Brazil, was expressed through the desire to build a confining wall around the housing development with electronically operated gates. Sharing the cost of operating these gates however is a conflicting issue in the community. The safety of children is a great concern. The access road to the cul de sacs was recently paved with increased traffic, demanding more supervision of outdoor play. Solid waste accumulation and adequate removal were also mentioned during the reflexive interviews.

Table 1. Reflexive interview analysis and speech excerpts.

Speech excerpts	Topics	Constellations
<p>[How do you feel about living in the Quilombo neighbourhood?]</p> <p>There's that space that was supposed to be a soccer field but was not done. There is no space for adults or teenagers, ... Kids got their playground, it was very nice, ... The problem was that the teenagers destroyed it, because they are big and heavy, ...</p>	<p>Collectivity Feeling Communication with city hall Common leisure spaces</p>	<p>Neighborhood</p>
<p>The outside was painted when we moved in, but the inside was unfinished. The house is so small that you can't even have a table. The kitchen only fits the stove, sink, and fridge. If you have a small child, you cannot spend 24 hours locked inside the house, because it is so small. During COHAB meetings we said that one couldn't call it home because of being unable to move around in it.</p>	<p>Incomplete house Residents trying to finish the house Extremely small houses</p>	<p>Incomplete house</p>

Although the reflexive interview method managed to engage participants in their perception of general problems in their neighbourhood, a focus on individual house upgrading concerns was only achieved through further guiding questions. The reasons for people giving preference to community questions, rather than individual needs in such meetings should be further investigated, but may be linked to the fact that questions involving the community are difficult to solve, whereas families feel they can intervene freely in their own homes. For the co-design phase of our LL, this issue needs careful planning to co-create solutions.

4.2 Kit of activities

As shown above, the reflexive interview conducted through a WhatsApp group, although feasible, had limitations and 20 activity kit were distributed with 17 returns. A list of upgrading priorities could be created. *Figure 4* shows some results. General community-related problems were demonstrated. Individual house upgrading issues were demonstrated through the second activity and the tags with their observations.

As a result, a list of issues could be created.

1. A concern with internet and Wi-Fi access due to costs and the economic situation of families during the pandemic.



Figure 4. Some results of the application of the analysis phase of the Quilombo LL. (Source: Authors).

2. Legal issues concerning property rights emerged. According to information received from COHAB-Campinas, the city is regularizing the situation after a long legal battle with the state housing company CDHU, the original owner of the land of the 'Residencial Quilombo I&II'.
3. The encroachment of some families on public land was considered a conflict issue.
4. Child safety was emphasized by several families.
5. A general feeling of insecurity in a project without a perimeter wall and electronically controlled gates were listed.
6. The issue of dividing amongst the families the cost of operating the existing electronically controlled gates is related to the previous issue and causes conflict.
7. Trash disposal maintenance and solid waste management are concerns.
8. The urban design and upkeep of public areas were considered important. Playgrounds were part of the development, today however in a precarious state of maintenance. The location of these areas is also in proximity to the access road with high-speed traffic.
9. Leisure activities for adolescents were considered important.

The free expression of the user's perception about their neighbourhood or house was essentially taken on by the children of the participants with drawings of their house facade. The value card activity was returned in the form of a sticker album for house-related upgrading issues. Priorities are shown in *Table 2*.

Several issues expressed as priority are not related to physical upgrading issues, but to cost of living issues. Also, challenges concerning these problems relate to ethical concerns. A LL should support the possibility of solving problems indicated in the analysis phase, but in the local case there is no guarantee of upgrading delivery as economic restrictions are imperative. No official incentive for upgrading and even general maintenance of the development exists. Brazil,

to this day, has no mandatory energy and water efficiency refurbishment regulations. NGOs should be involved in such upgrading processes with financing mechanisms that take the economic level of families into account. Joining all stakeholders in LL events is a priority to find viable solutions to the priority issues.

Table 2. *Upgrading priorities for houses, as a result of the value card game application in the Quilombo LL case study (Source: Authors).*

Individual house upgrading:	
Upgrading issues	Priority indication
Security	Building of a wall around the neighbourhood
Layout	Building and garage roof
Comfort	Improve acoustic comfort
General maintenance	Exchange all windows and doors
Plumbing installation maintenance	Exchange all bathroom and kitchen fixtures and taps
Electrical installation maintenance	Increase the electrical installation capacity
General remodelling and refurbishment	Redo the finishing (walls, floors, and ceilings) of all rooms
Privacy issues	Improve acoustic insulation
Sustainability issues	Exchange lamps and increase window openings
Accessibility issues	Larger room sizes
Social Life	
General maintenance	Improved street lighting
Urban infrastructure	Improved solid waste management
Sustainability issues	Introduction of selective collection, and recycling of solid waste

In our case study, other challenges were the physical access during the pandemic, to plan and design upgrading proposals. The full development of the reflexive interviews was restricted and the priority issue list above can only be considered a partial representation of concerns of the Quilombo community.

The alignment between families and finding common solutions that effectively add value to the quality of life of should be a major objective of the second and third phases of our LL. For this, the difficulties in engaging the private sector to get involved in upgrading processes must be overcome. To mitigate problems of ownership and invasions on public land the public sector needs to act as well. The small community also demonstrates communication engagement difficulties, which hampers collective decision-making. Information on and access to financial aid for upgrading actions and how to search for extra funding are further issues that our LL must pursue, for its innovative success. Avoiding frustrations is essential, as these populations are often exposed to situations that are impossible to be solved individually and makeshift solutions can at times do more harm than good.

On the positive side, we learned that during the pandemic the first engagement with users was possible. However, creating a multi-agent discussion was more difficult. Commonly used tools were to some extent sufficient and SH users showed a better-than-expected interest in discussing upgrading of SH. This was due to the fact that the interviews and questions of the kit were directly related to people's reality.

4.3 Impact of the pandemic

Our research case study is being conducted during the COVID-19 pandemic. We applied the reflexive interview method as well as the methods described in section 2. Other tools will be used for in-person participatory LL sessions with all stakeholders present when sanitary conditions permit. The methods were modified to attend to the special conditions under the restrictions imposed by the pandemic. To support these modifications, we used the guidance of several publications on participatory research conducted during the years 2020 and 2021.

A good summary of recommendations for this type of research can be found in Köpsel *et al.* (2021). We can learn that subject-to-subject interactions are of extreme importance for participatory research and that it is difficult to replace these completely by remote access. While social isolation indicates an increased need for remote interactions, underprivileged populations often have no access to the internet or own cell phones and computers. The pandemic affected the economic situation of families who were no longer able to pay for internet connections. Hardship (economic, and otherwise) forced stakeholders to non-essential activities, and digital technologies were reduced in many cases.

Online tools have to be carefully chosen and, in our study, interviews were replaced by online conversations via WhatsApp groups. These types of adaptations impact research methods and strategies further. The validity of data collected during the pandemic period must be questioned and put in perspective. For people with relevant backgrounds and skills, digital technologies may create collective actions, socially empathetic practices, but hands-on participatory activities are impracticable.

Furthermore, on the negative side, research teams have been burdened by social isolation. Child care, school work, house chores increased and have to be divided with academic activities now essentially in digital form. Digital meetings are less productive and joint writing meetings had to be cancelled. Most research teams did not provide guidance on how to handle the situation, including how to adapt their study method and calendars. Negative impacts outweigh positive ones.

Primary recommendations for participatory research during the pandemic are: to know your subjects and their preferred or possible communication

channels; explore all remote communication technologies, such as video calls or even radio; keep technology as simple as possible; avoid downloading apps or efforts that demand time; avoid going 100% digital; and have a flexible attitude as a facilitator. Thorough preparation is essential, as well as technical support to solve problems quickly. For stakeholders, without access to digital technologies, special creative methods have to be devised. During the pandemic, stakeholders experience different problems. These should be addressed and taken into account when interpreting results. Additional data is often needed to identify problems. Employment changes or specific health problems affect stakeholder participation levels and attitudes. Thus, researchers need to know their stakeholders better and strengthen relationships with them.

5. CONCLUSIONS

This paper examined the use of LLs to guide SIs for a participative process. The study allowed SH users to express their home-related values and demands. Although a full LL stakeholder event was not possible as yet, we are confident that it is possible to include other agents in upgrading discussions of the Residential Quilombo because real issues are prioritized. Also, despite the pandemic, our study demonstrates that in a Brazilian context, LLs may be successfully developed.

The main achievements of the understanding phase were the acquisition of know-how on ways to approach SH users and to gain their trust. Scientific knowledge was acquired by testing tools and methods, with or without social distancing measures. The first outline of a protocol on conducting SH upgrading LLs in a Brazilian context was drafted.

Solutions to conducting LLs with fairly simple ideas and actions were shown to be feasible. Reflexive interviews, focused surveys, and co-design methods may be used in the process. Also, for early engagement and preparation of LLs, the Value Card Game is useful. Engaging dwellers to understand and think about what impacts their well-being may promote suitable solutions to expressed needs. Solution ideas need creativity, transparency and visual communication tools to stimulate decision-making debates. Providing a return to SH users of the priority of problems is important not to lose trust. This was achieved through video conferences and a plan for co-design events.

As our research was affected by the pandemic, we added a further question, on how this immersion into reality can be achieved in these special circumstances? and: How to reduce the impact of a pandemic on conducting a LL on SH upgrading? Families had difficulty using virtual platforms or lacked internet access and this limited participation in the interviews. Answers to our questions however revealed that families were more at ease talking about public areas

than their own houses, and a list of priorities was achieved that should guide the co-creation of solutions.

The main lessons learned were that participatory research, especially under pandemic conditions, needed thorough planning. A first positive engagement as well as gaining trust are essential. Educational achievements need to be multilateral by users and researchers. A multi-agent discussion is more difficult as not all agents in the Brazilian context have personal interests in upgrading SH, due to a lack of mandatory interventions. The next steps, case studies such as the new described here involve the completion of the understanding phase of our LL with inputs from other stakeholders. Co-design of solutions need to be planned using various visual tools such as models and Virtual Reality. Finally, a protocol on conducting SH upgrading LLs is important to share acquired knowledge and enable communities like Quilombo to profit from the actual experience and put into action design solutions reached in a collaborative form.

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13 / THE COVID-19 PANDEMIC'S IMPACT ON ENVIRONMENTAL ATTITUDES

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ABSTRACT

Although COVID-19 has illustrated the human impact on the environment, it is also true that immediate needs (such as the ones provoked by the economic crisis that paralleled the COVID-19 health crisis) may endanger the importance people gives to sustainability. Generally, attitudes towards the environment are high, and several studies have proven that people are concerned about climate change and seem willing to take steps to stop it. Nevertheless, it is also true that the frame or the accessible information at different moments can affect the attitudes towards several issues. This paper examines the following question: has the pandemic provided an opportunity to strengthen pro-environmental attitudes or will it put environmentalism at risk?

We designed an experimental study to explore whether thinking about the COVID-19 pandemic affects people's environmental attitudes. A total of 411 people participated in our research (60% women; mean age of 42.03; SD = 14.06). The experimental design was a 2 (priming the pandemic vs. non-priming the pandemic) × 2 (valence of the priming: positive consequences vs. negative consequences). After asking participants to answer the open question mentioned above and elaborate on their responses, they answered several questions about their environmental attitudes, including towards climate change and the public policies to mitigate it.

Our results show that there were no differences in the priming factor (priming vs. non-priming the pandemic). However, the valence of the prime (positive or negative) had an effect on attitudes towards public policies to mitigate climate change. The results also show an interaction effect between the two conditions for the attitudes towards climate change. Those who expressed positive consequences in the non-priming

pandemic condition scored higher in attitudes towards climate change than those who expressed negative consequences. However, this valence effect did not occur when participants expressed their thoughts about the pandemic.

These results show that the information that is given to people before asking them about their environmental attitudes may influence the attitudes they express towards environmentalism. Contrary to what was expected, negative thoughts about the pandemic (e.g., about its economic or health negative impacts) had no effect on climate change attitudes. However, the valence (positive or negative) of the priming exerts an effect that needs to be considered when designing campaigns to implement climate change public policies

Keywords: COVID-19 pandemic, environmental attitudes, accessibility, climate change, experiment.

1. INTRODUCTION

The health impact of the COVID-19 pandemic is well-known: the disease has infected millions of people, claimed thousands of lives and sent most of the world's population into lockdowns at various times. However, as countries around the world implemented these lockdowns due to the terrible threat of the coronavirus crisis, the environment breathed a sigh of relief. The COVID-19 pandemic had some direct, short-term and positive effects on our environment, especially in reducing emissions and improving air quality. According to a global survey conducted by experts, which was published in Nature Climate Change, daily CO₂ emissions have dropped by 17% worldwide. This report also anticipates that 2020's annual emissions could be the lowest since the Second World War.

However, the UN's Framework for the Immediate Socio-Economic Response to the COVID-19 Crisis warns that the COVID-19 pandemic is far more than a health crisis: it is affecting societies and economies at their core. According to the International Monetary Fund, the global economy shrunk by 3.5% in 2020, representing the deepest global recession since the Second World War.

Given this scenario, the question now is whether the promises made to combat climate change will be kept now the health crisis appears to be nearing its end with the widespread distribution of vaccines, but the economic regression threatens to interfere with the next steps.

Since the coronavirus disease (COVID-19) outbreak originated in Wuhan, Hubei Province, China, in December 2019, it has become a threat to the health and lives of the world's population. By July 8, 2020, COVID-19 had spread to more than 210 countries worldwide, infecting over 11 million people and causing 539,026 mortalities (World Health Organization, 2020). As COVID-19 is highly transmissible and has a high mortality rate (Hu *et al.*, 2020), countries have taken various precautionary measures, such as large scale COVID-19 screening tests, social distancing, mask-wearing, handwashing and sanitisation (Chen *et al.*, 2020). Moreover, governments worldwide have implemented lockdowns to limit the spread of the virus, which have restricted activities around the world. The COVID-19 pandemic forced people to stay indoors, turning some of the world's busiest places into empty spaces.

Lockdown measures varied in timing and intensity according to the onset of the epidemiological crisis and the evolution of infections in each country. However, on a global scale, it was possible to observe shifts in human mobility patterns resulting from the enforced confinement associated with COVID-19 pandemic lockdowns (Chakraborty & Maity, 2020). The unprecedented reduction in global economic and transport activity resulted in a decrease in the emissions of greenhouse gases and other pollutants, evidencing the anthropogenic impact on air quality (Querol *et al.*, 2021). According to Venter *et al.* (2020), lockdown events reduced the population-weighted concentration of nitrogen dioxide and particulate matter levels by about 60% and 31%, respectively, in 34 countries. Across Europe, average emission reductions were estimated to be about 33% for NO_x, 8% for non-methane volatile organic compounds (NMVOCs), 7% for SO_x and 7% for PM_{2.5} during the most intense period of lockdowns (March 23 to April 26, 2020), with a reduction in road transportation being the largest contributor to total reductions (85% or more) (Guevara, *et al.*, 2021). In countries where the lockdown restrictions were more severe, such as Italy, France and Spain, reductions were even larger (Querol *et al.*, 2021).

These data show that the COVID-19 pandemic had some direct, short-term and positive impacts on the environment. However, this reduction in activity also had an economic effect. The COVID-19 pandemic caused extensive economic upheaval. The world's economies, including stable ones, went into a state of shock (Park *et al.*, 2020). Several reports have analysed how the COVID-19 pandemic has created a widespread economic slowdown and has affected a wide variety of sectors, reflecting the severe and generalised economic and financial downturn caused by the pandemic (Baker *et al.*, 2020; Gopinath, 2020; Nicola *et al.*, 2020). Many people have lost their jobs or seen their incomes cut (Baker *et al.*, 2020; Gopinath, 2020; Nicola *et al.*, 2020). Unemployment rates have increased across major economies (Jones *et al.*, 2021). Millions of workers have also been put on government-supported job retention schemes as parts of the economy, such as tourism and hospitality, have come to a near standstill. Businesses have faced reductions in sales and falling profits. The International

Monetary Fund described the decline as the worst since the Great Depression of the 1930s (Gopinath, 2020).

The COVID-19 pandemic has triggered a global economic recession, but it is uncertain how long the recession will last (United Nations, 2020). Economic recovery will require the collaborative action of governments, policymakers and citizens. However, it is unclear whether these efforts will consider the proven anthropogenic impact on pollution (as the reductions in the lockdowns illustrate) or whether economic recovery will be prioritised over all other factors, including environmental sustainability. The choices countries make now and public support for those choices will have long-term consequences. One must ask whether the COVID-19 crisis will act as an impediment or a catalyst towards increased public support of policies that put the environment, rather than economic growth, at the core of the recovery efforts.

Generally, levels of public concern about environmental issues are high, and several studies have shown that people are concerned about climate change and seem willing to stop it (Portinga *et al.*, 2019). There are, as of yet, few studies on the association between environmental concerns and COVID-19. Still, those that have already been published have found that after the pandemic began, concern about climate change has not diminished, but it has continued to grow (Severo *et al.*, 2020). These studies have found that the COVID-19 pandemic has helped raise awareness about climate change, opening a window of opportunity for action. Further, they have claimed that the pandemic will be a catalyst in the fight against climate change through the introduction of more ambitious public environmental policies.

However, although COVID-19 illustrated the magnitude of the human impact on the environment (Daryanto *et al.*, 2022), it is also true that immediate needs (such as needs related to the economic crisis that has run parallel to the COVID-19 health crisis) may affect the importance citizens place on sustainability and acceptance of public policies in climate change mitigation (Clayton *et al.*, 2015). Climate change mitigation policies are inherently in temporal conflict, as in most cases, protecting long-term interests through environmental action requires the sacrifice of short-term interests (Carni, 2013). Leiserowitz (2005) notes that while a large majority of people consider climate change to be a serious problem, they perceive it as being only a moderate risk that is more likely to affect people and places that are distant in space and time, viewing it as a low priority relative to other immediate issues. In other words, citizens do not prioritise action on climate change, especially when other issues seem more immediately urgent. Although Leiserowitz's (2005) work is somewhat dated, this trend has continued to appear in more recent studies (Ballew *et al.*, 2019). Thus, paradoxically, people seem concerned about climate change, yet view it as less important than more immediate issues.

Finding a possible explanation for this paradox, as recent studies have posited (Langenbach *et al.*, 2020), could be assisted by better understanding the cognitive processes involved in processing policy campaigns in climate change mitigation (Clayton *et al.*, 2015). One possible cognitive mechanism that could assist in understanding this phenomenon is the availability heuristic, which posits that the most accessible information in a judgment situation can affect one's attitudes towards several issues (Kay *et al.*, 2004; Tversky & Kahneman, 1973). The accessibility of the attitude from memory is postulated as a critical determinant of whether the attitude-to-behaviour process is initiated. Accessible attitudes function as psychological frames through which individuals interpret and appraise information (Shen *et al.*, 2004). The more accessible one's attitude is, the more predictive it will be of their subsequent behaviour (Fazio *et al.*, 1989). According to Bruner (1957), accessibility involves 'perceptual readiness' that can produce relevant changes in social perceptions and behavioural choices. Thus, the information that is accessible to a person may affect their subsequent decisions. In this study, our goal is to find out if making accessible COVID-19's positive (e.g., environmental or social cohesion) or the negative outcomes (e.g., economic or health negative impact) would affect public attitudes towards climate change and also those attitudes closer to action as attitudes towards public policies directed at mitigating climate change.

Accessibility can be accomplished through a variety of procedures, such as priming. Priming has been shown to have effects on one's perceptions and behavioural choices by increasing accessibility and influencing relevant choices and perceptions (Kay *et al.*, 2004). Several studies have shown that subtle, even subliminal stimuli can influence social perceptions, decision processes and, to at least some extent, behaviour (e.g., see (Baldwin *et al.*, 1990; Bargh *et al.*, 1996; Bargh *et al.*, 2001; Higgins *et al.*, 1977). To prime manipulations in these sorts of studies, participants are first exposed to certain information (words or images, for example) that appear in various sources (a text, a movie, a song, etc.). In the second step, participants are exposed to another, unrelated task, where reactions (attitudes, behaviours, etc.) to subsequent information are measured and the implicit memory of exposure to the previous task is expected to influence a participant's answer given in the task presented later (Bargh *et al.*, 2001). Although there are different approaches to applying priming, we focus on what is called 'mindset priming' in this work. This type of priming implies active and intentional participation rather than a passive presentation of stimuli (Bargh & Chartrand, 1999). In mindset priming, participants are asked to respond to a task where they have to consciously assess, think and make judgments. According to previous studies, the 'mindsets' that are actively developed in the first task continue to be active and influential in the second task, even though the participants are not aware of this (Gollwitzer *et al.*, 1990).

However, when asking people thinking about a topic, trying to make it more accessible, the valence of the information may also affect their subsequent

decisions. How information is labelled or framed may significantly influence people's judgments and decisions (for a review, see Levin *et al.*, 1998). When a prime is presented to a person, it can profoundly influence their later judgments without their conscious awareness (McElroy & Conrad, 2009; Chen & Bargh, 1999; McConnell & Leibold, 2001). The prime automatically exerts its valence on the later decision process by automatically activating either positive or negative valences, serving as a cue for many important judgments (Slovic *et al.*, 2007) and affecting the opinions a person construct (Druckman, 2001).

Further evidence for the influence of automatic valance information can be found in research examining the selective accessibility model (Mussweiler, 2003). According to this model, one can access knowledge through positive or negative influences on individuals' decisions (Mussweiler & Englich, 2005). Some previous studies have suggested that, compared with information presented neutrally, both positive and negative frames will enhance one's evaluation of an issue; however, the results are mixed in this regard. Some studies have found that participants in a positive framing condition tended to express greater support for the following choices presented than participants in the negative framing condition, like supporting voluntary HPV vaccination (Gesser-Edelsburg *et al.*, 2015), while others have found the opposite (Banks *et al.*, 1995; Homer & Yoon, 1992). Previous research has shown that increasing mortality salience (reminder of their individual mortality) enhances pro-environmental attitudes (Fritsche *et al.*, 2010), so making the negative impact accessible may activate people to respond against it.

Therefore, both how the type of information is primed and also how the valence of the information is framed are important. This can have a heuristic effect on the later decisions that need to be considered.

1.1. Study aims and hypotheses

In this research, we propose an experimental study to test whether the pandemic may offer an opportunity to strengthen or weaken pro-environmental attitudes, depending on how the positive or negative outcomes of the COVID-19 are more or less accessible to citizens. We hypothesise that making information about COVID-19 accessible will affect citizens' environmental attitudes more than making any other information accessible. As a non-priming pandemic condition, we asked participants to thinking about the positive and negative aspects of Twitter to keep the participants as cognitively active as those in the priming pandemic condition. The hypotheses under study are the following:

H0: No changes will be observed between groups in the topic or the valence condition.

H1: Pro-environmental attitudes will be higher among participants in the

COVID-19 priming condition compared to those in the non-priming condition (Twitter).

H2: Pro-environmental attitudes will be higher among participants in the positive valence condition compared to those in the negative valence condition.

H3: There is an interaction effect between the priming and valence conditions. The valence condition will cause scores on environmental attitudes to significantly increase, but only among participants in the COVID-19 priming condition and not those in the non-priming condition.

2. METHODS

2.1. Participants and design

We used a non-probability snowball sampling procedure to select participants. The process generated a final sample of 411 people from Spain (60% women; mean age 42.03; $SD = 14.06$). Following Giner-Sorolla et al.'s (2018) recommendations, we applied the effect-size-sensitivity approach to calculate power, whereby the maximum power obtainable with the available resources is calculated. This analysis was carried out with G*Power software (v.3.1.9.4). We conclude that for our design, this will allow us to detect an effect of $f = .13$ at .80 power and $f = .16$ at .90 power. The experimental design was a 2 (experimental vs control condition: writing about the pandemic vs writing about Twitter) \times 2 (valence of information: positive outcomes vs negative).

2.2. Procedure

Participants were recruited online, as they were required to fill out a questionnaire using the Qualtrics platform on their mobile device or laptop. Participants were randomly assigned to one of the four cells of the study. The study questionnaire consisted of four parts: an introduction, a priming section, a section with a series of questions about environmental attitudes and a final section relating to a manipulation and control questions check and sociodemographic information. Participants took an average of 12 min 30 sec to complete the task.

The present study was performed in accordance with the 1964 Helsinki Declaration and its later amendments as well as the 2016 APA Ethical Principles of Psychologists and Code of Conduct.

The priming section consisted of an open question where participants were randomly assigned to one of the four priming conditions. In the no pandemic priming condition, people had to express their opinions towards the impact of Twitter (one group was asked to express positive effects, while the other was asked to discuss negative ones). Furthermore, in the pandemic priming

conditions, participants had to express their opinions towards the positive (one group) or the negative (another group) outcomes of the COVID-19 pandemic. The open questions shown that participants in the positive priming pandemic condition referred to the positive outcomes of the pandemic (e.g., environmental and social cohesion impacts and the resignification of the meaning of life) while participants in the negative priming pandemic condition referred to negative outcomes (e.g., deaths, economic turmoil and lockdown-related mental health problems). In the non-priming positive condition, people referred to the positive effects Twitter has had (e.g., spreading information and facilitating more transversal communication). In the non-priming negative condition, participants referred to the negative consequences of this social media site (e.g. anonymity, disrespectful interactions and polarisation).

After answering this open question, where people had to elaborate their responses, participants then answered several questions about their environmental attitudes. One question related to their attitudes towards specific policies related to climate change, while another asked about their attitudes towards climate change. Finally, people had to answer a manipulation check question (to test if the priming had an effect), a question about the personal impact COVID-19 had had on them (to control for the fact that different personal effects from the pandemic could affect the accessibility of the information independently from the priming) and a question about sociodemographic information.

Following the 2x2 design proposed in this study, this study includes 2 priming conditions (priming the pandemic versus non-priming the pandemic) and 2 valence conditions (positive versus negative). These are discussed below.

Priming Conditions

Half of the participants were randomly assigned to one of two conditions: the pandemic priming group or the non-priming pandemic group (Twitter). In the pandemic priming group, participants were required to consider the consequences of the COVID-19 pandemic. In the non-priming pandemic condition group, participants were required to think about consequences stemming from the use of Twitter.

Valence Conditions

Half of the participants were randomly assigned to consider the consequences of the priming (pandemic or Twitter), in positive, and the other half had to discuss the negative consequences.

2.3. Measures

Attitudes towards climate change: Participants were required to answer on a 7-point semantic differential scale to what extent they thought that the

measures to mitigate climate change were: 'very unnecessary-very necessary', 'unimportant-very important', 'non-priority-priority', 'absurd-reasonable', 'idealistic-realistic' ($\alpha = .91$).

Attitudes towards policies: Participants indicated the extent to which they were in favour of or against certain policies in their country (1 = 'totally against' and 7 = 'totally in favour'). The question about the policies was as follows: 'In two years government should: Increase taxes on petroleum products, Subsidize the purchase of electric cars, Increase the road tax on cars that use gasoline or diesel, Prohibit the purchase of less energy-efficient appliances, use public money to subsidize renewable energies, Prioritize European subsidies on measures focused on climate change' ($\alpha = .78$).

Manipulation check: To find out to what point the priming had an effect on the participants' answers to the environmental attitudes questions, we asked participants to answer the following question: 'To what extent have you thought about the crisis caused by COVID-19 to answer the above question on policy measures?' Participants had to answer on a 7-point scale (1 = nothing, 7 = a lot).

Personal effects of COVID-19: To control the degree to which participants' personal experiences with the pandemic may have influenced the accessibility of the information by interacting with the priming effect, we also asked participants to answer questions on a 7-point scale (1 = nothing, 7 = a lot). We asked to what extent did they consider the COVID-19 crisis to have affected them personally, considering five statements: 'COVID-19 has affected me personally', 'COVID-19 has affected a family member or [a person I am close with]', 'The health crisis has had an effect on my mental and/or physical health', 'The health crisis has had consequences on my work situation', and 'The health crisis has had a negative impact on my income level' ($\alpha = .74$).

3. RESULTS

In examining the results, we first needed to confirm that the priming had had the expected accessibility effect on the participants. The results of the manipulation check showed that there were differences between the priming and non-priming conditions. Those who were asked to think about the pandemic during the priming phase expressed that this had influenced their attitudes towards public policies; this is in contrast to the non-priming group, who had considered a more neutral topic ($t = 5.96, p < 0.01$).

We also needed to control for the possibility that the responses in environmental attitudes were influenced by the priming manipulation and not because of the personal effects of the pandemic. There were no differences among the participants in the four condition groups based on the personal effects of the crisis ($F = 0.19, p = 0.902$).

Once we completed these checks, we continued analysing differences in environmental attitudes between the conditions. First, it is important to note the high scores registered in all the groups. The MANOVA results showed that the priming factor had no main effects on the participants' attitudes towards climate change ($F = 0.01$, $p = 0.923$, $\eta^2 = \mathbf{0.001}$) nor on their attitudes towards public policies ($F = 2.29$, $p = 0.131$, $\eta^2 = \mathbf{0.006}$). In the case of the valence factor, there was a main effect on the participants' attitudes towards public policies, being higher for the positive valence factor ($F = 8.042$, $p = 0.005$, $\eta^2 = \mathbf{.022}$). However, no differences were found in participants' attitudes towards climate change ($F = 0.585$, $p = 0.445$, $\eta^2 = \mathbf{.002}$). There was a significant interaction effect with respect to the participants' attitudes towards climate change ($F = 4.30$, $p = 0.039$, $\eta^2 = \mathbf{.012}$) but not for their attitudes towards public policies ($F = 0.740$, $p = 0.390$, $\eta^2 = \mathbf{.002}$). This interaction is illustrated in *Figure 1*. The participants in the negative valence non-priming pandemic condition scored lowest (i.e., expressed the most negative) attitudes towards climate change, while participants in the positive non-priming pandemic condition scored the highest in their attitudes towards climate change. Contrary to our hypothesis, in the pandemic priming condition, those who expressed more positive attitudes towards climate change were those participants in the negative valence condition.

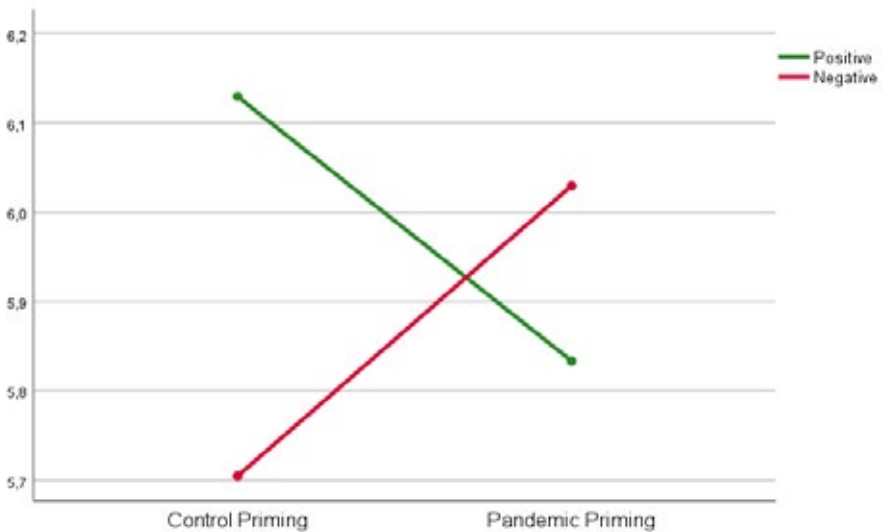


Figure 1. Interaction effect with respect to attitudes towards climate change.

4. DISCUSSION

This study aimed to find out if considering the consequences of the COVID-19 pandemic would have a positive or negative effect on one's attitudes towards climate change. To do so, we tested whether making information about the consequences (either positive or negative) of COVID-19 accessible to

participants would affect their environmental attitudes and compared that to situations where we made other information accessible instead. We expected that considering the positive consequences of the pandemic (e.g., providing clear evidence of the anthropogenic impact on the environment) would boost the participants' environmental attitudes. In addition, we expected that the economic impact of the pandemic (the negative consequence) would weaken participants' environmental attitudes.

Contrary to expectations, thinking about the pandemic had no effect on environmental attitudes (nor attitudes about climate change or public policies to address it). It appears that both participants in the non-priming pandemic condition (Twitter) and the priming pandemic condition had similarly high scores. Therefore, although the manipulation was successful in making participants think about the pandemic while answering questions about environmental attitudes, this had no differential effect when compared to those who thought about other topics. There was, however, an effect when considering the valence regarding the topics. According to our results, thinking positive or negative affects one's later decisions, at least when considering public policy. Participants who were asked to discuss the topics' positive consequences expressed more positive attitudes towards public policy to address climate change than those who were asked to think about the negative aspects in both topic conditions. However, while this is the case for public policy, the results for the attitudes towards climate change are slightly different. In this particular scenario, there is a significant interaction. Those in the positive non-priming condition expressed more positive attitudes towards climate change, while those who examined the negative aspects of Twitter (non-priming condition) scored the lowest. However, for participants in both the positive and negative COVID-19 priming condition (participants who thought about the consequences of the pandemic), the results were similar. In other words, when participants considered the pandemic, valence did not appear to have an effect.

This research confirms what has previously been found about environmental attitudes during the pandemic (Severo *et al.*, 2020). Citizens have positive attitudes towards taking actions to mitigate climate change, even considering the immediate necessity of confronting the pandemic. The sustainability discourse has become commonplace in many areas of society and it appears the population is open to these discussions (Portinga *et al.*, 2019). Our results also show that the valence of priming affects one's attitudes. At least with respect to attitudes towards public policies, thinking positively promotes better attitudes towards and greater acceptance of these policies.

However, the interaction results suggest the need to consider this affirmation carefully in applying these results to attitudes about climate change. In keeping with the results of previous studies (Yao & Wang, 2013), the results in our study also depended on the topic that was primed. When participants were asked to

think about the positive aspects of Twitter, this appeared to have a positive effect on their attitudes towards climate change responses. However, when thinking of the negative consequences of the pandemic, this appeared to increase concern about climate change attitudes when considering the pandemic.

This effect needs to be explored in the future. In this study, those in the non-priming pandemic condition tended to express greater support, which is consistent with other studies that have found this effect in other contexts like supporting voluntary HPV vaccination (Gesser-Edelsburg *et al.*, 2015). However, the negative priming pandemic condition reversed the valence effect, increasing concern about climate change. Previous research has shown that increasing the accessibility of negative impacts (for instance, mortality salience) enhances pro-environmental attitudes (Fritsche *et al.*, 2010). This may help explain why participants who were asked to consider the negative consequences of COVID-19 expressed more pro-environmental attitudes, especially among those who attributed the spread of COVID-19 – at least in part – to environmental misbehaviour, as many have argued (Ali *et al.*, 2021; Daryanto *et al.*, 2022; Severo *et al.*, 2020).

Finally, we need to recognise certain limitations of this study. Considering that this is a preliminary study, these results need to be considered cautiously, and they offer only an initial approximation on the topic. First, the high levels of environmentalism we discovered among participants may lead us towards the well-known social desirability bias (Crowne & Marlowe, 1960), which is very common among studies of attitudes about environmentalism (Vesely & Klöckner, 2020). Second, the study relied on snowball sampling to test this exploratory hypothesis. There is a need to replicate these results in a more representative sample and in different contexts. In addition, the evolution of the pandemic in Spain (where the data were collected) may have influenced the results. For example, the deaths' numbers, figures regarding active COVID-19 cases at the time of our study or even the specific responses the Spanish government was taking against the virus could have influenced responses. The results could be different in other countries depending on the local impact of the pandemic. Third, because the significant effects we identified were relatively small, future studies should replicate these findings. This would allow researchers to make more definitive statements about the trends identified in this study. Although the significant effects we found were modest, our research offers encouraging evidence and a model to use as an explanatory mechanism to launch communication campaigns and encourage further studies with larger samples in different contexts. In light of these results, which are contrary to what we hypothesised, we need also to consider the lack of control over the factors that participants felt were the causes of the pandemic. Knowing the participants' causal attribution of the COVID-19 would have helped us to confirm our explanations of the interaction effect we found between the priming and valence conditions.

5. CONCLUSIONS

The COVID-19 pandemic has had a profound global impact. It has been one of the most far-reaching and tragic public health crises in a century. In addition, although many of its consequences have already occurred, many others are likely to occur in the future in the coming months and years (Sarkis *et al.*, 2020). The implications of the COVID-19 pandemic on sustainability have not yet been seen. However, some studies, including this one, have attempted to figure out what impact the pandemic may have on sustainability efforts (Cohen & Kupferschmidt, 2020; Jribi *et al.*, 2020; Severo *et al.*, 2020).

This research confirms what has already been found about the evolution of environmental attitudes during the pandemic. It shows that people are still highly concerned about and committed to mitigating climate change (Severo *et al.*, 2020). Although we can be relatively optimistic about this, it is still necessary to be very cautious when proposing public policies to mitigate climate change. According to the results of our study, the type of information that is accessible, along with the valence (whether positive or negative) of such information, may have an effect on citizens' attitudes and their willingness to accept public policies to fight climate change. This research contributes to knowledge about how the different frames and valences affect citizens' attitudes and how this information can be used to promote pro-environmental attitudes. Policymakers may use the findings to neutralise the impact of this cognitive process of accessibility to frame those needs in the best possible way to overcome citizens' reluctance to support and implement public policies to mitigate climate change.

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14 / CITIZENS' CLIMATE RESPONSIBILITY AND HUMAN VALUES IN THE EUROPEAN UNION

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ABSTRACT

Using data from the European Social Survey for 17 countries in the European Union, we estimate models to predict personal responsibility to fight climate change and willingness to pay taxes on fossil fuels. This is the first study to research personal and fiscal responsibility simultaneously. It is also the first to use the details of all of Schwartz's basic human values to analyse pro-environmental behaviour. The study's main conclusions are the following. Firstly, human values in the self-protection dimension (*Conservation* and *Self-Enhancement*) tend to reduce responsibility, whereas values in the growth dimension (*Self-Transcendence* and *Openness to Change*) tend to increase it. Secondly, among *Self-Enhancement* values, *Power* has a negative effect, but *Achievement* tends to have a positive effect. Thirdly, among *Self-Transcendence* values, biospheric and other *universalist* values have a positive effect, but *Benevolence* reduces support for green taxes. Fourthly, *Hedonism* has negative effects on values of *Openness to Change* but *Stimulation* positive ones. Fifthly, the findings for control variables show that age is the most important individual factor explaining personal and fiscal responsibility, followed by political variables (left-right orientation, interest in politics, trust in politicians) and income. These results can help to design communication policies related to the European *Green Deal*.

Keywords: climate change; personal responsibility; fiscal responsibility; environmental behaviour; Schwartz.

1. INTRODUCTION

The *European Green Deal*³ is an ambitious package of measures accompanied by a roadmap of key policies. Its goal is to make Europe the world's first climate-neutral continent by 2050. The success of these policies depends on public engagement and support (Poortinga et al., 2019), which require proper design of communication policies. Ensuring success thus requires identification of social profiles with different motivations that affect perceptions and decisions about climate change. Ziegler (2017), for example, concludes that communication campaigns should focus on conservative and right-wing networks to foster support for climate change policies. In this respect, people are more likely to act pro-environmentally when they are more aware of the collective costs and benefits associated with their behaviour more strongly. As people are also more likely to act pro-environmentally when they strongly endorse specific human values (Steg, 2016), this paper uses Schwartz's (1992) scale of human values to analyse citizens' motivations.

Willingness to take pro-environmental action is a function of human values (Stern et al., 1995). Two of the potential survey items most closely related to policy design are personal responsibility to fight climate change and willingness to pay taxes on fossil fuels. We summarize these two dependent variables under the following generic description: personal and fiscal responsibility for climate change. Some prior literature has included human values in studying variables such as climate concern (Poortinga et al., 2019), which is related to willingness to pay to mitigate climate change (Dienes, 2015; Bouman et al., 2020; Davidovic et al., 2020). Boto-García and Bucciol (2020) analysed the role of four higher-order human values in shaping beliefs about personal responsibility. Fairbrother et al. (2019) focused on socio-political determinants of support for taxes on fossil fuels but not on human values. Ziegler (2017) studied the influence of environmental values on similar variables. No previous literature has, however, systematically analysed the role of Schwartz's basic values in personal and fiscal climate responsibility.

The aim of this paper is to analyse the role of Schwartz's (1992) ten basic human values in predicting personal and fiscal responsibility for climate change among citizens in 17 countries in the European Union. We study the effects⁴ of the following human motivations: *Security, Conformity, Tradition, Achievement, Power, Benevolence, Universalism, Self-Direction, Stimulation* and *Hedonism*. The analysis ultimately includes eleven values because we divide universalism into the biospheric value 'care for nature' and other aspects of *Universalism*. Using the European Social Survey (ESS), we estimate models by weighted Ordinary Least Squares (OLS) with standard errors clustered by country, focusing on individual-level human values and controlling for several socio-demographic factors.

³ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en

⁴ For reasons of convenience, we use the word effects to refer to statistically significant results in our statistical model. Section 5 adds some thoughts on the issue of causality.

This is the first study to research personal and fiscal responsibility simultaneously. It is also the first to use the details of all of Schwartz's basic human values to analyse pro-environmental behaviour. The study's main conclusions are the following. Firstly, human values in the self-protection dimension (*Conservation* and *Self-Enhancement*) tend to reduce responsibility, whereas values in the growth dimension (*Self-Transcendence* and *Openness to Change*) tend to increase it. Secondly, among values of *Self-Enhancement*, *Power* has a negative effect, but *Achievement* tends to have a positive effect. Thirdly, among values of *Self-Transcendence*, biospheric and other universalist values have a positive effect, but *Benevolence* reduces support for green taxes. Fourthly, regarding values of *Openness to Change*, *Hedonism* has negative effects, but *Stimulation* has positive ones. Fifthly, the findings for control variables show that age is the most important individual factor explaining personal and fiscal responsibility, followed by political variables (left-right orientation, interest in politics, trust in politicians) and income.

The rest of the chapter is organized as follows. Section 2 reviews the literature on human values and climate responsibility. Section 3 describes the methodology and data. Section 4 discusses the results. Finally, Section 5 draws conclusions and proposes some policy implications.

2. HUMAN VALUES AND CLIMATE RESPONSIBILITY: THEORETICAL FRAMEWORK

2.1. Schwartz's scale of individual human values and pro-environmental behaviour

Schwartz (1992) defines values as broad motivational goals that serve as guides to behaviour and as criteria for judging people and events. Each value is defined by the goals towards which it is directed—that is, by the motivation it expresses. *Figure 1* presents the ten basic values and the goals that define them. Values form a circular structure. The more compatible any two values are, the closer they are on the circle, and the more they conflict, the farther apart. *Table 1* shows additional details on Schwartz's scale of human values, as well as how these values are measured in the ESS. The ten basic values may be grouped into four higher-order values that summarize the opposition between competing values: *Conservation* vs. *Openness to Change* in the growth dimension and *Self-Enhancement* vs. *Self-transcendence* in the self-protection dimension. The growth dimension involves relation to self-restriction and order vs. novelty and independent thought. The self-protection dimension captures motivation towards personal interests vs. towards others. Moreover, *Conservation* and *Self-transcendence* are higher-order values with a social focus, whereas *Openness to change* and *Self-enhancement* have a personal focus. Among Schwartz's ten basic values, '*Universalism*' includes an ESS item about caring for nature

and environment, and this item is an indicator of biospheric values. Given the importance of this value, the empirical paper in this study analyses one indicator of *Universalism* (items v03 and v08) separately from the biospheric value (v19).

De Groot and Steg (2008) and Steg (2016) use an alternative classification of human values that is useful for understanding their relationship to pro-environmental behaviour. Steg (2016) concludes that both hedonic (feel good, reduce effort) and egotistical (focus on own resources, such as money and status) values lead people to focus on the personal costs and benefits of choice options. People are less likely to act pro-environmentally when they strongly endorse these values. Altruistic (benefit to others) and biospheric (nature) values, in contrast, lead people to focus on collective consequences of options. People are more likely to act pro-environmentally when they strongly endorse these values. Altruistic and biospheric values are sometimes considered as broadly equivalent to Schwartz’s *Self-Transcendent* and *Conservation* groupings, whereas egotistical values appear to belong to the *Self-Enhancement* cluster (Corner et al., 2014; Sagiv & Schwartz, 2022). These two classifications of human values do not, however, map on to each other precisely.

Our research hypothesizes that the most significant classification of Schwartz’s four higher-order human values separates growth from self-protection values. Values that express self-expansive growth motivations (e.g., *Self-Direction*) contrast with values that express self-protection motivations (e.g., *Security*).

Figure 1. Circular structure of the 10 basic values, four higher-order values and two underlying motivational sources.



Source: Sortheix and Schwartz (2017).

Broadly speaking, we expect values in the growth dimension (*Self-Transcendence* and *Openness to Change*) to be more pro-environmental and values in the self-protection dimension (*Conservation* and *Self-Enhancement*) to be less pro-environmental. We must qualify this starting point, however, when we classify values into ten human values.

In *Figure 1* and *Table 1*, *Self-Transcendence* includes *Universalism* and *Benevolence* (values in the growth dimension and with social focus), related to altruistic and biospheric values. We thus expect a positive effect of those values on pro-environmental behaviour. As explained by Bruna (2022), however, items v12 (out-group value) and v18 (in-group value) could conflict with each other, partially due to the role family plays in each individual and culture. A similar conflict occurs in Hofstede's (1980) human values scale, in which prioritizing family over work is considered a sign of individualism. The expected effect of *Benevolence* on pro-environmental behaviour is thus unclear. One result below shows a negative effect.

In the self-protection dimension, *Self-Enhancement*, which includes *Achievement* and *Power*, opposes *Self-Transcendence*. While *Self-Enhancement* is an egotistical value with foreseeable negative effects on pro-environmental behaviour, *Achievement* is more complex. It mixes focus on relative social success with own abilities and achievements, which may be positively related to climate change challenges, as shown in one of our estimations below. Indeed, *Achievement* is considered both a growth and a self-protection value (*Figure 1*).

Moreover, Schwartz's scale understands *Hedonism* as part of *Openness to Change*, along with *Stimulation* and *Self-direction*. While we may expect *Hedonism* to affect pro-environmental behaviour negatively, the expected effects of *Stimulation* and *Self-direction* are unclear, as these values have a personal but not necessarily an egotistical focus. They motivate towards new ideas and challenges that could increase probability to act pro-environmentally. One of our later results reveals a positive effect of *Stimulation* on pro-environmental behaviour.

In the growth dimension, the term opposing *Openness to Change* is *Conservation*, which includes *Security*, *Conformity* and *Tradition*. These socially focused self-protection values cannot be simplified to a dichotomy between altruism and egoism. Details in *Table 1* show that these values are about order, self-restriction, and resistance to change. We thus anticipate that these values could generate a negative reaction against climate change challenges.

Table 1. Four higher-order value dimensions, ten basic values with their motivational goals and the 21 items of the European Social Survey used to measure them.

SELF-PROTECTION VALUES	
Conservation:	Values that emphasize order, self-restriction, and resistance to change.
Security	- Safety, harmony, and stability of society, of relationships and of self v05 - Important to live in secure and safe surroundings v14 - Important that government is strong and ensures safety
Conformity	- Restraint of actions likely to upset others and violate social expectations or norms v07 - Important to do what is told and follow rules v16 - Important to behave properly
Tradition	- Respect, commitment and acceptance of the customs and ideas of traditional culture or religion v09 - Important to be humble and modest, not draw attention v20 - Important to follow traditions and customs
Self-Enhancement:	Values that emphasize pursuit of one's interests, relative success, and dominance.
Achievement	- Personal success through demonstrating competence according to social standards v04 - Important to show abilities and be admired v13 - Important to be successful and that people recognize achievements
Power	- Social status and prestige, control or dominance over people and resources v02 - Important to be rich, have money and expensive things v17 - Important to get respect from others
GROWTH VALUES	
Self-Transcendence:	Values that emphasize concern for the welfare and interests of others.
Benevolence	- Preservation and enhancement of welfare of people with whom one is in frequent personal contact v12 - Important to help people and care for others well-being v18 - Important to be loyal to friends and devote to people close
Universalism	- Understanding, and protection for the welfare of all and the environment v03 - Important that people are treated equally and have equal opportunities v08 - Important to understand different people v19 - Important to care for nature and environment (biospheric value)
Openness to Change:	Values that emphasize independence of thought, action and feeling, readiness for change.
Self-Direction	- Independent thought and action-choosing, creating, exploring v01 - Important to think new ideas and being creative v11 - Important to make own decisions and be free
Stimulation	- Excitement, novelty, and challenge in life v06 - Important to try new and different things in life v15 - Important to seek adventures and have an exciting life
Hedonism	- Pleasure and sensuous gratification for oneself v10 - Important to have a good time v21 - Important to seek fun and things that give pleasure

Source. Prepared by the authors based on Sortheix and Schwartz (2017) and on ESS documentation.

2.2 Human values and climate responsibility

Having generally assessed human values and pro-environmental behaviour in the previous subsection, we turn to the prior literature on our specific indicators of personal and fiscal responsibility for climate change. As that literature is minimal, we begin by summarizing the literature on a dependent variable related to ours, concern about climate change.

Using ESS data and considering a two-variable version of Schwartz's four higher-order value dimensions, Poortinga *et al.* (2019) found that *Self-transcendence* (vs. self-enhancement) increased climate concern, whereas *Conservation* (vs. openness-to-change) reduced it. For a small sample of students in Italy, Prati *et al.* (2018) found that *Self-Direction* increased concern, whereas *Hedonism* reduced it. Using the ESS, Bouman *et al.* (2020) showed a positive influence of biospheric values and climate concern on personal responsibility and support for climate taxes. Dienes (2015) and Davidovic *et al.* (2020) also showed a positive effect of concern on willingness to pay to mitigate climate change.

Also using ESS data and Schwartz's four-higher order value dimensions, Boto-García and Bucciol (2020) analysed the role of human values in shaping beliefs about personal responsibility to mitigate climate change and found that the four human values were statistically significant. Their effects align with our discussion above: values in the self-protection dimension (*Conservation* and *Self-Enhancement*) reduce personal responsibility, whereas values in the growth dimension (*Self-Transcendence* and *Openness to Change*) increase it.

Ziegler (2017) showed that environmental values increased support for publicly financed climate policy in the United States and Germany. Fairbrother *et al.* (2019) used ESS data to conduct a detailed analysis of determinants of support for taxes on fossil fuels but did not study the role of human values. They considered, however, egalitarian attitudes—related to Schwartz's *Universalism* (see *Table 1*)—as different from political orientation, to conclude that egalitarian individuals tend to favour climate taxes.

3. EMPIRICAL MODEL AND DATA DESCRIPTION

3.1 Methodology

We model personal responsibility to reduce climate change and willingness to support green taxes in the European Union (variables Y) as a function of individual socioeconomic characteristics (control variables X_c) and Schwartz's ten basic human values (X_{hv}), as follows:

$$Y = \beta_0 + \beta_c X_c + \beta_{hv} X_{hv} + \varepsilon,$$

where β_0 is the intercept, β_c and β_{hv} are the sets of coefficients associated with the respective explanatory variable, and ε is a vector of individual error terms assumed to be independently and identically distributed. This model is estimated by OLS. As detailed below, our dependent variables are categorical, although we assume that they are linearly related to the explanatory variables. Additional estimations not reported here show that ordered probit models yield results qualitatively similar to linear models but harder to interpret.⁵

⁵ These results are available upon request. Literature summarized by Bruna and Rungo (2020) for categorical variables of well-being assume linearity for the same reason.

Moreover, we realize the potential for many interaction effects among the control variables and between the control variables and the ten basic human values. We leave these issues for further research.

We use weighted estimation⁶ and cluster the standard errors of the coefficients in *Table 3* by country. The results, not reported here but available upon request, show that weighted estimations with clustered standard errors are more demanding in evaluating the statistical significance of our explanatory variables. The results of the significant variables presented in *Table 3* are thus more robust than unweighted estimations or estimations with regular standard errors.

3.2 Data

Using the eighth round of the ESS,⁷ we analysed a sample of 23,800 individuals from 17 countries in the European Union. Our two dependent variables are the following two questionnaire items:

- 'To what extent do you feel a personal responsibility to try to reduce climate change?', where the response scale ranges from 0 ('Not at all') to 10 ('A great deal').
- 'To what extent are you in favour of or against the following policies of increasing taxes on fossil fuels, such as oil, gas and coal?', where the response scale ranges from 1 ('Strongly against') to 5 ('Strongly in favour').

Schwartz's 'Computing Scores for the 10 Human Values'⁸ explains methodological details for computing human values scores on the ESS. These values are calculated as arithmetic means from the 21 questionnaire items (see *Table 2*). For reasons discussed in Bruna (2021), we prefer raw calculation of human values to a version centred on the mean of the ten human values for each individual, as suggested by Schwartz. We do, however, introduce two additional transformations. Each of the 21 items is recoded so that possible responses range from 1 'Not like me at all' to 6 'Very much like me'. Additionally, the basic human values considered in the models in *Table 3* are defined as deviations from their country means and standardized.⁹ As mentioned in subsection 2.1, Universalism is divided into two different variables.

Our control variables are the following (see also *Table 2*):

- Age and Age². Previous literature has shown a negative impact of age on pro-environmental behaviour. Poortinga et al. (2019) found this impact for concern about climate change. Dienes (2015) and Fairbrother et al. (2019) obtained the same result for intention to pay taxes to combat

⁶ We used the ESS analysis weights (anweight), which correct for different selection probabilities within each country, as specified by sample design for nonresponse, noncoverage and sampling error; and consider differences in population size across countries.

⁷ <https://www.europeansocialsurvey.org/data/round-index.html>

⁸ See also the following link: <http://essedunet.nsd.uib.no/cms/topics/1/4/4.html>.

⁹ See note to *Table 2* for further details on standardization of variables.

climate change. Dienes (2015), however, found a positive influence of age when explaining whether the respondent had personally taken action to help fight climate change. We study the nonlinear effects of Age to consider additional complexity.

- Gender: coded 1 if the respondent is *Female*; 0 otherwise. Prior literature has shown that women engage in more pro-environmental behaviour (Wicker & Becken, 2013; Muttarak & Chankrajang, 2015).
- Education: coded 1 if the respondent affirms having *Tertiary education*; 0 otherwise. Education seems to promote pro-environmental behaviour, according to Dienes (2015), Muttarak & Chankrajang (2015) and Poortinga et al. (2019). Since preliminary unreported tests revealed tertiary education as the main discriminatory education level, we focus on this dichotomous variable.
- *Rural*: coded 1 if the respondent states that they live in a country village, on a farm or in the countryside; 0 otherwise. Living in an urban vs. rural setting could affect pro-environmental behaviour in different ways. Living in rural areas encourages a closer relationship to nature, but our model also controls for biospheric values. People in rural areas tend to be more conservative than urban populations, but other variables in our model also capture this difference, rendering the expected effect unclear.
- *Political orientation*. On a left (value 0)-right scale (10), *Centre* is coded 1 if the respondent chose scores between 4 and 6; 0 otherwise. *Right* is coded 1 if the respondent chose scores between 7 and 10; 0 otherwise. Hornsey et al.'s (2016) meta-analysis shows that the largest correlation of a demographic characteristic with climate change belief is political affiliation. Further, Driscoll (2019) found that political polarization has caused a decline in sociodemographic predictors of climate change concern in recent decades. Due to the significance of political influences, we considered three political control variables. As to Political orientation, the literature shows that right-wing citizens tend to be less pro-environmentally inclined (Fielding et al., 2012; Poortinga et al., 2019; Duijndam & van Beukering, 2021).
- *Interest in politics*. *Quite interested* is coded 1 if the respondent affirmed being hardly or quite interested in politics on a four-category scale; 0 otherwise. *Very interested* is coded 1 if the respondent affirmed being very interested in politics; 0 otherwise. Apart from political orientation, we propose the hypothesis that political sophistication increases pro-environmental behaviour, as suggested by Fairbrother et al. (2019) for willingness to pay green taxes.

- *Trust in politicians.* On a scale from 0 (no trust at all) to 10 (complete trust), Medium is coded 1 if the respondent chose scores between 4 and 6; 0, otherwise. High is coded 1 if the respondent chose scores between 7 and 10; 0, otherwise. Tam and Chan (2017) found a weaker association of environmental concern with behaviour in societies with higher levels of distrust. Davidovic et al. (2020) show that perceived quality of government helps to explain willingness to pay environmental taxes. Fairbrother (2017) remarks that political distrust is key to explaining support for policy solutions to environmental problems.
- *Relative household total net income.* On a scale of 10 deciles, *Medium income* is coded 1 if the respondent affirmed an income level in the 4th to 7th deciles; 0 otherwise. *High income* is coded 1 if the respondent affirmed an income level in the 8th to 10th deciles; 0 otherwise. Despite some previous controversial results (McCright & Dunlap, 2011), for a sample of European countries, we follow Inglehart's postmaterialist thesis, predicting higher propensity to pro-environmental behaviour for people with higher relative income (Gelissen, 2007; Franzen & Meyer, 2010).

Variable	Mean	Std. Dev
Personal responsibility	6.795	2.649
Favour taxes	2.793	1.238
Age	50.1	17.8
Female	0.512	0.500
Tertiary education	0.252	0.434
Rural	0.379	0.485
Political orientation: centre	0.534	0.499
Political orientation: right	0.246	0.431
Quite interested in politics	0.736	0.441
Very interested in politics	0.131	0.338
Trust in politicians: medium	0.418	0.493
Trust in politicians: high	0.123	0.328
Medium income	0.446	0.497
High income	0.270	0.444
Security	4.616	1.028
Conformity	3.994	1.095
Tradition	4.280	0.985
Achievement	3.699	1.204
Power	3.222	1.070
Benevolence	4.963	0.797
Universalism	4.767	0.859
Biospheric (v19)	4.883	0.998
Self-Direction	4.650	0.915
Stimulation	3.551	1.174
Hedonism	4.078	1.117

Table 2. Summary statistics.

Note. The table presents the descriptive statistics of the variables before transformations performed for the equations in Table 3. In those estimations, dependent variables and variable Age are centred globally and standardized. Human values are also centred on the national means and divided by the standard deviation. See the text for details on country dummy variables.

- Country dummies are coded by regions of the European Union, as in Poortinga *et al.*'s (2019) study: *Northern* (Finland & Sweden), *Southern* (Italy, Portugal and Spain), *Western* (Austria, Belgium, France, Germany, Ireland & Netherlands) and *Eastern* (Czechia, Estonia, Hungary, Lithuania, Poland and Slovenia). *Eastern* is the reference group for Table 3.

4. RESULTS

4.1. Control variables

One contribution of this research is to show comparable differing effects of Age on personal and fiscal responsibility for climate change. Our results align with Boto-García and Bucciol (2020), who found that Age increased the feeling of personal responsibility to reduce climate change, although at a decreasing rate (the estimate for *Age squared* is negative). These results show an inverse U-shape relationship between personal responsibility and age, such that the middle-aged feel most personal involvement to fight climate change. The opposite is true for willingness to pay taxes to mitigate climate change. Age reduces willingness to pay taxes, although the oldest people are more willing to pay than are the middle-aged (U-shape).¹⁰

As to gender, our results confirm that *Female* has a positive effect on personal responsibility, a result also obtained by Boto-García and Bucciol (2020). In the weighted estimation with clustered standard errors shown in Table 3, *Female* is not significant for willingness to pay taxes, although alternative estimations not reported here reveal a positive significant effect, like that also found in Fairbrother *et al.* (2019).

Tertiary education has a strong positive effect on willingness to pay taxes (Fairbrother *et al.*, 2019) but is not significant in this restrictive estimation of personal responsibility.¹¹ In unreported alternative estimations, *Tertiary education* is also significant and positive for responsibility, as found by Boto-García and Bucciol (2020).

Although our results confirm the finding by Boto-García and Bucciol (2020) that living in a rural location is not significant in explaining personal responsibility, we obtain a significant negative estimate of *Rural* for willingness to pay taxes to fight climate change (see discussion in subsection 3.2).

As to political variables, right-leaning *Political orientation* reduces personal responsibility, as in Boto-García and Bucciol's (2020) results, and affects willingness to pay taxes even more strongly (Ziegler, 2017; Fairbrother *et al.*, 2019; Sivonen & Koivula, 2020).¹² Our results confirm the hypothesis that higher *Interest in politics* increases personal and fiscal responsibility. They also confirm

¹⁰ To avoid estimates with many zeros, we estimate the models presented in Table 3 with standardized Age and Age². The estimates in the table do not therefore permit calculation of the turn-around age of the non-linear relationships to the standardized dependent variables.

¹¹ For the United States, McCright and Dunlap (2011) report that the effects of education attainment on global warming beliefs and concern are positive for liberals and Democrats but weaker or negative for conservatives and Republicans.

Table 3. Weighted OLS with clustered standard errors by country (23,080 observations).

		Personal responsibility	Favour taxes
Sociodemographic variables			
Age		0.31*** (0.03)	-0.35** (0.10)
Age ²		-0.40*** (0.04)	0.28** (0.09)
Female		0.06* (0.02)	0.04 (0.02)
Tertiary education		0.03 (0.02)	0.19*** (0.03)
Rural		-0.01 (0.02)	-0.09*** (0.03)
Political orientation: centre		-0.04 (0.03)	-0.11* (0.04)
Political orientation: right		-0.05* (0.02)	-0.15*** (0.04)
Interest in politics: medium		0.21*** (0.04)	0.13*** (0.03)
Interest in politics: high		-0.31*** (0.06)	0.16** (0.05)
Trust in politicians: medium		0.05 (0.04)	0.23*** (0.02)
Trust in politicians: high		-0.11* (0.05)	0.36*** (0.03)
Income: medium		0.11** (0.03)	0.06** (0.02)
Income: high		0.13** (0.04)	0.15*** (0.02)
Northern		0.49* (0.19)	0.66*** (0.07)
Southern		0.32 (0.20)	0.07 (0.07)
Western		0.55* (0.20)	0.22* (0.09)
Self-Protection human values			
Conservation	Security	-0.03* (0.01)	-0.06*** (0.01)
	Conformity	-0.04** (0.01)	-0.00 (0.01)
	Tradition	-0.01 (0.01)	-0.04* (0.02)
Self-Enhancement	Achievement	0.02* (0.01)	0.01 (0.01)
	Power	-0.05** (0.02)	-0.01 (0.02)
Growth human values			
Self-Transcendence	Benevolence	-0.01 (0.02)	-0.04*** (0.01)
	Universalism	0.07*** (0.02)	0.02 (0.02)
	Biospheric value (v19)	0.24*** (0.02)	0.15*** (0.02)
Openness to change	Self-Direction	0.00 (0.01)	-0.02 (0.01)
	Stimulation	0.06** (0.01)	0.03 (0.02)
	Hedonism	-0.02* (0.01)	-0.03** (0.01)
R ²		0.18	0.12

Note. Weighted OLS estimation using ESS analysis weights (*anweight*). Standard errors clustered by country are in brackets. Results for intercept are not shown. See note to Table 2. * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

¹² Davidovic et al. (2020) note that leftist political ideology is a more significant driver of public support for environmental taxes in countries with high quality of government.

that high *Trust in politicians* has a strong positive effect on willingness to pay green taxes (Fairbrother *et al.*, 2019) and significantly influences personal responsibility.

In this sample of European countries, higher individual relative Income has strong positive significant effects on both personal responsibility (Boto-García & Bucciol, 2020) and favouring climate taxes (Fairbrother *et al.*, 2019).

Comparing the size of the standardized estimates shows that *Age* is the most important individual factor explaining personal and fiscal responsibility, although it does so differently for each dependent variable. Political sophistication, measured by *Interest in Politics*, is a key attribute explaining personal responsibility, while *Trust in politicians* plays a stronger role in support of green taxes. *Tertiary education* and *Political orientation* are more important for taxes than for personal responsibility. Relative *Income* is a significant variable, but political attributes dominate.

The country dummies' main significant positive effect is on *Northern* in willingness to pay taxes, a result also obtained by Fairbrother *et al.* (2019). The fixed effects of *Western* are also significant. Our results confirm lower personal and fiscal responsibility towards climate change in *Southern* and *Eastern* countries.

4.2. Human values

Our general results for personal responsibility are consistent with Boto-García and Bucciol's (2020) findings for the four higher-order human values: Self-protection values (*Conservation* and *Self-Enhancement*) tend to reduce personal responsibility, whereas growth values (*Self-Transcendence* and *Openness to Change*) tend to increase it. Our analysis of the ten basic values reveals, however, some particularities that are masked in studies of human values at a higher aggregation level.

On the self-protection axis, *Conformity* and *Security* seem to be the most significant *Conservation* values for personal responsibility and are estimated as negative. Similarly, *Power* is the most significant *Self-Enhancement* value and is estimated to be negative. The *Self-Enhancement* value of *Achievement*, in contrast, has a positive effect on personal responsibility due to its simultaneous attributes as a value of self-protection and growth, as discussed in subsection 2.1

Among the motivation towards growth, our results for personal responsibility confirm the positive effects of *Self-Transcendence* values, particularly for biospheric and other universalist values. Similarly, *Stimulation* is the most significant *Openness to Change* value explaining responsibility and is estimated

as positive. As expected, however, the estimate for *Hedonism* is negative (see discussion in subsection 2.1).

As to willingness to pay taxes on fossil fuels, our global assessment of the results resembles the previous assessment for personal responsibility, with some specific differences. In motivations for self-protection, *Security* and *Tradition* are the most significant *Conservation* values reducing support for green taxes. *Self-Enhancement* values are not significant in the weighted estimation with clustered standard errors, although *Achievement* has a significant positive estimate in some of our other unreported estimations.

On the growth axis, the biospheric value is again the most significant *Self-Transcendence* value for the variable taxes and has a positive effect. *Universalism* also has a significant positive effect in some of our estimations, but not in the one reported in *Table 3*. In this case, however, *Benevolence* seems to have a significant negative effect, consistent with our discussion of in-group priorities in subsection 2.1.

Only *Hedonism* is significant among the values of *Openness to Change* in this restrictive estimation of willingness to pay taxes, and the estimate is negative. *Stimulation* has a positive significant effect on other estimations not reported here.

Comparing the size of the standardized estimates shows that biospheric values are the most significant in explaining higher personal and fiscal responsibility. Other universalist values and *Stimulation* also increase personal responsibility, whereas *Power*, *Conformity* and *Security* reduce it. *Security*, *Tradition*, *Benevolence* and *Hedonism* reduce willingness to pay green taxes.

5. CONCLUSIONS

This study used the ESS to analyse the role of Schwartz's ten basic human values in predicting personal and fiscal responsibility to mitigate climate change. We estimated models by weighting OLS with standard errors clustered by country and considered additional sociodemographic control variables.

Our main results are the following. *Age* is the most significant individual factor explaining personal and fiscal responsibility, although the relationship to personal responsibility takes an inverse U-shape and the relationship to support for green taxes a U-shape. *Interest in Politics* is a key attribute explaining personal responsibility, whereas support for green taxes is more strongly affected by *Trust in politicians*. *Tertiary education* and *Political orientation* are more significant for taxes than for personal responsibility. Relative *Income* is significant but less relevant than political factors.

Human self-protection values (*Conservation* and *Self-Enhancement*) tend to reduce personal and fiscal responsibility, whereas growth-oriented human values (*Self-Transcendence* and *Openness to Change*) tend to increase it. Our results for Schwartz's ten basic values reveal, however, relevant particularities that are masked in analyses with higher-level human value dimensions. Among *Self-Enhancement* values, *Power* has a negative effect, but *Achievement* tends to have a positive effect due to its simultaneous characterization as a value of self-protection and growth. In the growth dimension of *Self-Transcendence*, biospheric and other universalist values have a positive effect, but *Benevolence* reduces support for green taxes, possibly due to the dominance of in-group effects in Schwartz's definition of this human value. As to values of *Openness to Change*, *Hedonism* has negative effects, whereas *Stimulation* tends to show positive estimates, possibly due to challenges associated with climate change for people who focus on the novelty of this issue.

These results have some limitations, which help to design a future research agenda. Potential endogeneity is always an issue in this type of research because the interplay between human values and socio-demographic factors generates unclear causal relationships. Due to this risk, we have omitted concern and other climate beliefs as explanatory variables of responsibility. More careful study is thus needed on variables related to responsibility. Further research is also needed to analyse the interactions between human values and other mediating factors. Additional models using time series or estimating random intercepts and slopes could also provide useful insights.

Our findings have direct implications for policy design. Following Steg's (2016) framework, institutions can motivate people or strengthen their motivation to adopt values associated with the growth dimension of human values, while also considering the specific motivations of people oriented to *Hedonism* or *Benevolence*. Further, communication policies should address people oriented to *Achievement* and *Stimulation*, even though these values are considered as self-protective in Schwartz's scheme. Policy makers should also develop strategies to empower and motivate people to act on their universalist values. Finally, they should recognize the motivations that decrease pro-environmental behaviour and try to change perceptions of costs and benefits among these citizens, while addressing specific communication policies oriented towards citizens with those orientations.

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05

ENVIRONMENTS AND RESIDENTIAL SCENARIOS



15 / DEVELOPING COVID-19 SAFETY SOLUTION AT A CROWDED AREA IN KOLKATA

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ABSTRACT

During the global pandemic, people have been aware of their surroundings and tried to maintain covid protocols. After the lockdown, the businesses were coming back with the flexibility of preserving safety protocols for their workers and customers in the Indian markets. This article aims to provide suggestions for maintaining safety measures in the marketplace through the service design method. This article reviews the literature on space design, traditional marketplaces, and covid safety measures. Marketplaces are very crowded most times; it is vital to practice social distancing and hygienic regulations in those areas for the safety of the people. The New Market in Kolkata will be observed through fieldwork and analysed through personas and user journey maps. With the observations of the space and user behaviours, the research will propose a suggestion to be developed.

In this process, to establish safety measures for the community, the designer must ensure that the task of the space takes into account the various needs of individuals while still allowing the option to enjoy the area alone or with multiple people. At the same time, the firms continue to thrive as they have in the past. The concept of using service design provides a perspective on understanding public spaces in traditional areas. We can obtain basic suggestions on improving safety measures by combining the results of a literature review and case studies.

Keywords: COVID-19 Measures, Service Design, Indian Marketplace.

1. INTRODUCTION

1.1. Research Background and Purpose

After 30 January 2020, the WHO declared the COVID-19 outbreak a public health emergency of international concern. Fortunately, the rolling out of the vaccines for all the population has shown a better improvement in the reduction of active cases. The main points in preventing the spread in society are vaccination, hand hygiene, social distancing, and quarantine. With increased vaccine and testing capacity, detecting more COVID-19 positive patients in the community will also reduce secondary cases with stricter quarantine rules.

The pandemic has undoubtedly brought in many changes in the lifestyle of people all over the world. Communication and movement have had to go through many specific alterations in public spaces.

The Centers for Disease Control and Prevention has recommended that people wear masks in public to help contain the spread of the virus; one may wonder whether that's enough to keep everyone safe while shopping at a traditional market.

In this research study, the traditional market refers to is veteran shopping spaces established and evolved over the years with their diverse history and culture—a space where business and culture mix and is an asset to the local vendors. Traditional markets are found worldwide, but this study's context and references will focus on the New Market space in Kolkata.

The German philosopher Jürgen Habermas defines the public sphere as "made up of private people gathered together as a public and articulating the needs of society with the state". (Habermas, 1991) The public sphere exists between the state system and private interests, and public opinion is formed by citizens through equal exchanges. It is a third space between the state and society. It can be understood as a public domain formed by a collection of private individuals, focusing on the civic attributes of public spaces.

Different people and people's spontaneity are prerequisites for the creation of a public space. When redefining public spaces, the dimension of material. (Liu, J., 2021)

The digital revolution has made customers' demand for good experiences even more powerful. Where they once were often forced to take what they could get locally or find in the newspaper, they now have a huge choice. Indeed, it is often easier to buy from the other side of the planet than from the store across town. Customers channels for information or for purchase, have many even within one provider, and will switch between them at their convenience. They have more

information, with price comparisons, alternative sources, trusted reviews, and wealth of other data just screen away. (Stickdorn, M., 2018)

This research recommends a design direction of Covid safety measures at the New Market area, providing a safer experience for the customers and the workers through literature reviews and a service design approach.

1.2. Method

This research examines the literature on traditional public marketplaces and their safeguards. In a nutshell, the risks associated with covid instances stem from a lack of social distance and sanitation and attempting to regulate them limits human life freedom. If the regulatory system can be made more flexible, people should not have to give up everything for the pandemic. They should be able to enjoy their favourite veteran shopping location in Kolkata, which has been around since the British reign in the 1800s. Designing for public spaces may be difficult in the aftermath of the outbreak, but this is where service design can help.

Designing for public areas may be difficult in the aftermath of the outbreak, but this is where service design can help provide the experience that customers want. In the post-epidemic age, the design of multicultural public space is still a relatively young research subject. As a result, this study combines another Asian traditional market space with representative characteristics and investigates how they managed to conduct their enterprises despite the circumstances. The market in Gimhae, a Korean city, will serve as an alternative.

Furthermore, this study develops an essential safety guide to establish a new standard for developing Covid solutions in the context of Service Design.

2. LITERATURE REVIEWS

Raising the safety of the public in a traditional marketplace and reduce their physical contact in the form of exchanging bills and communicating without protective gear for covid risks the spread of the infection. The key focus will be initially to understand the spaces about native language and cultural norms and how can an acceptable solution be utilized in a market by the public. Existing studies present the concerns comprehensively, categorizing them into:

2.1. Protective and Control Measures

Nationwide closures, lockdowns, travel restrictions, personal hygiene, and social and workplace distancing may help prevent infection. A modeling study from

Singapore investigated the impact of control measures implemented to reduce the spread of COVID-19. (Haj Bloukh, S., 2020).

Different media outlets are hosting in their native dialect languages for the ongoing outreach projects that appeal to the elderly about personal hygiene and care. (Koon, 2020).

Many countries have taken preventive measures against the virus, and Government officials continue to make efforts to minimize human contact by facilitating countrywide shutdowns of public places. Various steps were initiated to ensure the safety of the people. During the lockdown, most companies and businesses faced a hit. The combination of demand and supply shocks are hitting the Indian economy at a time when the tools to deal with the crisis are mostly ineffective, namely fiscal, monetary and financial. Over and above this, the external sector of the economy has been weakening as well. (S. Mahendra, 2020) Office workers continued to work from home, but the enterprises run by vendors had to open and run it as they could not continue to be in losses. So most of them tried harder to come up with safe solutions so they could keep their shops open.

2.2. Community Adaptation

The traditional market is one of the leading facilities for the community to obtain daily food needs, as a place to sell wet food, dry food, and ready-to-eat food ingredients that aren't easy to replace with existing modern markets. During the Covid-19 pandemic, traditional markets can be a locus in spreading the virus because of activities that invite crowds. However, buying and selling activities in traditional markets must continue to supply the community's daily needs and support the economic sustainability of the poor society.

This condition causes conflict between providing community needs or protecting the community in the spread of Covid-19 in the community. The market is one of the locations with great potential as the center of the spread of Covid-19. The government, through the Decree of the Minister of Health of the Republic of Indonesia number HK.01.07 / MENKES / 382/2020 concerning Health Protocols for Communities in Public Places and Facilities in the Context of Prevention and Control of Corona Virus Disease 2019 (covid-19) provides rules or directions for the community, market managers (government / related agencies) in activities in traditional markets. Implementation of some health protocols is challenging to do in a market environment.

2.3. Modernizing the Traditional Market

The traditional commercial system of Dongdaemun marketplace, composed of the merchant community, has not been eliminated but maintained. It has evolved to adopt modern forms, such as a grand architectural structure and a marketing system. This maintenance of the commercial system became the main factor in revitalization. The uniqueness of the Dongdaemun market lies here, and that is why we call this market “a traditional market wearing a modern suit.” This was possible because the redevelopment of this market was not carried out in the same way as the redevelopment of other traditional markets. The essential cause of the success of this market was that the spatial changes had been carried out without harming the existing social pattern—the commercial organizations of the merchants.

There are several important implications of this investigation. The initial concerns were the need to balance past conditions and future aims in redevelopment planning or policy for revitalizing an old area. Numerous cities have undertaken a redevelopment policy to restore their declining city centers or commercial sites, but many have not been very successful.

This failure is usually a result of a poorly conceived plan, with insufficient attention to the balance between the existing environment and future aims. Such methods attempt to turn the declining area into a completely new and revitalized environment without securing and preserving its vital energy. Such as its social structure and economic situation, to enhance the site. At worst, this attempt at revitalization can even destroy an existing urban fabric or social community without any fruitful results (Cohen, 1999) (p. 15). The results of this failure are neither a future as planned nor the maintenance of the past condition but a useless status between these. To emphasize, it is not necessary always to orient ourselves to the future at the expense of the past. Sometimes successful revitalization can be achieved by conservation of the past or in a combination of the past and the future. Revitalization does not need to be a total conversion of the past status into a new one. In fact, if we can find something of continuing value in an existing situation, it can be a safe and effective way to adapt the latent power of the past within the framework of modern development. Dongdaemun marketplace, where the conservation of the traditional commercial system served as the key to revitalization, is an example of this.

Second, how important is the social context for revitalization? The urban physical environment cannot be differentiated from the social environment, and every environment has a social context. But sometimes redevelopment policies are so focused on physical aspects that the social aspect of the redevelopment is often forgotten. The policies can even destroy valuable social constituents. Policies of redevelopment and revitalization deal with existing areas and are not creations of a completely new site. Thus, it is essential to understand the current

social constituents and deal with them appropriately in making a policy or plan. Although it resulted from the second-best policy, which was not thought to be pertinent at that time, Dongdaemun succeeded in maintaining the favourable social resources and could be revitalized through them. This unexpected success suggests that redevelopment policy should not be focused only on physical reformation but also sensitive to the existing social context and its latent merits.

Third, it is necessary to improve the models and methods of redevelopment. In particular, it is necessary to develop a methodology for matching valuable social constituents such as historical activity, commercial systems, and community with new development. In this respect, in the case of Dongdaemun, "physically, it is a redevelopment, but socially, it is rehabilitation" (Choi and Na, 1999) (p. 47).

Indeed, it is improper to judge the case of Dongdaemun as a success or a failure of a redevelopment policy. Nevertheless, the success of this unintended policy shows the subtlety of the issues surrounding redevelopment and revitalization projects. It is necessary to learn to deal with this subtlety, which can be done by examining the whole situation, including the physical and social aspects of the redevelopment area. Many subtle and even invisible things need to be considered when planning a site within an existing historic area, should develop strategies to deal with them.

2.4. Space Design for Multicultural Environment

People have become more individualistic as a result of the pandemic's social separation. This has resulted in a rapid increase in social atomization, necessitating a rethinking of the role of multicultural public spaces. This paper intends to present recommendations for the design direction of multicultural public places in an increasingly atomized future world through literature and case studies.

They focussed on four places for their case study with a more visible degree of multiculturalism, taking into account the natural environment, regional demographic mix, and measures to respond to the epidemic. For example, High Line Park and Central Park are based on natural landscapes and emphasize how intercultural interactions interact with the environment.

Reading Terminal Market and Superkilen are based on human activities and are concerned with how people interact in a multicultural setting. We can understand how social atomization and multiculturalism affect public spaces and how these public areas respond.

Although the manifestations of multicultural spaces vary from society to society, the variables that cause social atomization are comparable. There are few

remedies for social fragmentation following the advent of an epidemic that can be done just in physical settings. Still, numerous techniques may be adopted in online areas.

Individuals become the basic unit of society during social atomization, and the job of public space is to connect individuals, groups, and the space itself. Perhaps, as a result of societal atomization, cultural background units will likewise be atomized into individuals, and any location will be referred to as a multicultural public space.

Seems like the authors have observed these spaces even before the Pandemic to understand the solutions to be implemented in such cases. Designers or Urban Space Researchers are working on similar topics at present. And this paper seems to be like an ideal recommendation for them to study as a reference. New York/ Philadelphia is more or less as an Urban or Modern kind of space, the implementation of virtual or online solutions can be easier to implement.

My personal interest would be, if a more oriental or ethnic kind of space were to be targeted. Would it be easier to implement or develop a virtual walk in that place?

Here is an image showing the best virtual walks places around the world. But most of them are in US, UK or European countries. Very few in Asian or African parts.

There is no critique for a paper like this, but maybe a curiosity if the authors would be open to studying a different space in Asia? A space that is not conventionally known globally but still faced some difference due to the pandemic.

2.5 Value Centric Services

The key to unlocking new sources of competitive advantage is high-quality interactions that allow each customer to co-create unique experiences with the organization. Both the enterprise and the consumer will have to work together to produce value.

In the old system, corporations select what items and services to provide, implying they also decide what is valuable to the client. Consumers play little or no influence in value generation in this The Traditional Concept of a Market Source: Prahalad and Ramaswamy (2004) system. During the last two decades, executives have discovered ways to divide some of the organization's work and pass it on to customers. Whether through self-checkout (e.g., gas pumps, ATMs, supermarket checkout), customer involvement in product development (e.g., industrial customers help design the products they need, as airlines do with Boeing), or a variety of other approaches.

Some of these are advantageous to customers. Companies like Disney and Ritz Carlton have come up with novel techniques to stage an experience for customers (Pine & Gilmore, 1999). The firm is still in charge of the overall orchestration of the experience in all forms of consumer involvement, from self-checkout to participation in a staged encounter. Yes, they put a premium on customer service, but their customers are essentially viewed as objects. Companies like these have a disproportionate amount of control over the nature of the experience. They are largely focused on the product, service, and, as a result, the company. The emphasis is clearly on connecting the customer to the company's products and services.

To appreciate the peculiarity of the Dongdaemun market, we must first consider the traditional market's meaning in Korean culture and the inclination for commercial areas to grow in the city center. The rapid rebuilding of Seoul's major retail sector for modern business-related applications is an important change factor.

To summarise the literature reviews, "a traditional market wearing a modern suit." (Kim, J. I., 2004) Describes the Dongdaemun market in Korea, but this quote resonates so deeply in my perspective with the similarity drawn to New Market which is a space of its own in a different country and a diverse culture. The modernity lies in the adaptation of technology that India has been evolving to during the Covid-19 pandemic crisis.

3. METHODS

3.1. Preliminary Research

The preliminary research will require fieldwork at the Indian and Korean market spaces and gather data to observe the space, collect information and images, and identify the existing market conditions by inspecting the hygiene and maintenance of the markets. Physical and non-physical data in the form of availability of handwashing facilities, availability of signs/guides for visitors in the circulation room, bulkheads between traders, conditions of sewage, placement of market salespeople, lighting systems, and air circulation in the market, and user behaviour.

Secondary data is in the form of regulations issued by the government and theories related to health protocols in traditional market areas. The analysis model used is descriptive qualitative research.

From the secondary research onwards, the data will be segregated and organized to observe patterns of similarities and other features that may favour identifying concepts for the solution in the space.

The third stage onwards many cultural and legal norms will have to be studied and understood before analysing and brainstorming the concept.

The concept, strategy, and solution will depend on the initial data gathered, hence concluded at the end of the research.

3.2. Contextual Differences of the Two Societies

Being two most influentially strong countries of the continent, there lies some strikingly evident differences, factually.

Table 1. Societal and Social Concerns.

Questions	Korea	India
Caste System	Non-Existent	Exists
Population affording sanitisation	Most of the population	Least of the population

Table 2. Protocols for Rules.

Questions	Korea	India
Wearing Masks	Mandatory	Mandatory
Punishment for not wearing a mask	100,000 KRW - Fee	-
Health Check-up	Mandatory	Not Compulsory

The above tables are to present a perspective that is created due to many layers of societal and social matters. These are not to be misconstrued for a comparison of who is better than whom. Just for analytical purposes.

This also gives an outlook for the potential of bringing in a change through a respectful manner that can be adapted by the public.

3.3. Possibilities

During the past few weeks, once I got a chance to share this research with some of my labmates. They had a very valid question, when I said I intend to implement the concept of a kiosk or a vending machine. She asked me,

1. What about the elderly?
2. How can they access a kiosk?
3. What is an alternate solution to this?

In that moment I did know that she has a point, but I felt stuck in the knot with this.

I began speaking to people back home and unintentionally through a story I got to know, when the lockdown finally opened up in 2020, the public transport use had a new rule. Passengers would have to pre book their rides from before. in an app, named PATHADISHA (Patha: Way , Disha: Direction).

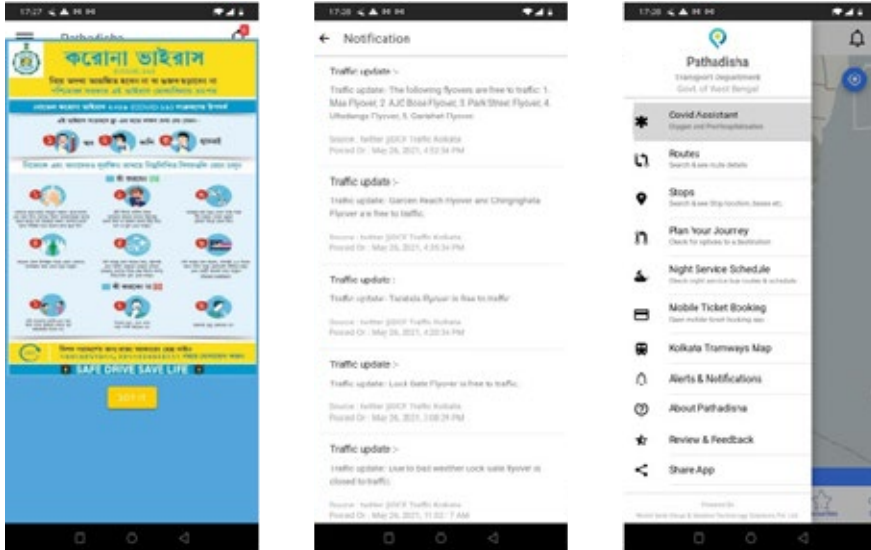


Figure 1. Screenshots of the app PATHADISHA.

New market is an area where one has to walk a lot, ideally not the place where it is senior citizen friendly. Even so, they would still have to ride the subway to reach there, which is one of the main access points of New Market area. People usually do not take their cars to New Market, so most people use the public transport. The news of this app existing not only made me very happy, but I do a silver lining with my research to implement and extension of a kiosk which in some way can help in maintaining the hygiene and the social distancing.

4. WALK THROUGH NEW MARKET

Despite the appearance of new air-conditioned, American-style, shopping malls all over Kolkata, New Market, which has survived two devastating fires and regular flooding, remains at the core of the shopping experience in the city. Over 2000 stalls under its roof sell everything from clothing to wheeled luggage to electronics to a special cheese found nowhere else. Under its apparent chaos lie extraordinary finds as well as remarkable bargains. Newmarket is a place to shop for garments & accessories, flowers, different food items including raw meat, fish, vegetables and fruits and even spices. There are crockeries and utensil stores. It also has a florist section dealing with exotic flowers. It is situated on Lindsay Street, Kolkata (Calcutta), just off Chowringhee Road.

4.1 Characteristic

The popular market can popularly be known for the following:

- **Crowded**
It is always full of people and customers hurling around. It is the busiest junctions of the transport system of Kolkata. Hawkers and Vendors make their living through businesses that run in the market. It also acts as a Transient Space between the surroundings of the market.
- **Culturally Diverse**
This market has an interesting spread of culturally diverse backgrounds of businessmen and traders coming together and running their businesses. During a regular day at the market, the livestock of goats are being taken to the meat shop, a sight like this can be uncomfortable to some from the Hindu religion who practice vegetarianism. But they learn to respect and co-exist other businesses.
- **High Communication Frequency**
Being the City centre and located near prime tourist spot it aids to the transports and workplaces become a constant asset to one another
- **Low Maintenance of Hygiene**
Given the pandemic situation some still struggle to follow rules.

4.2. Visually Understanding the Space

Trying to visually understand the space only through the aspect of human communication and utilization of the space.



Figure 2. Marking entry and meeting points of the market.

The marketplace allows the public to access it as a crossroad to commute from one part of the area of Esplanade to the other. Each individual has their purpose of being in a hurry, jaywalking, window shopping, or just getting some cool and covered passage to cover instead of walking in the Kolkata warm and sunny climate. The social and interactive space's engagement and between retailer and consumer is co-dependent. Internally and externally, the retail design process engages with broad stakeholders, enabling more staff to be networking into creative processes and thinking. In a metaphorical sense, it stimulates the development of mental and organizational space to think and act creatively.

4.3. Design Process

By designing, aligning, and optimizing an organization's operations to better support customer journeys, service design improves user and employee experiences.

Considering the natural environment, regional population composition, and measures to respond to the epidemic, the design cases for the market must consider physical and diverse public area of it. Among them, front entrance and transient spaces used to commute as shortcuts are based on the structure of the market formed ages ago, focusing on how to utilize and balance the human to human interactions that integrate with the environment.

The service design approach for new market will be as follows:

- Prioritizing
- Blueprint
- Employer & Customer Journey Mapping
- Identify & Validate the Concept
- User Scenarios
- Kiosk Design Proposal

4.3.1. Prioritizing

Prioritizing methods can be used to focus a wide range of "things," including research questions, user segments, features, and ideas and activities. This article focuses on using these strategies in the context of road mapping, prioritizing problems, and organizing them into a strategic timeframe.

“Prioritization methods base these important decisions on objective, relevant criteria instead of subjective opinions.”

The marketplace encourages certain activities because of its layout, system and

culture. Through observations it is justified that certain activities like queuing, waiting, moving are of higher effort and other like navigation, interaction is comparatively lower effort.

Table 3. Streamlining and highlighting categories.

Interactions	Typical Activities	Concerns
Asking Directions	Shopping	Social distance
Jaywalking	Sales	Hygiene
Self Promotion	Market navigation	Location/transport
Transportation	Transportation	

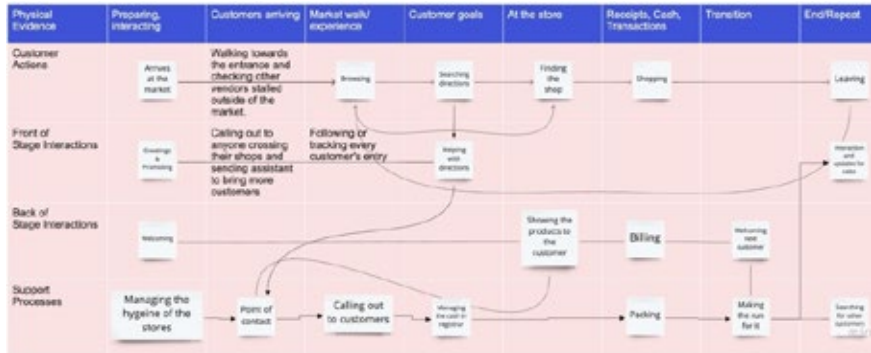
These are further streamlined to categories of activities to define the purposes and people behavior in the marketplace. These pointers can aid to form the design proposal and concept.

4.3.2. Service Blueprints

Service blueprints provide an organization with a complete understanding of its service and the underlying resources and processes that enable it — both visible and invisible to the user. Focusing on this bigger picture (combined with more traditional usability considerations and specific touchpoint design) has strategic implications.

Service blueprints come in a variety of visual styles, with some being more graphic than others. Every service blueprint, regardless of its visual appearance or scope, contains the following fundamental elements:

Table 4. Blueprint of service design.



a. Customer actions:

The blueprint in Figure 16 for the customers activities are arriving to the location, browsing, window shopping, shopping.

b. Frontstage actions:

The frontstage actions are directly linked to customers' actions: the shop worker meets and greets customers, a shop assistant manages sales and the store, the manager contacts the customer through assistants.

c. Backstage actions:

Numerous backstage actions occur: A store assistant employee inputs and updates the accounts and coordinate between the owner and managers; a store assistant contacts both the customer and the manager in charge to confirm products and sales.

In a service plan, critical parts are grouped together and separated by lines. The following are the three main lines:

- The line of engagement represents the customer's direct interactions with the store.
- All service actions that are visible to the customer are separated from those that are not visible by the line of visibility.
- Everything visible onstage appears above this line, while everything not visible onstage appears below it.

Contact officers are separated from those who do not directly assist interactions with customers/users by the line of internal interaction.

4.3.3. Employer & Customer Journey Mapping

To create a journey map when working with a distributed team, one must always put in extra effort and be more mindful of potential dangers. There are no shortcuts; establishing a cohesive, shared vision for a project necessitates more proactive planning and energy. While no tool will eliminate all of the obstacles to journey mapping success listed in the previous section, the correct tools can make the process easier and raise the odds of a positive conclusion for dispersed and in-house teams.

Both the stakeholders here, the customer and owner define their journey through the activities and emotions they're experiencing. These emotions could detect what factors to focus more on and what to be more sensitive with while designing for them.

4.3.4. Identify & Validate the Concept

From the above service design steps, it is established that a concept can be implemented for self-health check, or an assistive monitoring screening before the entrance of the marketplace.

A wireframe was user-tested through Microsoft teams by participants aged 25-40 living in India who have experienced a marketplace like New Market. The participants collaboratively participated and results were recorded.

In the above figure 19 the self-health check or diagnosis is being tested. This will ideally be the customers entering the market, they can scan the QR code to confirm the safety of the public.

4.3.5. Kiosk Design Proposal

The recognized empty spaces can be utilized to use a Covid related Health Kiosk

The electronic kiosk will provide information about the market and provide services like calling a taxi or providing masks or sanitizers for public use.

- a. Materials: the materials of the kiosk will comprise of inner, outer materials depending on the suitability of the climate of the place since it will be semi-open and well ventilated. There will be an inner screen, QR code scanning port and a vending machine to get a supply of masks and sanitizer.
- b. Form: the digital screen inside is touch screens which will be used by the public. The form of the kiosk will be standing upright so people can use

them standing and ergonomics of it would be levelled 3-4ft above the ground.

- c. Technology + Resources: The resources required would be a decent electricity connection to run the system of the kiosk.
- d. Visual Communication: The branding of the product will depend on how many business stakeholders and government organizations would want to be a part of it. The screen's user interface will be simple and minimal following the guidelines of the material design rules.

Figure 3. Suggestion of the placement of the kiosk.



Figure 4. Suggested prototype to present the concept of the kiosk screen.

5. RESULTS

The Results will be observed through existing market conditions

From the three traditional markets' research, a description of space adaptation and means of implementing traditional markets in the new standard safety measures.

1. Provision of hygiene maintenance through sanitizers, disinfectants, hand washing stations.
2. Air circulation and ventilation to avoid a stagnant environment for germs to multiply.
3. Limitation of the public to follow social distancing with protective gear like mask and vizer.
4. Provision of information and map of the market to avoid unnecessary interaction inside the market.
5. Identify and modify the wayfinding sign system.
6. An accessible concept will attempt to implement the above for a better and safer experience at the market during the pandemic.

6. CONCLUSION

The present era is and will be understood very differently in history and how as a race we all adapted to it. This is a good opportunity to participate and have the opportunity to implement safe and convenient methods to be able to coexist in a public space. The individuals using traditional markets are either vendors, customers or store helpers. Creating this concept can be utilized as a proposed model for the potential traditional market spaces.

Market spaces offer opportunities on how retail development can grow and adapt to new retail strategy opportunities with the new age pandemic protocols. Consumer and sociological studies have documented the emergence of retail space for social and leisure activities, and marketing experts have investigated the significance of the environment in shop atmospheres, branding, service, and operations. Separate bodies of study have focused on organizational creativity. (Kent, 2007) However, creativity in the retail context has received little attention, and the function of invention and the creative process in creating retail spaces and their uses is unclear. The evolution of retailing toward stores with suggested service design experiences, new demands on retailer creativity and their ability to enable other stakeholders to co-create products, services, and interactions within the store's spatial configuration and in a larger context mall and street.

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16 / UNDERSTANDING SPATIAL AFFORDANCE THROUGH THE EVALUATION OF URBAN SPACE QUALITY EXPERIENCED BY USERS UNDER WEATHER VARIATIONS: THE CASE OF ROOFTOP GARDENS IN CENTRAL TOKYO

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ABSTRACT

Reducing heat islands, providing wet areas for water retention, protecting biodiversity, and most recently promoting urban food production, green in high rise buildings has many years of tradition of offering positive effects to the network of public spaces in compact cities. Many successful designs of green infrastructure worldwide influence the guideline of production cities green space in Asia, especially Tokyo. According to the requirement of Sustainable Development Goals, Tokyo Metropolitan Governance has implemented an evaluation scheme of green infrastructure, the Social and Environmental Green Evaluation System (SEGES), to promote the creation of quality green space belonging to high-rise buildings or urban complexes of mix-used. However, other critics concerned such infrastructures as the only adoption of global standards and relied on transport network development but ignoring the user attachment to the urban commonness of community identity of ordinary practices. Purposing to evaluate these spatial qualities under different weather, this study develops on previous work on the Spatial Qualities in selected case studies belonging to the classification of SEGES, identified as Rooftop Garden in mix-used building settings. The precedent method combines different data collections to gather information from 118 samples of users. These samples were collected under two weather conditions at several rooftop gardens classified by SEGES in central Tokyo. Firstly, using multiple tools like observation, questionnaire, rendering, simulation, the study combined four sets of parameters. By finding the patterns of each combination, the variations of Settings were illustrated. Secondly, these variations patterns were interpreted as parameters of Experience. The results show the tendency of Experience indulged by settings as distinguished between intangible and tangible aspects. Thirdly, by combining Setting and Experience, the findings showed the variations of Qualities of the rooftop garden

under the influence of the weather. Besides, a literature review on Tokyo green space confirms the idea that the social practice of the general users still follows the traditional way of experiencing the spatial deepness and envisioning opportunities for informal appropriation. These practices are emphasized by the appropriation of spatial affordances, despite the homogenous production of public space with more mobility, connectivity, giant green space, and interactive usage. Hence, these current researches want to insist on this idea through an interdisciplinary approach on the uncertain effects of weather and how the design planning maintains a certain quality of public spaces for urban dwellers. An analysis of the spatial affordance patterns in rooftop gardens in different gathering areas like garden area, lawn space, and rest area will uncover the tendency of spatial sequences. This investigation on the relationship between people-space-environment will shed light on the mechanism of variations of Space

Affordance. The finding expects to define the user-centered approach as an important factor in the research of climate change uncertainty for the public space transformation of compact cities like Tokyo. Also, regarding the design of public space integrated green space, the results are expected to contribute to the urban restructuring and facilitate the conversation between different professionals during the discussion on sustainable development. Furthermore, it will enhance the users' relationship to the natural environment in compact cities while preserving the inhabitants' well-being concerning the current situation of pandemics and the implementation of SDGs. As our lifestyles in the cities are changing toward a new normal, and urban regeneration is gradually transforming to be more flexible, mobile, and sustainable, the design of spatial affordance in contemporary public space in Tokyo needs new attention toward the user. This initiative will give opportunities to urban dwellers to engage in social practice as preserve the identity of community resilience while adopting the global vision of sustainability.

Keywords: Urban space; Natural environment; Public space; Rooftop.

1. INTRODUCTION

The impact of climate uncertainty has become critical on a global basis. Problems such as frequency of extreme weather, heat stress, environmental pollutions are amplifying in urban areas. Since over half of the global population is in urban settlements, these areas have a vital role in addressing the challenges of climate uncertainty (UN Global Compact Cities Program, 2020). However, urban areas, especially in a metropolis like Tokyo, with a highly developed network of infrastructure and density settlements, are facing problems of enhancing public health and well-being. As indicated in the SDGs report (Sustainable Development report, 2020), the indicator of subjective well-being of urban dwellers in Japan was "Moderately improved". The reason is despite having a well-design and highly maintenance advantage to reach the global standard, the urban public spaces in Tokyo are often considered homogenous with less attention given to users. As the metropolis area of Tokyo expands together with the transport network, the tendency to develop public space links to mix-used buildings and train stations, which results in a profitable scheme than quality (Dimmer, 2012). Besides, these public spaces also initiate urban regeneration through area branding and combating the heat island effect through rooftop greening. Due to the limited access to nature and green spaces, the government of Tokyo have been opting for solutions to increase the quality of city living through open green spaces such as Rooftop Garden to guarantee access to the natural environment and enhance citizen well-being in the city center. As an integrated natural environment in the mix-used building requires careful design to tackle weather uncertainty, this research aims to understand the effects of weather and how the design strategy maintains a certain quality of public spaces. The quest to enhance urban well-being could be achieved via a better living environment for the urban dwellers by investigating the quality of urban public space through a study of the relationship between user-space-environment.

To properly understand the dimension of a user in space and environment, this study learned from several theories explained in the following. Firstly, (Ashihara, 1970) defines the exterior space as "architecture without a roof", created by a delimiting nature. The planning, enclosure, hierarchization and sequences of the outdoor space required careful design. The method to comprehend exterior space in his discourse is always related to the human scale, as it is brimming with human intentions and functions. This concept shares a commonality with the study proposed by (Gehl, 1987), which mentioned that high-quality, well-designed open spaces enhance the quality of life by affecting the community's closeness and the city's livability. His research emphasizes the human dimension where communication can be made simply by seeing, and minimal duration of stay can contribute to social life. These researches focus on the human dimensions determining the factors of Setting of the Rooftop Garden.

Secondly, the term "affordances", introduced and defined by (Gibson, 2014), presents a world of meaningful objects and events meant for human experiences.

These experiences are an ongoing process following the change of the human attributes toward the environment setting. (Barker, 1968) emphasizes that the settings could take on a different meaning at certain times and places. This interdependence relationship between the user and environment resulted in a Behavior Setting. To theorize this idea, (Thiel, 1997) provided a complete approach to the behavioral patterns of human attributes trying to bridge the gap between the architect and the user within the design process. His study mentioned that the correspondence between outer reality (objective/ physical world) and the inner one (subjective/ perceived world) is not a linear process. This idea suggests that the relationship between the human dimension, as Setting, and human perception, as Experience, should be investigated through the interpretation of various factors.

The above researches propose a study method started with an observation on how the user behaves in space under a variety of settings. These settings could have physical attributes such as height or texture, while also being influenced by the environmental attributes in different weathers. Next, by combining these attributes into specific configurations in each area of the rooftop gardens, the Spatial Qualities will be illustrated following the order of emerged Spatial Affordance. From the previous study by the authors (Nguyen-Tran & Murata, 2020), the illustrated Spatial Qualities represent most of the situations existing in rooftop gardens during a specific time of the year but do not yet explain how these Qualities transform under different weather. Therefore, in this study, the objective is to continue this discussion on the spatial quality of rooftop gardens via another viewpoint through Spatial Affordance to understand its impact, its relationship and propose a method for the future design of urban open space under weather uncertainty.

2. RESEARCH METHOD

Purposing to evaluate the Spatial Qualities under different weather, this study develops on previous work on the Spatial Qualities in selected case studies belonging to the classification of SEGES, identified as Rooftop Garden in mixed building settings. The precedent method combines different data collections to gather information from 118 samples of users. These samples were collected under two weather conditions at several rooftop gardens classified by SEGES in central Tokyo. Firstly, using multiple tools like observation, questionnaire, rendering, simulation, the study combined four sets of parameters. By finding the patterns of each combination, the variations of Settings were illustrated. Secondly, these variations patterns were interpreted as parameters of Experience. The results show the tendency of Experience indulged by settings as distinguished between intangible and tangible aspects. Thirdly, by combining Setting and Experience, the findings showed the variations of Qualities of the rooftop garden under the influence of the weather. By adopting the results of

previous research, this study investigates applying its framework partly and reusing the same data collected from its fieldwork. The details are explained in the sub-chapters below.

Framework

The interdisciplinary framework of the previous study is shown in *Figure 1*; the grey part is the portion related to the user and will not be mentioned in this study. This study reuses the data collected from a previous study of 118 users in 4 cases of Rooftop Garden in central Tokyo, under different weather found within the period from August to October 2018. The framework is structured into three steps as follow. The first step focuses on the variation of settings of the Rooftop Garden identified as Zone/Boundary and Shading time/Wind flow.

Zone/Boundary are collected through observation on-site during chosen weather at 11 days, while Shading Time/Wind flow is average simulated data based on the observation. From these parameters, the second step is a combination of different patterns to reveal the configurations of the Rooftop Garden in terms of Spatial Affordance. Finally, the last step explains how these configurations could influence the changes of Spatial Quality in different weather. These changes will be manifested in terms of Usage and Image of Identity.

Case studies

This part is the selection process of case studies of Rooftop Garden in the mixed building, as belonging to private firms and had the highest concentration in the Tokyo Metropolitan area (*Table 1*).

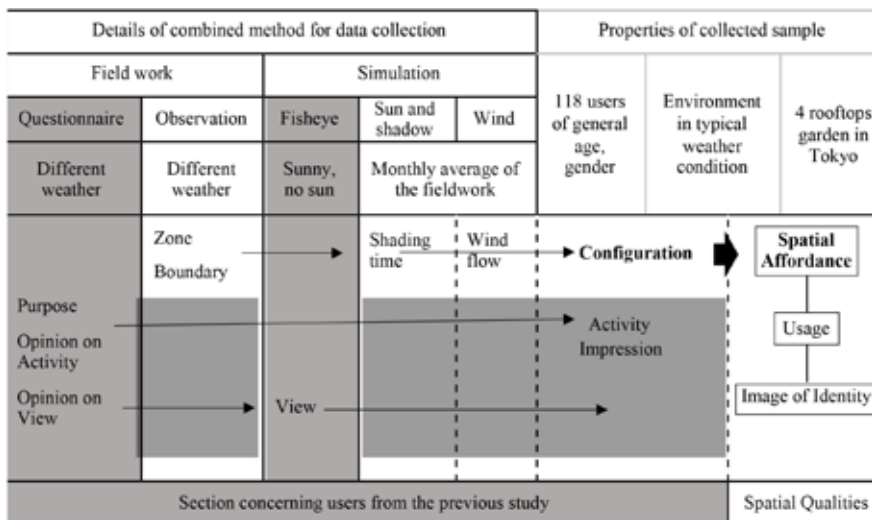


Figure 1. Interdisciplinary framework adopted from previous research.

Table 1. Case studies of SEGES rooftop garden.

Case studies	Ginza	Isetan	Kitte	Omohara
Year of built and renovated	2017	1993, renovated 2013	1931, renovated 2012	2012
Location (Nearest central station, building, rooftop)	Near Ginza station, 13th floor of Ginza Six building	Near Shinjuku Sanjome station, 9th floor of Isetan Shinjuku building	Near Tokyo station, 6th floor of Tokyo Post Tower	Near Meiji Jingumae station, 6th floor of Tokyu Plaza Omotesando - Harajuku building
Surface (ratio of garden by rooftop surface)	2000m ² (60%)	1500 m ² (60%)	1500 m ² (50%)	820 m ² (70%)
Mix-used program	Office, theatre, shops, garden	Office, post, event hall, shops, garden	Shops, banquet room, garden	Shop, café, garden, bar/restaurant

A recent article of Shinken-chiku (Kishii *et al.*, 2020) on public spaces have published many discussions mentioning the image of Hiroba (広場). It is usually linked to the precinct of the Shinto shrine or the market during the Edo period. As said, the Japanese open space seems to not be associated with static and monumentality, but the spontaneous events at the human scale (Jonas & Rahmann, 2014). As social life often happens in the backstreets which are narrows, vibrant but not many amenities given to the public (Hidenobu, 2011), the spatial characteristics of the urban public space is these particular traits of intervention using the void as opportunities for social life. Hence, the target of this study is to understand how the appropriation of the void could enhance Spatial Quality comprehended by users. It is the idea of the casual and uncommon actions of place-making by taking advantage of blurred and ambiguous boundaries. This place is considered as a buffer zone, which exists as a physical form without a defined border (Heide, 2008). This place allows the user to experience a spatial dynamic, and the spatial usage is carefully adapted in subtle negotiation of informal activities which are meaningful for the users. In the context of the rooftop garden, this experience is an occurrence rather than the planned strategy imagined by the designer, defined as Affordance. These Affordances are the products of temporality and transitory, which relies on the variations of the physical boundaries and climatic conditions. It will take the metamorphosis of an act of integration to the recurrent practices. For these reasons, this study selects the case studies that are relevant for the users' evaluation in a hybrid landscape, mix-used, and continuously evolving settlement. It demonstrates the values of attractiveness, diversity and livability in which compact cities are experimenting with the contemporary urban public space to improve the daily life and recreation for the busy urban citizens. Also, it requires a context strongly influenced by the natural environment, which is nowadays unpredictable.

This study then focuses on this typology classified in an evaluation scheme of the Social and Environmental Green Evaluation System - Urban Oasis (SEGES Urban Oasis, 2018). SEGES Urban Oasis selection was established in 2013 by the Organization for Landscape and Urban Green Infrastructure sustainable to promote sustainable development in cities via promotion of social value through quality green space. This organization is supported by the Ministry of Land, Infrastructure, Transport and Tourism. A set of criteria were applied to the list of SEGES selection from 2013 to 2018: is a rooftop garden, situated in the city center, near a central station, presenting a high ratio of the garden (50% surface of floor area), locating at the top floor of the mix-used building and having three primary areas such as open space, garden and rest area to accommodate multiple uses. From these criteria, four sites are chosen as case studies. For details, Kitte is a renovation project focusing on a long promenade with a panoramic view of Tokyo station. This promenade guides users into different portions of the garden and rest area. Omohara, on the other hand, is organized around a hexagonal open space and rest area surrounded by the garden.

The unique appeal of this rooftop garden is the design of stairs around an atrium in the center. Ginza is the most recent project with the highest altitude. The garden has a symmetrical plan concentrating on the open space with lawn and water. On both sides, a garden combines with rest areas connects to a long promenade around the pathway. Finally, Isetan is the pioneer of public rooftop gardens in Tokyo, which showcases the landscaping garden distinguishing through seasons. The gardens are organized around a vast lawn space and multiples shaded rest areas. By considering these similar and singular characteristics, the selection of case studies represents a diverse data collection for research.

Data collection

Concerning the fieldwork, this study reuses the 118 collected samples from the previous survey due to their relation to defining configurations made by spatial affordance. Previously, a team of two members visited the sites and conducted an observation during specific weather conditions. The survey recorded users' position on the map and captured photographs that define their posture with the nearby physical elements. Also, the user's localization on the map is used for the simulation. The factors chosen for analysis are Sun-Shading and Wind Flow, as its effect could be seen on the user's behavior (Whyte, 1980). Besides, concerning the users' behavior patterns in the outdoor environment, this study follows the idea of thermal adaptation in the Environmental Design field. This idea is set apart from those with indicators such as WBGT, SET, MRT that measure the thermal stress on users on-site. This research aims not to evaluate the garden but to find beneficial environment characteristics for the user's spatial experience. Differed from the study of (Nikolopoulou & Koen, 2003) that collects data through on-site surveys, this aspect will explore another method of collecting data through simulation. As an example of the output of the simulation, software like Google Sketchup Shadow Analysis will provide

a map of sun hours, and Autodesk Flow Design will illustrate the wind flow effects on outdoor space.

3. VARIATIONS UNDER WEATHER UNCERTAINTY

Collected data is analyzed by following two categories of variation of setting: mapping and delimitation by physical elements of Zone-Boundary and environment effect of Shading time and Wind flow. These categorizations correspond to each of the following sub-chapter.

Physical elements of Zone and Boundary

Zones are categorized as walkable zone, non-walkable zone such as flowerbeds or zone not open for the public and out of study perimeters such as indoor zone and keep out zone. The separation between zones is identified as a boundary and materialized as fences, stairs, high or low vegetations, benches with or without backrest, concrete blocks or indication boards. These boundaries are classified by their physical features such as height, texture and presence of green elements. Also, boundaries can be differentiated by floor material such as grass, wooden deck, concrete or soil. From the observation, the users were found only in the walkable zone due to the strict safety measures of these roof gardens. This zone has three different areas classified according to user's behavior, defined as firstly the open space corresponding to the lawn space, water pond or any areas without eaves and is dedicated for physical activities such as walking, playing ..., secondly the garden corresponding to the area where is the abundance of vegetation contains trees, plants, bushes and flower beds..., and finally the rest area representing the area with eaves or having high trees that create shades, additional amenities for lingering activities such as vending machines, tables, chairs can also be found in these areas. In different weather conditions, the users were found in different areas on the site and having different activities. However, at a general level, in the rest area, users are always found to be in the nearly same spot around the outdoor seating but not in the case of open space and the garden. This aspect is manifested particularly in the case of Ginza and Isetan due to its size that allowing users more space to move around. While in the case of Kitte and Omohora, due to the limited seating available, users are found more in proximity contrasting with the scattered situation in the other case studies.

Environmental effects of Shading time and Wind flow

As for sun/shadow and wind flow simulation, the locations of 118 collected samples are simulated under typical weather during the fieldwork period. This period from August to October is when the weather presents moderate sun shading and wind velocity. This condition is not the extreme weather in Tokyo, which is considered most appropriate for outdoor lingering. Hence, early-stage environmental modelling seems to be suitable for this level of simulation, which corresponds with certain simulation software, as explained in the following.

Firstly, for sun and shadow simulation, the sun path is chosen on the middle day of the month, within the time interval of 10 am to 5 pm, which corresponds to the observation timeline. This simulation uses Google Sketchup Shadow Analysis plugins to generate shadow every 15 minutes during the defined period. The environment considers only the direct sunlight and clear sky. The models were built considering elements provided shade as higher than 2 meters (tree, wall, eave) with material that allows no transmission and no porosity. The results provided visual data of all the shaded zone during the study period. It is further classified as long shading or short shading time and compared with the position of users found during observation. Secondly, the wind flow simulation is based on the monthly data of an average velocity and wind direction during the same time of observation. This simulation uses Autodesk Flow Design plugins to generate air movement, speed and pressure constant on the sites. This software utilizes the CFD techniques consisting of the LES turbulence model and the Navier-Stokes equations to simulate airflow. The models were built within its urban settlement, considering windbreak on-site as elements higher than 2 meters (tree, wall, eave) and omitting the material surface of all physical elements. Also, a wind tunnel was built for all models at full scale in the computation domain on a ratio of 4L-3W- 3H (length-width-height) with a mesh size resolution defined at 150%. Wind flow is simulated in full 3D at transient mode until it reaches the stabilized state to export results. The result provided visual data to classify as stronger or weaker compared to the average level of input and further compare with the position of users found on-site during observation. For the relevancy of using these plugins, (Gherri *et al.*, 2018) and (Sousa *et al.*, 2015) compared these tools with others and proved that the results are viable for the level required for this study.

Configurations in each area by the combination of Zone/Boundary and Shading time/Wind flow

From the combination of features of physical elements and environment, five configurations are found. As shown in *Table 2*, these configurations correspond to the areas of: Open space (COa, COb), Garden (CGa, CGb) and Rest area (CR). Aside from the distinction by activities, all configurations are differentiated between each other by all the parameters related to features of physical elements such as height, texture, enclose and green and features of environment based on Shading time and Wind flow. The characteristics of each configuration are mentioned as follows. Firstly, in the area of Open Space, COa and COb are differentiated between each other by all the parameters related to features of physical elements such as height, texture, enclose and green.



On the other hand, it shares some similarities in terms of No change in short shading time while COa presents no change during weak Wind flow, and in the case of COb, it exists a change between weak and strong Wind flow. Secondly, in the Garden area, CGa and CGb are similar in terms of height, texture and green while having different enclosures. As a consequence, these configurations share the same behavior in terms of environment, such as the existing change between short and long Shading and between weak and strong Wind flow. These characteristics showed a strong dependency on the condition of weather. Finally, in the Rest area, the configuration CR with the most enclosed space presents no change in long Shading time and strong Wind flow. This configuration characteristics shows less dependency from the weather variations due to the enclosures.

Table 2. Configurations in each area based on variation of settings.

Area	Features of physical element											Configuration of Zone/ Boundary & Shading time/ Wind flow	Features of environmet		
	Height			Texture			Enclosure			Green			Shading time	Wind flow	
	Low	Medium	High	opaque	Porous	Floor change	None	1 side	2 sides	3 sides	None				Present
Open Space	•						•	•						No change in short Shading time	No change in weak wind flow
	•					•		•							
		•		•					•			•			
			•		•				•			•			
Garden		•			•				•			•		Existing change between short and long Shading time	Existing change between weak and strong wind flow
		•				•			•			•			
		•			•						•	•			
		•				•					•	•			
Rest area		•		•							•	•		No change in long Shading time	No change in strong wind flow
			•		•						•		•		

4. TANGIBILITY OF SPATIAL AFFORDANCE

From the previous research by the authors (Nguyen-Tran & Murata, 2020), Spatial Affordance has resulted from the combination of Zone/Boundary and Shading

time/ Wind flow. This chapter purposes to identify the variation of Affordance in different weather conditions and show the effect of such variation on Spatial Qualities through Usage and Image of Identity.

Characteristics of configurations in each area in terms of Spatial Affordance

As previously shown in the framework (*Figure 1*, the Quality of the Rooftop Garden is discussed based on the variations of Spatial Affordance within different weather. Also, from another publication by the authors on the factors of Spatial Quality (Nguyen-Tran & Murata, 2018), the Quality of the Rooftop Garden could be understood through three main factors consisting of Spatial Affordance, Usage and Image of Identity. Hence, this part of the study will explain the change in terms of Usage and Image of Identity resulting from the Spatial Affordance of Configurations in each area. From the analysis of the previous sub-chapter, each area's configuration consisted of different Spatial Affordance characteristics, which will be different in sunny weather and no sun weather (as described in *Table 3*). The configurations of COa-COb-CGa-CGb-CR corresponded to Q1-Q2-Q3-Q4-Q5 in sunny weather and Q1'-Q2'-Q3'-Q4'-Q5' in no sun weather, respectively. The Qualities that differentiate between sunny weather and no sun weather are also defined by the Usage and Image of Identity as illustrated in the photos. For example, in the case of the configuration in open space such as COa of low height boundary with change in floor material present no change in short time Shading and weak Wind flow. This configuration could afford variable usage and preference on scenery in time of sunny weather as a Natural Open Space (Q1) but will change to afford more physical activity during cloudy weather and completely inaccessible during rainy weather (Q1'). Besides, the configuration in Garden CGa is strongly dependent on the weather change but in terms of Spatial Affordance, this configuration shows a less drastic change in Usage and Image of Identity between different weather (Q3 and Q3').

On the other hand, the configuration in the rest area CR with an enclosed boundary and present no change in long Shading time and strong Wind flow shows an important change in terms of Quality. As explained by Q5 to Q5', a variable Usage with preference in Q5 turn to be a Usage with bad opinion and an average Image of Identity in Q5', which transform the Quality of this configuration from a Shaded rest area to an Isolated rest area.

Sequencing Spatial Qualities by Spatial Affordance

Finally, to determine how the Spatial Affordance could influence the Spatial Qualities, the users is observed moving between each area of Open Space, Garden and Rest area within different weathers. As shown in *Figure 2*, in a general situation, the relationship between each Spatial Quality is affected by the weather, which in No Sun weather appears with less connection compared to the ones in Sunny weather. There are various changes in connection between each area however the connection between COa and COb is maintained despite

Table 3. Spatial Affordance affecting Usage and Image of Identity during different weathers.

Config.	Characteristics in terms of Spatial Affordance	Sunny weather		No sun weather (cloudy, rainy)	
		Spatial Quality	Usage and Image of Identity	Spatial Quality	Usage and Image of Identity
COa	- Low height boundary, change in floor material - No change in short time Shading, weak wind flow	Q1: Natural OS	- Usage variable - Image of Identity with reference on scenery	Q1': Outdoor playground	- Multiple usages, physical activities - Variable image of identity
COb	- Medium height, semi-enclosed, various material - No change in Shading time and Wind flow	Q2: Semi-outdoor OS	- Usage variable - Image of identity variable	Q2': Multi-purpose OS	- Usage variable - Image of Identity with reference on artificial landscape
CGa	- Medium height boundary, present of green - Change in Shading time and Wind flow	Q3: Corner Garden	- No majority in usage - Image of Identity with reference on green scenery	Q3': Leisure Garden	- Usage focus on passive activity - Image of Identity with reference on green scenery
CGb	- Medium height boundary, more enclosed with green - Change in Shading time and Wind flow	Q4: Shaded Garden	- Usage focus on passive activity - Image of Identity with reference on green scenery	Q4': Separated Garden	- Usage variable - Image of identity variable
CR	- Enclosed boundary, various change in floor material - No change in long Shading time and strong Wind flow	Q5: Shaded rest area	- Usage variable - Image of Identity with reference on artificial landscape	Q5': Isolated rest area	- Usage variable with bad opinion - Average rating on Image of Identity

the variations of weather. In detail, several findings related to the situation of each rooftop garden are explained in the following:

1. In some rooftop gardens, depending on the weather condition, some sequences between Spatial Qualities are more enhanced in sunny weather than the no sun one, like in the case of Kitte and Omohara. For example, In Kitte, the continuity from COa to CGa lost its in-between sequences from Sunny to No Sun weather. It is explained by the least presence of elements with eaves on the site, and the most unchangeable Spatial Affordance happens around the glass handrail providing Spatial Quality for the user. Also, in Omohara, Q2 stays at the center of the distribution in sunny weather while Q2' is found on the same level as other Qualities in no sun weather. This finding has resulted from the auditorium being as centrality with most of Spatial Affordance provides eaves. Due to the proximity between each quality, variations of Spatial Affordance in the case of No Sun weather seem to be overlapping, providing fewer sequences of Qualities for the user.

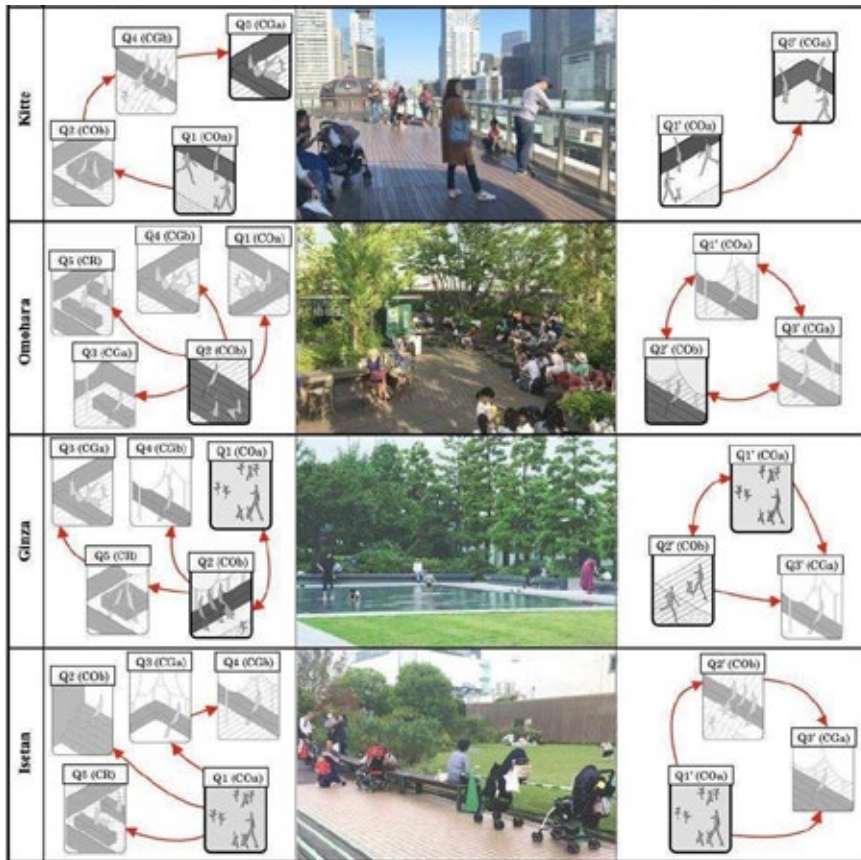


Figure 2. Spatial Affordance influence Spatial Qualities under weather uncertainty.

2. For Ginza and Isetan, at first glance, two sites appear to propose the same flow of sequences, which accentuate the COa as the central position and provide diverse sequences to users. However, the variations of COb found at the edge of open space express the distinguished intention in design between the two sites. Ginza gives attention to the configuration of Spatial Affordance to keep the variations within control, also preserves the sequences between Spatial Qualities in both kinds of weather. Even though the border of the open space is homogenous on all sides, the Spatial Affordance of the water pond and lawn space with no separation steps could stimulate users in disregarding the weather. In Isetan, by another approach, the focus is on the seasoning garden and emphasizes the change in season. The configuration of COb with fewer eaves also blurs the limit between space. It can be concluded that in these case studies, the design focus on maintaining the relationship despite the weather change while preserving a variation in terms of Spatial Affordance.

3. It shows that by following the variation of Spatial Affordance, the designer could envisage sequencing the Qualities of Rooftop Garden in different weather. The Spatial Affordance present a certain level of tangibility that is predictable under the weather change and further affects the Usage and Image of Identity for the users. These findings insist that the design of Rooftop Garden with integrated green spaces need to give attention to the variations of Spatial Affordance and how sequencing the Spatial Qualities under weather variations.

Tangibility of Spatial Affordance during restriction times

The situation of post-pandemic cities in terms of COVID-19 has put multiple restrictions on urban living. Even though access to open green spaces has become the new priority for urban dwellers, especially since 2020, the situation of rooftop gardens is different. The situation of the rooftop gardens that belong to private firms is contradictory become more restricted due to their position connecting to other retails and businesses that belong to the same mix-used building. A recent survey has been done during September 2021 to collect the changes concerning the area configuration of the roof garden in 4 case studies. It can be firstly remarks that during the restricted times, the number of visitors in each roof garden is widely decreased but there are still visitors frequent these spaces. Also, some of the gardens have implemented new features and limitations to control the access and maintain the safe distance between users. For example, during the state of emergency, Omohara has limited the number of people on roof garden while Ginza have denied access to the roof. Other new features such as signage and fence were introduced to avoid the access to lawn space and water pond in Ginza and Isetan. However, the tangibility of Spatial Affordance can be found in all case studies that certain usage and image of identity still preserve. In the smaller size roof gardens such as Kitte and Omohara, the design with a central space such as the auditorium or long corridor has maintained its Spatial Affordance even during restraint conditions. On the other hand, design with high openness and flexibility like in the case of Ginza and Isetan found difficulty in maintaining the engagement from users during social distancing. The new features such as fence and signage to restrict the access toward users have been affected the level of affordance, therefore affecting the usage and image of identity of the roof garden.

5. TOWARD SUSTAINABILITY IN THE CLIMATE CHANGE ERA

From the above findings, the study has clarified the relationship between user-space-environment for a complementary investigation of Rooftop Garden in Tokyo during this transition period toward a sustainable city. It is conceived as the first necessary step to find a new way toward a sustainable future in compact cities by focusing on the users' well-being. Regarding the scope of research, it

is limited to only four case studies among the vast potentials of urban public space in Tokyo, during a specific period chosen according to characteristics of each case study and the numbers of the sample are limited due to various fieldwork parameters. However, it demonstrated certain trends that could be useful to predict the situation of Rooftop Garden and other public spaces strongly influenced by the unpredictable natural environment. Regarding the method of study, the findings contribute to the planning of new public spaces in urban planning projects and facilitate the conversation between different professionals during the discussion on sustainable development. By focusing on the variations of Spatial Affordance, future projects of public green space in compact cities could guaranty flexibility in terms of weather uncertainty while offering a diversity of sequences for all users in different kinds of situations. This study hopes to generate a new way of apprehending interdisciplinary research of user-centered approach in the built environment while making use of new perspectives and technology of collection data to enrich the knowledge and attention given to the quality of urban public space and urban living.

Our lifestyles and life in the cities are changing at a quick pace. Urban regeneration is required to be more flexible, mobile and sustainable, the design of Spatial Affordance in contemporary urban green space in Tokyo needs new attention toward the user to give opportunities engaging to social practice as preserving the identity of the Japanese experience while adopting the global vision on sustainability. Furthermore, this initiative will enhance the urban dwellers' relationship to the natural environment in compact urban structures while caring about their well-being. By rooting on the importance of green space regarding the current situation of pandemics and the implementation of SDGs, this initiative gives opportunities to urban dwellers to engage in social practice as preserve the identity of community resilience while adopting the global vision of sustainability. In a metropolitan like Tokyo with a hybrid landscape, mix-used, and continuously evolving settlement, the importance of green space within the notion of sustainability is extremely important. It demonstrates the values of attractiveness, diversity and livability in which compact cities are experimenting with the contemporary urban green space to improve the daily life and recreation for the busy urban citizens according to the vision of SDGs.

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17 / TOWARDS A DUAL RESIDENTIAL SCENARIO AND THE DISAPPEARANCE OF THE INTERMEDIATE SITUATIONS

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ABSTRACT

During the sixties, Jahn Gel and Jane Jacobs's contributions with complementary visions resituated the importance of proximity, closeness, and even physical contact as a basis for public space. Jacobs focused on the use of parks by citizens, Gehl on the construction as a basis to generate visible spaces. Later on, William H. Whyte tested the importance of small urban spaces as a paradigm of the city through theory and practice, which were essential for coexistence.

The intensity of the COVID19 pandemic reflected the necessity to establish other residential and coexistence models; for years, density was the solution for many urban problems, including sustainability. This starting point fell into crisis due to COVID-19; urban density increases the risk of infection. Above all, it has no sense if we annul a way of life which does not dedicate much time at home; also, there is a high dependency on services and spaces offered by the State. Daily areas such as kitchens and living rooms have changed by domesticated streets. In different countries and with different intensities, a process for eradicating vehicles started with the occupation of urban users -residents and visitors; the COVID19 crisis was the ending point.

During April and May 2020, just some days after global confinement, a public opinion survey was conducted in nine Latin American countries to study the first reaction to a lockdown, which affected 81% of more than 12000 respondents.

The methodology was quantitative, exploratory, and descriptive; by an auto administrated online questionnaire; they asked participants about perceptions related to their homes, consumption, access to services, neighborhood relations, jobs, and public space. Analysis of these factors allows us to get closer to a change model that appears to be happening in the urban area.

The main results of this survey are: - Population hardly trusts government capacity when it gets to the application of demanded measures - The majority of respondents want their city to be greener (93.8%), to have more pedestrian zones and closer services (82.3%) - Young population (highest percentage) agree to implement urban changes in their cities - Country where participants live influence perceptions on urban space - 56% of the respondents buy in nearby shops or grocery stores.

Conclusions highlight a new model close by that will go towards a dual scenario. On the first, a new urban center with equal density, greener, and with more pedestrian zones; less human-based. On the other, the emergence of a new type of residents: disperse, but digitally connected, with nearby resources and less density; this anticipates a new problem in the intermediate spaces, new urban outskirts, which nowadays seem to lose their existing reasons after many years concentrating the highest population growths.

Keywords: Physical contact; Public space; COVID 19; urban space.

1. INTRODUCTION

According to the World Health Organization (WHO), in March 2020, from the first cases detected in the Chinese city Wuhan in December 2019, the health crisis of COVID19 has rapidly spread around the world to become a global pandemic. The worst moments produced economic, social, and political instability in the pillars of several societies that exceeded the pandemic virus. The impact of the pandemic exhausted the health sources and health systems, which in many cases were already weak for the financial crisis of 2008; also, it has been a radical challenge in economic, psychological, and public management terms (Boscá, Domenech & Ferri, 2020; Ranero, 2020).

Overall, to retain the virus spread and with different grades of intensity, the government adopted actions; for example, the most highlighted were keeping the “social distance”; mobility restrictions; and application of lockdowns.

These three measures infringe directly upon the urban lifestyle characterized by the density, multi-scale hypermobility, and the configuration of a space model designed for and by the inland means of transportation according to production, consumption, and leisure logic (Córdoba-Hernández, 2020); application involved the adaptation of a new way to understand space, not only from the urban view but also from the domestic.

From the city's approach, the health crisis challenged the suitability in quantity, quality, and localization of elements such as green and leisure areas; it also revealed the importance of having public services and basic economic activities close to homes.

It was not related to new theories because these were concepts already stated in the city-garden proposal from more than a century ago and in the last years have returned importance by the biophilic design theories, personal space theories, or Prospet-Refuge Theory and other strategies to prioritize health and wellness (Flander & Miller, 2020).

On several occasions, the "social distance" required to make pedestrian zones or to readapt inland spaces for the citizen's use; also, has been observed the flexibility of the use of areas in favor of catering and other tertiary activities (Rojo Cerón, 2021), under the argument of supporting the local economy; even there was a change of mobility paradigm accepted (Sumatra et al., 2017), the new reoccupation of the public space obligated to reconsider priorities.

This crisis has also meant a strong change in understanding housing and new relations with the domestic areas (Asta, 2021; Villalobos, 2021); lockdown has allowed revaluing domestic spaces like balconies, terraces, or common areas that, in several cases, are infra-used (Marcus et al., 2020).

Furthermore, the border between the private and the public space has become more permeable and interchangeable, making unnecessary the tags and assuming the virtues of "Everyday Urbanism" (Chase et al., 1999).

Almost in a parallel form, telework and other labor activities filtered in our homes, claiming new uses of space; as a consequence of this, it is necessary to explore new places to work. Also, new production mechanisms in which social coexistence has more relevance (Müller, 2021); the border between the domestic and productive space has become unquestionably more porous, which has resulted in one hand, assuming a new tendency of socialization in the work ambiance and pace and on the other hand, the overlapping of the productive sphere and the domestic assume the convergence in a unique space, housing, which roles were associated to specific areas differentiated: father/mother, househusband/wife, worker, friend, coworker, etcetera.

The colonization of the domestic area by new relocated work methodologies has allowed different perspectives of genre about housing; works from Bonavitta and Wigdor (2021) have revealed the existence of an overcharge on care and domestic labors and telework assumed by women in lockdown and social isolation contexts. Also, it allowed visualizing its importance, even before the pandemic, to change the functioning logic on a world's level (Koolhaas, 2020). This work explores some of the partial conclusions obtained from the project

“Emergent cities” developed with the cooperation of nine Latin American institutions in Argentina, Brazil, Colombia, Chile, Ecuador, Mexico, Portugal, Peru, and Spain. This academic institution net was designed some weeks after the almost total lockdown in March 2020; this net launched an online questionnaire about promoting the first impressions of it 81% of the 12 000 participants were affected for this measure.

This questionnaire contained varied questions related to the COVID19 impact in homes, consumption, and access to certain services, neighborhood relationships, work, or use of the public space. However, this work has two fundamental objectives. First, to analyze the interviewees’ vision related to the public space in the framework of the Public Politics adopted to mitigate the COVID19 spread and the window of opportunities that opens to introduce improvements in the approach and management of the city. Second, as a consequence of the partial results obtained until this moment, we would like to explain with reflexive and speculative tone certain elements that suggest a paradigm’s change in the preferences of settlement; this moves forward the consolidation of two housing profiles very different. In one, a localized one in the urban downtown and the densest zones of the city; in the second, a profile settled in the peripheries; this polarization would increase in the average zones, which have led generally in the urban growth the last years.

2. METHODOLOGY

The large-scale online survey conducted in April and May 2020; obtained more than 10 thousand answers; in all countries, the 1,000 questionnaires generated a total base with more than 700 000 data.

The methodology of this research is quantitative, exploratory, and descriptive; as stated before, this work analyzes the public space, studying which urbanity and sociopolitical changes are desirable by the interviewees; also, their perspective to execute these changes.

In this sense, and being conscient of the unique opportunity that the current situation of the global pandemic to introduce changes in the urbanity approach, the participants are questioned for what things would they change in the public space management of their cities and if they consider that those changes are possible in going back to normality scenario when finishing the global pandemic. Therefore, we aim to know what model of the future city is desirable by the interviewees and how desire and change expectation is conjugated.

Categorical questions are combined with dichotomous and polyatomic questions, using rating and suggested answers. Nominal scale and Likert questions helped explore data in specialized software (SPSS). In this way, the questionnaire

required interviewees to show their opinion (Totally disagree, Disagree, Not agree nor disagree, Agree, Totally Agree) related to these items:

- I would like the city to be as before
- I think the city will be as before
- I would like the city has more restrictions on accessibility
- I think there will have more restrictions on accessibility
- I would like the city to be greener
- I think the city will be greener
- I would like the city has more pedestrian zones and proximity
- I think the city will have more pedestrian zones and proximity
- I would like the city has more control over residents
- I think the city will have more control over residents

Some representativeness parameters and sample bias are adjusted because this is a non-stratified online questionnaire. Age groups under 20 and up to 65 were eliminated, because of the poor representativeness in the sample.

Items are into two variables. In the first, we refer to the variables related to the access restrictions, control over citizenship, and the coming back previous to the COVID19 crisis as Sociopolitical Changes; in the second, variables related to a green city, with pedestrian zones and proximity as Urbanity Changes (*Table 1*).

Table 1. Organization of the variables into two differentiated groups.

Sociopolitical Changes	Urbanity Changes
The city will be as before	The city will be greener
The city will have more restrictions on accessibility	
	The city will have more pedestrian zones and proximity
The city will have more control over residents	

3. ANALYSIS

When asking interviewees to imagine their ideal future city, they prioritize those changes related to urbanity issues. Table 2 shows that 82,3% of them would like their city to have more pedestrian zones and proximity, and 93,8% would like the city to be greener.

However, the suggested sociopolitical changes do not promote much consensus, related to increasing control over residents has more support (51,2%). The

expectations of the execution of changes, in a future scenario postCOVID19, present separation of a group into two variables: the expectations of change in urbanity (pedestrian zones and proximity and green areas) are notoriously low (29,7% and 29,1% respectively), mainly because the high consensus generated in favor of it; this means that it would exist a great desire for change in this sense, but also, a lack of expectations that these changes would consummate.

Table 2. Summary of the descriptive analysis of the interviewees' perception of a future city.

	Statements	% of answers		
		Agree	Not agree nor disagree	Disagree
Sociopolitical changes	I would like the city to be as before	26,9	23,6	49,4
	I think the city will be as before	39,2	22	38,8
	I would like the city has more restrictions on accessibility	36,7	24,7	38,6
	I think the city will have more restrictions on accessibility	39,1	29,2	31,7
	I would like the city has more control over residents	51,2	18,9	30
	I think the city will have more control over residents	37,8	33,7	28,4
Urbanity changes	I would like the city has more pedestrian zones and proximity	82,3	13,2	4,5
	I think the city will have more pedestrian zones and proximity	29,7	36,9	33,4
	I would like the city to be greener	93,8	4,8	1,4
	I think the city will be greener	29,1	36,9	34

Source. Own elaboration.

Expectations related to the variables grouped under Sociopolitical Changes are slightly higher than those of the Urbanity Changes group; same as the two items of the last group, expectations on Sociopolitical Changes are also pretty homogeneous. However, it is possible to identify small shades; for example, the item that states the possibility to have higher control over residents, as we have seen before, promotes a high consensus in favor (51,2%).

Nevertheless, expectations on having more control over residents are inferior (37,8%); in the case of the other two items (“I think the city will be as before” and “I think the city will have more restrictions of accessibility”) expectations on change still are very modest, they are superior to the desires that they materialized (39,2% and 39,1%, respectively).

To synthesize, we can point out a high consensus and desire to change the urbanity feature (more pedestrian zones in the city, closer services, and greener areas);

but the expectation that these execute is significantly small. Also, sociopolitical changes (“The city will be as before”; “The city will have more restrictions to accessibility” and “The city will have more control over residents”) promotes much less consensus, even the expectations that these changes materialized are a little more optimistic, but still notoriously low.

Therefore, three of the five changes proposed are not perceived as possible by the population. In items “I would like the city has more control over residents”; “I would like the city to have more pedestrian zones and proximity”; and “I would like the city to be greener” the majority of the interviewees consider that their desires are not going to fulfill. In other cases, items “I would like the city to be as before” and “I would like the city has more restrictions of accessibility” have a higher percentage on answers related to materializing these beyond their desires.

The proposals of the sociopolitical changes group are complex to interpret; being perceived as possible and desirables, or negative and undesirables, depending on the social, historical, and political context of the city.

It is important to remember that this research formulated questions at the beginning of the lockdown and during one of the most dramatic peaks in the pandemic. These may explain, for example, the high expectations in items “I would like the city to be as before” and “I would like the city has more restrictions on accessibility” due to interviewees may think in coming back to normality before the pandemic, and this would suppose an increase on restrictions. Similarly, the desire of one part of participants to increase control over residents may respond to make the guidelines effective to try to control the virus; in this sense, control would be on topics related to health management. Either it cannot be eliminated that, in some Latin American countries, the concept of control could be perceived as positive, as a form to reduce the high levels of street insecurity.

The significant difference between the desire for change and the belief that change will materialize is in the Urbanity Changes group; as stated before, those changes are the most desirable for the interviewees. The fact that there is a high expectation to materialize these changes might be related to the perception of the political class priorities; in this way, the population may perceive that government does not bet for urbanity politics or does not involve enough in them for improving the city.

4. DESCRIPTIVE ANALYSIS OF THE POLARIZATION BY COUNTRIES

With results described in a general way, participants’ answers helped to observe differences by countries; on desirable and expected changes in the future post-covid city; to do this with clarity and to see the polarization of the future city.

Two categories of analysis were created and pondered on 100 to facilitate comparison. One of them has answers on levels “Totally agree” and “Agree” and the other group with levels “Totally disagree” and “Disagree”; subsequently, to observe the polarization between countries about their desires and beliefs of a future city.

If the difference between the two categories is high, it means less polarization. Also, the sign indicates the type of answers with more cases: if it is positive, the most preponderant answer, it means that interviewees disagree, and if it is negative means they agree.

Table 3. Polarization of the desire for change between countries.

Polarization of the belief		Statements				
		I think the city will be greener	I think the city will have more pedestrian zones and proximity	I think the city will have more restrictions on accessibility	I think the city will be as before	I think the city will have more control over residents
Country	Spain	10,25	5,60	-14,68	-14,06	-24,19
	Argentina	10,43	20,71	-1,87	-13,69	0,59
	Chile	14,95	15,16	2,78	-3,63	-10,18
	Colombia	-2,27	3,74	-25,90	3,72	-14,24
	Peru	-8,57	-7,44	-53,15	23,09	-33,23
	Ecuador	-20,55	-8,17	-30,13	16,80	-26,75
	Mexico	5,79	16,63	13,21	-13,21	12,78
	Portugal	9,24	3,65	-3,01	-3,01	10,24
	Brazil	23,70	-26,38	2,81	2,81	-17,72
Polarization of desire		Statements				
		I would like the city to be greener	I would like the city to have more pedestrian zones and proximity	I would like the city to have more restrictions of accessibility	I would like the city to be as before	I would like the city to have more control over residents
Country	Spain	-91,36	-75,07	0,00	2,05	18,91
	Argentina	-84,02	-57,61	8,47	8,47	-12,62
	Chile	-93,81	-80,43	13,58	25,46	3,56
	Colombia	-92,66	-77,40	-16,84	39,89	-48,13
	Peru	-95,97	-83,61	-20,76	46,44	-59,48
	Ecuador	-94,42	-75,69	-22,01	24,66	-60,90
	Mexico	-95,72	-80,77	-3,00	20,74	-29,65
	Portugal	-88,84	-83,95	22,76	6,89	25,04
	Brazil	-94,93	-81,30	26,21	29,25	-38,33

As observed in table 3, variables with higher polarization by country are in the Sociopolitical Changes group; this means that there are considerable differences between the number of persons that reject more restrictions in the city, that

city will be as before and the city to have more control over citizenship, and the number of persons that desire these measures.

Also, comparing values of each variable per country, it can be observed that there are significant variables among them; this indicates that polarization of the population about these issues is not only national, it is also international.

In this way, it is possible to appreciate that Spain (0,00), Argentina (8,47), and Mexico (-3,00) are the countries with more polarization on the desire of increasing the access restrictions, mostly disagree on the two first and agree on the last.

Spain (2,05) and Argentina (8,47) are, one more time, the countries with higher polarization in the item on the desire of the city to be as before; most of the answers disagree with the statement; also, Portugal (6,89) have the majority against it.

For last, about the desire to increase the control over residents, Chile (3, 56), Spain (18,91), and Argentina (-12,62) are the countries with more polarization being in disagree with the first two and agree with the last. In this way, it is interesting to highlight that Spain and Argentina are countries with higher polarization about the desire to apply the sociopolitical changes.

Following this line, it is also necessary to consider which side are desires of most of the countries pondered. The difference is positive in all cases of the variable "I would like the city to be as before"; most of the population of each country agrees with the statement.

In variables "I would like the city to have more access restrictions" and "I would like the city has more control over residents" the sign of difference is not homogeneous; this varies according to the country, which means that there is no consensus in countries. In the last two variables, there is no consensus in the countries; even in the first, there is polarization, all of them are mostly agree.

On the contrary, variables of Urbanity Changes do not present polarization by country. There are no considerable differences among the participant countries in the number of persons who want a greener city with more pedestrian and proximity zones and the number of people who reject these changes.

Also, it is significant to consider that all numbers of those columns have a value close to 100, this means that there are no significant differences between countries related to this issue, excepting -57,61 in Argentina in the variable "I would like the city to have more pedestrian zones and proximity" being the only country that considerably differs from the rest. The sign of difference is negative; in all cases, it means support by the majority of the population in countries to apply these measures.

Table 3 shows polarization, which in all cases is considerably higher in variables of Sociopolitical Changes and Urbanity Changes groups. If participants consider these changes would be executed in their cities, further than their initial desires. Peru is the only country with a score higher than 50; in the variable, “I think the city will have more restrictions of accessibility” compared to the rest of the items and countries, there is a high consensus.

Related to the side of the scale in which are most of the answers, the signs of differences are not homogeneous in any variable, which means that there is no kind of consensus among countries; the existent polarization is national and international; also, it is significant enough to not perceive it as trust or untrust. This means that different from the desires of change, there is no consensus in trusting the application of changes.

It is time to observe which countries present higher polarization. According to the obtained variables of the “Sociopolitical changes” group, item, “I think the city will have more restrictions on accessibility” presents a higher polarization in Argentina (-1.87), Chile (2.78), and Portugal (8.91), the majority of the population of the first country is in favor and the last two, against. In the case of item, “I think the city will be as before”, countries with higher polarization are Brazil (2.81), Portugal (-3.01), and Chile (-3.63), the first mostly against and the last two in favor. Finally, item “I think the city will have more control over residents” presents higher polarization in Argentina (0.59), Portugal (10.24), and Mexico (12.78), being the majority against Argentina, the most polarized from all table.

Also, related to variables of the “Urbanity Changes” group, Colombia (-2.27), Peru (-8.57), and Mexico (5.79) show a higher polarization in item “I think the city will be greener”; most of the interviewees of the first two countries are in favor of the statement, but Mexico seems to disagree. Finally, item “I think the city will have more pedestrian zones and proximity” are Portugal (3.65), Colombia (3.74), and Spain with higher polarization with the majority of the answers against the proposal states.

It is possible to affirm that national and international polarization of the future city perception is much higher in expectations of execution of the desired changes than in the own desire of changes. This means that the population may get a consensus on what changes would they like to introduce in their city, but hardly would organize to agree on the real capacities of the government to execute these changes; the public opinion seems to be very polarized on trust on the political class, being the majority hopeless about it.

4.1 New models of the space occupation in the city post-covid conclusions

Once presented and analyzed data, we can extract some fundamental conclusions. Data seem to indicate a lack of general trust (or hopelessness) from the population on the capacity of government to conduct desirable changes, especially in the case of suggestions of the Urbanity changes group.

In this sense, it is interesting to highlight the percentage of interviewees doubting their answers (it means, they don't agree to disagree) in the statements "I would like..." than in "I think..."; this may be because it is simpler to have certainly in what population desire for the city than in what is possible to do. After all, this depends on third actors, for example, the public management.

Taking into consideration the pandemic context and lockdown of the interviewees at the moment of answering the questionnaire, the lack of trust may respond to a negative perception of the government performance to manage pandemic and the perception that measures not related to this management, like the urbanity, may not be priorities to the political class.

This work has demonstrated with an analysis per country; those items of the Sociopolitical Changes indicator register a higher polarization among participants. There is a high level of discrepancy in the number of persons that reject the city has more restrictions, to be as before and to have more control over citizenship and the number of persons that desire these measures, in internal and among the different countries. Spain and Argentina present higher polarization on the desire to execute sociopolitical changes such as increasing the restrictions of accessibility, to be the city as before, and increasing control over residents. However, there are significant differences among countries on variables from Urbanity Changes. Between the number of people desiring their city to be greener, to have more pedestrian zones and proximity, between the number of people that reject them.

From a more territorial perspective, there is a strong dissent if participants think that the suggested changes will execute in the future; this may mean that different from the desire for changes, it is not achievable to observe any consensus on trust on the application of changes.

In summary, if we analyzed data by age by country, with shades and particularities already presented, there is a certain consensus about desires to imagine a city greener with more pedestrian and proximity zones. However, there is a significant disagreement on the relevance of introducing changes related to control over residents, on having more restrictions of accessibility, and to returning normality previous to the pandemic. This difference may emerge from a complex perception of concepts like "control" and "restriction" that could have different connotations

among the several participant countries, in this way; they may not be understood in the same way, for example, in countries like Portugal and Spain in one side, and other Mexico or Colombia.

It seems to anticipate a dichotomy between those who reinforce the importance of the central city as a space of cohabitation, with substantial modifications in the public area and housing (Slim, 2021), and those unable to find what they are looking for in a dense city, intercede for open and healthy spaces far from the urban (Kleilein, 2021). The consolidation of this dual scenario, which still needs to be verified, would leave significant urban gaps, especially in the worst constructed borders of cities, unable to guarantee the social intensity of places with higher centrality and not enough green spaces to propound a healthy alternative.

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18 / ECOLOGICAL MOMENTARY ASSESSMENT OF THOUGHT VALENCE IN GREENSPACE AND INDOOR ENVIRONMENTS

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ABSTRACT

Time spent in greenspace is believed to provide mental health benefits (Ohly et al., 2016). Past research has specified what some of these benefits are, including attention restoration, mood (Kondo et al., 2020), and improvements in cognition (Schertz & Berman, 2019), but details as to why can be challenging to study. A more complete understanding of how greenspace aids mental health could do more than help individuals, especially during a pandemic. In many locales, stay-at-home orders made allowances for walking in public parks, since these areas allow for minimizing virus transmission risk. With other options for leisure unavailable, these resources saw increased use in many communities. Further, the pandemic caused people around the world to experience distress, anxiety, and other difficulties, while limiting access to mental health care. With this increased demand for greenspace, increased need for mental health support, and greenspace's resilience against pandemic lockdowns, the post-COVID era has the potential to be a golden age for public interest in and funding for greenspace. However, one key factor in framing greenspace as a public health resource will be understanding what greenspace's benefits are, and how they work. Theoretical background: Attempts to bring greenspace into a laboratory (e.g., using media), while informative, risk eliminating the multisensory features of time spent outdoors. Similarly, assessing how these benefits unfold in real time without disrupting them poses challenges. One solution is to use Ecological Momentary Assessment (EMA) (Beute et al., 2016). EMA can support a range of analyses on emotional valence data in human-environment interaction (Isenhower et al., 2012). With these issues in mind, our experiment aimed to replicate past findings that time spent in greenspace supported mood and explore the time-dependent change in these effects. Methods: Participants (n=18) were randomly assigned to an indoor or outdoor condition. In the indoor condition, participants walked on a treadmill holding the EMA device, which prompted the participants every 60 seconds by vibrating. When prompted, participants classed their current thought as positive or negative using the device. In the outdoor condition, participants walked

on a marked route through a college campus. Participants walked for 30 minutes. Results: Participants in the outdoor condition reported more positive thoughts than those in the indoor condition and this difference approached significance ($t=13.98$) = -1.90, $p = 0.079$). We additionally conducted a Growth Curve Analysis, which is similar to regression, but uses time as a factor (Singer et al., 2003).

We calculated the running total of mood reports for each individual (Positive = 1; Negative = -1). The model (Cumulative Mood = Condition x Time) showed a significant main effect for time ($t = 3.58$, $df = 523$) and no significant main effect for Condition ($t = 0.78$), indicating that the trajectories changed over time, but no overall difference between the two conditions. However, a significant interaction term ($t = 4.92$, $df = 523$) indicated that the difference between the two conditions developed over time. A plot of these trajectories shows the nature of this change [Figure available]. The trajectories show a clear separation, with those in the outdoor condition showing a more positive trajectory. We can further see that this effect obtained immediately, and that the trajectories only began to converge during the last several minutes of the study. Discussion: The convergence of the trajectories at the end of the study may have suppressed main effects. This may suggest that the mood effect is short lived, or that participants in the outdoor condition were unhappy to see their walk coming to an end, and those in the indoor condition were pleased to be finished. A longer duration version of this study (currently underway) aims to disambiguate this. Regardless, the experimental data are proof of concept of the applicability of EMA measures, together with time series analysis, for specifying under what circumstances greenspaces are salubrious, and what the mechanisms are behind these effects. Such understanding could prove important in securing public and government support for the allocation of more resources toward public greenspace, and providing the associated benefits for individuals, communities, and our environment.

Keywords: Greenspace; Mental health, Restoration; Public health.

1. INTRODUCTION

Options for leisure activities during the COVID-19 pandemic became substantially limited in many locales. Temporary and permanent closures of restaurants, bars, clubs, entertainment centers, and public spaces forced people to remain on their own property or in a limited number of outdoor spaces. In Idaho, USA, some of the first areas reopened after initial lockdown measures were public lands such as national forests, national monuments, and state parks (Boise National Forest - Alerts & Notices, n.d.). This coincided with emerging studies showing the relatively low risk of outdoor virus transmission due to an abundance of sunlight, air circulation, and space for social distancing (Freeman & Eykelbosh, 2020).

Indeed, outdoor recreation in public spaces is the ideal pandemic activity in many ways. It has been shown to boost mood (Kondo *et al.*, 2020) and attentional resources (Ohly *et al.*, 2016). Time spent outdoors may also help prevent infection in those with a vitamin D deficiency (Bergman, 2020). These resources are poised to become increasingly important in coming years. Continuing local surges in COVID-19 cases, the emergence of new variants, and the probable emergence of the next pandemic (Madhav *et al.*, 2017) will likely drive people outdoors repeatedly over the coming decades.

This may partially explain a surge in usage of public lands in the western USA over the past year. In Idaho, for example, a record number of visitors came to Idaho state parks, and National Forest usage fees increased by 27% over previous years (Corbin *et al.*, 2021). National forests, parks, and monuments, and other vast areas of public lands in the western USA offer opportunities beyond those afforded by city parks and walkways. Backpacking, river rafting, or horse packing through public lands allows for multi-day excursions and thereby provides a longer, more immersive experience which could compound the benefits of nature experience. For example, backpackers on 4-day excursions showed improved associative creativity after their outing (Atchley *et al.*, 2012). Hartig *et al.* (1991) used a quasi-experimental design with pre- and post-test measures to show a positive effect of extended wilderness experiences on happiness and proofreading abilities. These and other wilderness experience research studies are promising, but additional research is needed to further explore the extent to which larger-scale outings (ones that are longer in duration and take place in larger, more remote parcels of land) offer beyond “near nature” recreation. At what point during a one day, four day, or 14-day outing do these benefits take effect? And what process underlies them?

Such research presents some unique challenges. Much past research on benefits of greenspace used surrogates or components of greenspace such as pictures, sounds, or aromas brought into a laboratory setting, or Virtual Reality (VR) simulations (Valtchanov *et al.*, 2010). Since the salubrious effects of greenspace are believed to be driven, in part, by its immersive quality, these

approaches are somewhat limited. One solution is to use minimally invasive dependent measures for in situ research. Questionnaires, for example, can be administered after time in greenspace (Atchley *et al.*, 2012; Nisbet & Zelenski, 2011), but capture only the state of the participant at the end of the study. Portable electroencephalogram (EEG) devices offer rich datasets that can help pinpoint the specific times during a greenspace session that changes in brain waves occur. Such devices have shown that walking through greenspace areas is associated with healthful patterns of brain activity (Aspinall *et al.*, 2015). However, they can present a tradeoff between portability and precision (Bateson *et al.*, 2017), and may not be feasible for extended data collection (e.g., over a multi-day wilderness outing), and do not capture subjective measures.

One technique that has been suggested as uniquely suited to in situ studies on the psychological effects of greenspace is ecological momentary assessment (Beute *et al.*, 2016). This minimally invasive technique can be done with devices that are portable and have a long battery life, making them ideal for studying the benefits of extended trips into the backcountry. EMA additionally produces relatively rich time series data which lends itself well to a number of sophisticated analytical tools (Isenhower *et al.*, 2012), and could help indicate how long one is required to spend in greenspace before specific benefits are achieved. While there are several versatile EMA mobile phone apps available for this type of research, cell phone use in the wilderness areas can present challenges related to device durability, unreliable signals, and battery life. Additionally, one of the more valuable aspects of immersive wilderness experiences may be the break it provides with technology and connectivity (Beute, 2016). With this in mind, we designed a preliminary experiment that used a portable, durable EMA device to assess the effects of urban greenspace on the development of thought valence (positivity or negativity of thoughts) over the course of a short period of time, with the eventual goal of scaling this design up to study of immersive wilderness experiences.

2. METHODS

2.1. Participants

Participants ($n = 18$) were undergraduate students at the College of Idaho recruited through the subject pool and received partial course credit for participating in the study. Participants were randomly assigned into either the indoors condition where they walked on treadmill in a lab space or outside on a marked course through the greenspace of an urban campus. The walking portion of both conditions lasted 30 minutes.

2.2. Materials

The EMA device was a handheld box with dimensions of 9.7 x 4.6 x 6.4 cm. The box exterior featured an LED indicator light and two buttons, one labelled with a happy face symbol, and the other with a sad face symbol. Inside the box was an Arduino microcontroller which managed a vibration motor, the LED light, and input from the two buttons. A data logging shield recorded timestamps and participant reports on a micro-SD memory card. Two lithium-ion drone batteries supplied power. Every 60 seconds, the device vibrated and the LED was illuminated to prompt the participant to report. If no entry was recorded five seconds after a prompt, an additional prompt was given. Participants were also provided with a digital stopwatch to know when to return to the lab for debriefing.

The walking course consisted of two concentric loop routes through the greener, more scenic parts of campus. The course was marked on the pavement with spray chalk.

2.3. Procedure

Upon arrival, participants were provided a consent form with a description of the experimental procedure. Upon signing the consent form, they were given the instructions for their assigned condition (outdoors vs. indoors) and how to use the device. Participants were instructed to turn off their phones and store them in their pocket for the duration of the procedure. In the outdoor condition, participants viewed a map of the walking course and were instructed to follow arrows painted on the pavement that marked the walking course. They were advised to complete the larger loop first and the smaller loop second, and that if they got off the course at any time, they could either retrace their steps to return to the course, or continue walking according to their memory of the course on the map, approximating the course as best as possible. No participants reported difficulty following the course. Participants who completed the course in under 30 minutes were instructed to repeat the smaller or larger loop as needed. In both conditions, participants were instructed to choose a walking speed/treadmill setting that most closely matched what they consider a moderate walking pace. When the device vibrated, participants pressed the top button to indicate that their current thought was generally positive or the bottom button to indicate that it was generally negative. Upon completion of the 30 reports, participants completed the exit survey.

3. RESULTS

To first assess the effect of urban greenspace on overall thought valence, we conducted an independent samples t-test on the total number of positive

thoughts reported by each participant. Those in the outdoor condition generally reported more positive thoughts ($M = 18.9$, $SD = 13$) than those in the indoor condition ($M = 7.5$, $SD = 11.2$), and this difference approached significance ($t(13.98) = -1.9$; $p = 0.079$).

To help characterize the development of thought valence over the course of the trials, we coded positive reports as 1 and negative reports as -1 and calculated a running total of these values for each participant. Using these trajectories, we conducted a Growth Curve Analysis. The model (Cumulative Mood = Condition \times Time) showed a significant main effect for time ($t = 3.58$, $df = 523$) and no significant main effect for Condition ($t = 0.78$), indicating that the trajectories indicated overall increase or decrease over time, but there was no overall difference between the two conditions. However, a significant interaction term ($t = 4.92$, $df = 523$) indicated that the difference between the two conditions changed significantly over time. The nature of this interaction is apparent in *Figure 1*. The trajectories departed almost immediately, with the outdoor condition trajectory showing an early positive bias. However, the trajectories converge towards the end of the trials.

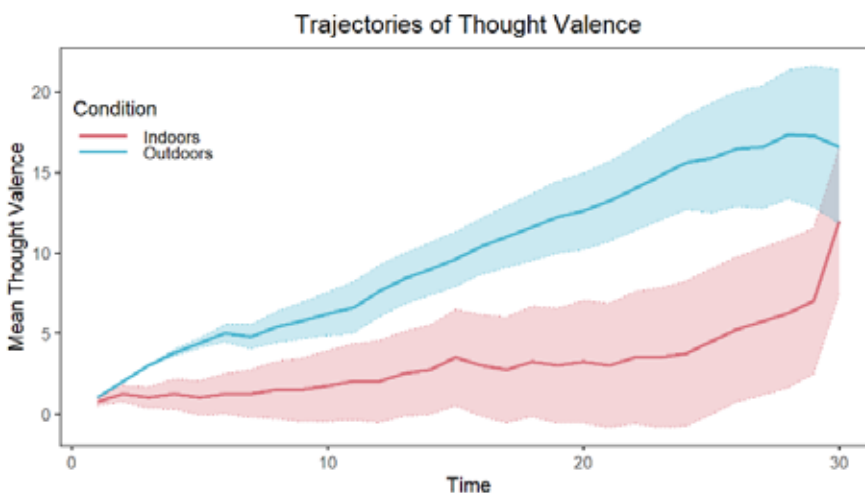


Figure 1. Mean running total of reported thought valences (positive = 1; negative = -1) by condition. Shaded regions indicate one standard error of the mean.

4. DISCUSSION

The primary goal of this study was to demonstrate the feasibility of a portable, durable EMA device with long battery life for in situ research of the benefits of extended outings in remote wilderness areas. Our design came close to replicating past research on overall mood benefits of greenspace (the difference approached significance only), but perhaps more importantly, yielded rich time

series data that provides a window into how this type of benefit unfolds. Some research, for example, suggests that benefits are gained after a minimum of 15 minutes outdoors (Park *et al.*, 2009). While this may be the case for some benefits, our time data suggest that whatever process supports thought valence benefits might begin immediately. Our data also show a curious convergence of thought valence trajectories toward the end of the study trial, suggesting either an effect that is either limited to periods shorter than 30 minutes or one that is sensitive to participants' knowledge that the end of the experiment is approaching. In other words, this may be indicative of participants having positive thoughts in anticipation of getting off the treadmill, and negative thoughts in anticipation of a pleasant outdoor walk coming to an end. It is worth examining whether this effect is due to a roughly 30-minute limit on these benefits or due to participant anticipation of the end of the experiment. We are currently conducting a follow-up study that uses two different trial lengths (20 minutes and 40 minutes) to reveal which possibility is at play.

In either case, an additional intriguing possibility is that this convergence itself may be temporary, and benefits of the time outdoors might continue in some fashion after the walk has concluded. This could be explored in another follow-up study in which participants continue carrying the EMA device for a period of time after the walking portion of the experimental session has ended. Other follow-up research could use a continuous reporting scheme in which participants hold the respective button down for a period of time that corresponds to the degree of valence of their emotion (e.g., for a strongly positive report, the participant would hold the button down for several seconds; for a slightly negative report, one second) (Isenhower *et al.*, 2012). Alternatively, a third button could be added to allow for the reporting of a neutral emotion, which would in turn facilitate additional analytical tools.

The current study has a number of limitations. Since participants were randomly assigned to either the indoor or outdoor condition, participants were advised to arrive at the experiment prepared to walk indoors or outdoors, and this may have revealed enough about the nature of the experiment to introduce demand characteristics. The study exclusively studied college students, and therefore may not generalize to other populations. Students in the outdoor condition participated largely unobserved by the researcher, and therefore may have engaged in activities or encountered circumstances which compromised the validity of their reports (e.g., they may have violated the directive to keep their phone off, or may have encountered a friend on campus, etc.). Data were collected primarily during the early fall, when weather in our region tends to be pleasant, and these results might not generalize to all weather conditions. Finally, there is evidence of individual differences in tendency to enjoy outdoor settings (Ojala *et al.*, 2019), and this may have impacted our experiment given our relatively small sample size.

Nevertheless, this experiment and its results demonstrate a way forward for investigating the benefits of extended outings in outdoor environments, especially in remote wilderness areas. Further research in this area may provide further incentive for federal, state, and local governments to protect and preserve wilderness areas that facilitate this type of recreation.

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ANTHROPOCENE AND NATURAL ECONOMY



19 / THE ANTHROPOCENE NEW CHALLENGES*

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ABSTRACT

The Anthropocene is a global phenomenon that manifests the planetary character of the huge ecological transformations resulting from human actions. Since the eventuality of climate change has prevailed, the Anthropocene is often seen as the time of predicting catastrophes, whether it be the astonishing acceleration of climate change, the collapse of biodiversity or the increasing development of pandemics. It seems that the development of these crises and their impressive capacity to destruction is based on the amnesia of anthropic environments, that is on the relationships of coexistence, dependence and attachment that gather human communities, their companies and their metropolises with local ecosystems. This is why the central issue of the Anthropocene is habitability, which makes it possible to maintain the conditions of existence and subsistence for a human community but also for other living beings which without them the human community cannot survive. There are three challenges that must be overcome to be able to operate in the Anthropocene. The first challenge is catastrophe: how do you manage to act in a disaster situation? How to restore a "sense of the possible" in these anxiety-provoking moments marked by this catastrophic prospect? To do this, it is necessary to provide feedback to better understand the mechanisms of catastrophes. The second challenge is territories: at what scale can we act? The Anthropocene is a global phenomenon but it is also a diverse phenomenon, which affects very differently, through its effects on their living environment, populations across the globe. Therefore, to re-territorialize the climatic problem and the Anthropocene's other problems is necessary, but these new territories, subsistence territories or bioregions, will be project territories which will "bring together" human populations and other living beings around a common project of habitability preservation. The third challenge is these living beings: who are we going to act with? The problem of their survival still encounters a lot of indifference by humans, it is the ecological crisis, a crisis of sensitivity which feeds on an impoverishment or even an extinction of our experience with Nature. To defend Earth's habitability in the face of the ecological crisis,

* Both authors have an equivalent contribution to this article's elaboration.

it would be necessary to find paths to living beings' attention, to become "biosensitive". Thus, we propose a research program to define a framework of actions for the State of São Paulo to be able to face the local consequences of the Anthropocene crises. The research program will experiment with participatory methods to define and implement solutions based on an integrated and participatory approach for resilient bioregions constitution that link territories, communities and ecosystems.

Keywords: Physical contact; Public space; COVID 19; urban space.

1. INTRODUCTION

How to live together? This questioning made all the difference in the posture and way of being as a researcher in the area of human and social sciences, in the engagement in implementing public policies for the anthropic environment and in environmental area militancy and, above all, as belonging to the human species. Thus, this questioning brought something else and deeper or at least suddenly led to the perception that something important was being forgotten and left behind... The experience of this sudden perception, which brings a mixture of discomfort for a possible "failure" and, at the same time, relief and joy for having had a perceptive experience that we can now, without a shadow of a doubt, translate into a poetic experience¹, immediately led to profound reflections which, in turn, led to a broad and controversial field called "The Anthropocene Age".

Until now, we can say that the environmental area work and militancy focused on the "human being", believing that if the production of this environmental crisis that we are experiencing today is the result of the economic development model adopted by "humans", it is this human being who needs to change his relationship with the world. Thus, living and working in a country with immense social inequalities, such as Brazil, led the work in the field of environmental education to clarify that environmental degradation issue refers not only to the environment biophysical degradation, but also concerns the social degradation, to human misery, as they are the result of the same economic development model that we have adopted. This approach sought, and still seeks, to bring the environment closer to people, as this is still seen as something distant and that "does not concern us".

Thus, we learned, over these years, that a broad conception of the environment that integrates the human being is necessary to understand, interact and

transform this reality. Broad conception of the environment understood in the way it is exposed by Milton Santos (1982), that is, an environment that contains both physical and social dimensions, the way in which human existence on the planet is organized within a systemic view, since it considers the space with all its fragmentary interrelationships, these fragments containing the interaction between the aspects: natural, build, social and cultural. Which means, above all, to reaffirm that the environmental issue cannot be treated in a fragmented way as has been done through sectorial public policies, pointing to the urgent need to develop a new paradigm capable of abandoning the purely objective conception of reality, reducing nature to an object and separating it from the human being.

However, the Anthropocene, with this question: How to live together? leads us to understand what would actually be this broad conception of the environment that does integrate the human being but also integrates, in the same way and with the same rights, other living beings and environmental entities on this planet. Thus, this change in vision leads us to an even greater challenge, going forward: "What will the coexistence between human beings and other living beings and all environmental entities be like?"

Yes, it is this human being who must be transformed, who must leave his anthropocentric position of dominator of "nature". In this sense, the Anthropocene is not to be confused with "Anthropocentrism", but it denounces and highlights the impacts of this Anthropocentric model.

This understanding has been gaining in breadth as shown by the joint IPCC/IPBES workshop, published on June 24, 2021, which argues that the two biggest challenges: climate change and biodiversity loss must be tackled together, not only in the scientific realm, but also in the political realm.

The 17th Venice Architecture Biennale 2021 (May 22 to November 21, 2021) brought this beautiful questioning, in other words, the theme was precisely: "How will we live together"?

These reflections brought by the Anthropocene makes you experience in practice the Buddhist principle, that one of this article's authors has been using for years in environmental education lectures, called "esho funi" (Ikeda, 2010) - inseparability of life and its environment. The spectrum of understanding has widened, and the challenge has become broader, but more complete, in which the struggle for Human Rights must walk hand in hand with the struggle for the Rights of Nature and for the Rights of all living entities that have no voice in this world dominated by humans.

2. ANTHROPOCENE CHALLENGES

The first allusion to the Anthropocene phenomenon was made by Michel Serres (1994), in his famous work "The Natural Contract" in which he mentioned the immense human plates formed by concentrated human beings that together constitute themselves in an overwhelming, almost geological force. This first approach allows us to characterize the Anthropocene as the era in which large-scale anthropic processes destroy our natural environment and, consequently, threaten the future of human communities. But Serres did not mention the Anthropocene explicitly in his book. The first to introduce the term Anthropocene was the Dutch chemist Paul Crutzen, along with the American ecologist Eugene Stoermer, in 2000, to denote a new geological era characterized mainly by the imprint of anthropic activities.

Since then, the notion of the Anthropocene has been widespread. However, it is not entirely satisfactory for thinkers like Bruno Latour (2020) and feminist biologist Donna Haraway (2017). Indeed, the Anthropocene hardly separates itself completely from the anthropocentric escalation resulting from humanism. Humanism is understood here as a vision of the world where everything revolves around the human being, just as everything revolves around God in the theological vision that preceded it. For Bruno Latour, resorting to Gaïa makes it possible to complicate this simplistic vision. With this narration, he relates the turmoil of the planet, under the effect of a complex of living entities and physical forces intertwined with one another, in such a way as to form a system that reacts to anthropic abuses. For Haraway, the Anthropocene should not be anthropocentric, as the human being acts geologically only with the help of very powerful agents such as bacteria and viruses, therefore, it is the set of organic species and abiotic actors that make history. The recent pandemic informs us that our anthropic future is linked to the action of other great planetary transformers, such as viruses.

Reflections on the Anthropocene, fueled by scientific ecology, called our attention to the indispensable role of other living beings in the maintenance of our human communities. It happens that living beings, by discharging their metabolism waste, for example oxygen, by chance create new and unforeseen conditions that other organisms take possession of in order to prosper. Step by step, over several billion years, an entirely new environment was formed, the biosphere, where all living organisms, including humans, are interdependent. However, humans are rapidly destroying this biosphere.

Since climate change became evident, the Anthropocene is often seen as the "time of catastrophes", whether it's the stunning acceleration of climate change, the collapse of biodiversity or the spectacular development of the COVID-19 pandemic. Climate change appears to be the most serious of these heralded catastrophes, but the consequences of the collapse of biodiversity are equally

troubling, as shown by the COVID-19 pandemic. How to escape the sideration effect in view of these perspectives in order to develop appropriate actions?

This being so, this Anthropocene notion seems intimidating because, in fact, it does lead us to question how to act on planetary phenomena?

Thus, we consider necessary to define and implement actions on a metropolitan scale or local actions, complementary to the best known national or international actions. In this sense, Agenda 21 already brought this proposal, because by proposing the construction of a new sustainable global model, it brings with it the reflection that we can only build this new global model if each one does its part in its reality and, thus, this sum of local actions is what makes possible to transform the whole. Therefore, chapter 28 of the global Agenda 21 establishes the implementation of local Agendas 21.

Consequently, challenges have to be faced in order to act in the Anthropocene and, in this article, we will address three challenges: catastrophe, territories and other living beings.

2.1 How to act in a catastrophe situation?

The first challenge is that of catastrophe: how to manage to act in a catastrophe situation? It is necessary to better understand the mechanisms of disasters. The *domino effects* phenomenon (Provitolo, 2005) explains the transformation of an accident into a catastrophe and the impacts multiplication of a catastrophe. The notion refers to the multiplier risk constituted by the presence, in the same place, of several dangerous companies or by the possible combination of technical, natural and social dimensions, during an event. The hazardous event creates a domino effect when secondary and tertiary impacts spread beyond their first impacts and exert themselves on elements that are not necessarily related to each other. Some of these spatiotemporal propagation effects are based on ecosystem dynamics and metropolis dynamics and dysfunctions.

The domino effects and unexpected impacts reveal the interrelationships between the technological company and its social and biophysical environment, that is, human activities, metropolis and ecosystems that support and shelter it. In Fukushima, for example, it was the earthquake that triggered the tsunami that in turn triggered the industrial accident. The company Tokyo Electric Power (TEPCO) that manages the nuclear plant in Japan can no longer ignore its location in a coastal area of the Pacific, at the junction of two tectonic plates (the Pacific and Eurasian plates), which expose it to earthquakes and tsunamis. Likewise, in the region that hosts the plant, the socioeconomic impacts of the catastrophe affecting its industrial and tourist activities became visible, while the radioactive discharges will threaten the health of its human populations for several decades,

as well as the proper functioning of its agro-systems and the terrestrial and marine ecosystems that sustain it. The catastrophe reintegrates, *in its way*, the objective reality of the company in its environment. Unfortunately, it transforms these environment constitutive relationships into vectors of transmission, amplification and transformation of the hazards and impacts caused by the initial event. It reveals to us the illusion of objectification that should free us from biophysical or social environment ties. Catastrophe is also a return to reality, but a very painful return.

Thus, it seems that the current development of catastrophes and their impressive capacity for destruction are supported by the *anthropic environment's amnesia*, that is, of the relations of coexistence, dependencies and attachments that unite human communities, their companies and their metropolises, with local ecosystems. From our point of view, the analysis of the Anthropocene's serious environmental crises should be interested precisely in these anthropic environments that constitute its blind spot.

In previous research, we used the notion of *anthropic environment* or *livelihood*, to analyze how the population lives in São Paulo society, but also the impacts of inequalities and risks on this population, as well as their efforts to improve that way of life habitability. Phenomenological geography (Dardel 1990, Berque 2000, Hoyaux 2002) analyzes inhabiting as the humanization of the biophysical and objective environment, through the symbolic sphere. Human beings build their world by organizing different elements that they have removed from the environment through perceptual choices and imagination. This process reveals the human being to himself, thanks to the meanings he produces when doing, saying and thinking. This world of meanings is accessible through lived, sensitive and affective experience. These analyzes make it possible to explain the livelihoods formation. To dwell, for human beings, means to transform the biophysical environment in a way that is specific to make it their livelihood (Berque, 2000). The livelihood is constituted by the way we have to understand things by our senses, by our words, by our thoughts, by our actions. It is the sensitive, bodily, practical and imaginative relationship that the inhabitant maintains with its environment. In other words, the livelihood is the “humanized” biophysical environment, that is, transformed by a human community, at different scales, so that it can live, work, dream or engage in any other activity. Therefore, the livelihood expresses the conditions of existence and subsistence of that community. This notion expresses a double meaning: the livelihood expresses at the same time the world in which one lives (“medium” is used here more in the French sense of *milieu*) and the world in which one lives (“livelihood” in the Portuguese language is associated with people's subsistence).

The growing weight of ecological crises in the Anthropocene demands a redefinition of the anthropic environment, which should better integrate the elements of fauna, flora and environmental entities (river, forest...) to define the

new conditions of existence and subsistence of human communities. Thus, the Anthropocene challenge would be a habitability that allows maintaining the conditions of existence for a human community, but also for other living beings and/or entities, without which it could not survive.

3. THE CHALLENGE OF TERRITORIES: ON WHAT SCALE CAN WE ACT

How to fight these global changes? Until then, international action has been favored, witnessed by global climate governance (IPCC) and by biodiversity governance (IPBES). However, if the Anthropocene is a worldwide phenomenon, it is also a diversified phenomenon that affects the populations of the world in different ways, through its effects on livelihood.

In order to act effectively, to territorialize problems management is necessary. Awareness is emerging, as in the State of São Paulo, for the development of territorialized public action in order to build resilient municipalities, which favors technological and economic solutions that supposedly solve biophysical environment problems, but which, on the other hand, neglect the social, aesthetic, cultural and ethical dimensions that explain and feed the choices linked to environmental issues. To overcome this limitation, action must also rely on *environmental humanities* (Eckersley, 1998) that analyze the complex interrelationships between human activity and environment, in the broadest sense.

Another criticism that could be made to this first attempt at territorialization is that it is a *top-down* state policy that concerns traditional political territories and does not integrate population or local ecosystems. To take this criticism into account, it would undoubtedly be necessary to develop a more integrative territorialization that could be supported by a bioregion. A bioregion (Berg, Dasmann., 1977) corresponds to a territory whose boundaries are not defined by political boundaries, but by geographic boundaries that take into account both human communities and ecosystems. It is a place of life where all interested parties strive to live together in a sustainable way. Starting again from hydrographic basins, microclimates, soil types, fauna and flora vitality, our usual territories would be redesigned. Bioregions will bring together heterogeneous populations of human beings with other living beings around a common project, the maintenance of their livelihood's habitability. The constitution of resilient bioregions, which articulate territories, communities and ecosystems, would make it possible to locally face the Anthropocene crises.

This general problem must take into account local specificities. For example, in Brazil, it will be necessary to take into account the huge social inequalities that affect the low-income population, as the next environmental crises that shall hit Brazil, and the metropolis of São Paulo in particular, will be exacerbated by these

social inequalities. The prospect of a water crisis associated with climate change assumes disturbing proportions with the explosion of irregular occupations in the water reservoirs protection zones. The peripheries of the metropolis would become uninhabitable with the combined development of heat islands, water contamination and sanitary risks. The community's resilience also requires a fight against the huge social inequalities that affect the low-income population.

3.1 How to interact with other living beings?

The third challenge concerns living beings, as maintaining the biosphere is essential to preserve the world's habitability, notwithstanding, their survival still finds much indifference on the part of human beings. How to sensitize the inhabitants to the importance of other living beings in their livelihood so that they get involved in the elaboration of these transformation projects for their own anthropic environments? The main obstacle lies in the fact that the ecological crisis overlaps with a sensitivity crisis (Morizot 2019, 2020), that is, an impoverishment or even the extinction of the experience with nature. Philosopher Baptiste Morizot expresses what this sensitivity crisis consists of, during an interview with the Le Monde newspaper:

"Most people in a developed country don't know where tap water comes from, where the waste left in the garbage goes to, what kind of soil is under our feet, when is the next full moon, when planting the different types of vegetables, what bird sings in the morning in our windows. The sensitivity crisis is, in fact, the impoverishment of words, of the capacities to perceive, of emotions and of the relationships that we can establish with the living world. We inherited a culture in which, inside a forest, in front of an ecosystem, "we don't see anything", we don't understand much and, above all, that doesn't interest us: it's secondary, it's "nature", it's for "ecologists", scientists and children, has no legitimate place in the field of collective attention, in the construction of the common world" (Morizot, 2020, our translation).

This crisis of sensitivity is undoubtedly explained by the success of scientific objectification based on subject/object and nature/culture cleavages. We tend to regard nature as outside of humanity. As Patrick Howard indicates:

"The epistemological ideals of clarity, detachment and objectivity silenced the voice of Nature. For over 300 years we have been trying to separate our people from the organic processes and the natural world rhythms. Unfortunately, our children learned their lessons" (Howard, 2005, p. 5, our translation).

In order to defend Earth's habitability in the face of the ecological crisis, it would be necessary to find ways of caring for living beings in local ecosystems, becoming

“biosensitive”. Therefore, we propose a project that uses the *environmental aesthetics* (Berleant 1991 and 1992, Blanc & Lolive, 2009) which is a research current aimed at overcoming references to works of art and landscape that constituted the exclusive framework of aesthetic reflections, to give a privileged place the aesthetic experience of nature and everyday environments. For the philosopher Emily Brady, this new current “*recognizes that natural environments are not experienced essentially as landscapes, but as environments in which the aesthetic subject appreciates nature as dynamic, changing and evolving. This is an aesthetic approach that, according to its different forms, has its roots in ecological knowledge, imagination, emotion and a new understanding of nature as the bearer of its own narrative*” (Brady, 2007, p. 64, our translation). For Arnold Berleant, the founder of this current, it is about transforming remote and essentially visual observation of the natural environment into a global sensory immersion into the environment, that is, instead of conceiving the subject as a simple spectator of the landscape, it is about considering him an active participant in the situations he is confronted with. Thus, environmental aesthetics is an attempt to integrate nature into the human beings experience. We will now link these theoretical analyzes with the inhabitants’ practices.

The inhabitant's livelihood has a strong aesthetic tone. It is the object of a lived experience that is simultaneously sensory, sensitive (integrates emotions), imaginative (transfigures reality) and significant at the same time. It declines the different meanings of sense: it is, therefore, aesthetic in the broad etymological sense of the term because for the ancient Greeks the term *aisthesis* means perception through the senses. When livelihoods undergo important transformations, imposed, driven by large companies or institutions, to become a risk zone, a contaminated area or a large urban project implementation territory, these transformations are considered by the inhabitants as intolerable attacks on their livelihood. They will produce their emotional reaction that reveals their attachment: what they want and what they fear losing. The *concern* (Brunet, 2008) is rooted in this emotion of the inhabitant who responds to the attack on its livelihood. It produces a potential for commitment and availability for collective action, defines conditions for the emergence of inhabitants’ mobilizations, but, more broadly, of any action taken by inhabitants to maintain or improve the habitability of their livelihood.

These analyzes allow us to think about the role of environmental aesthetics in *aesthetic mobilizations* (Lolive, 2013), in particular in metropolises, which refer to inhabitants mobilization in the aesthetic field (for example, landscape defense) or mobilizations that involve aesthetics actors or that use aesthetic criteria to justify themselves. This diverse movement brings together landscape defense segments and metropolitan movements that strive to promote more diverse urban livelihoods, including the “integration of nature in the city”. Likewise, aesthetic mobilizations are an attempt to integrate nature into claims in order to improve the inhabitants’ livelihoods.

In this way, it is proposed to test the hypothesis that environmental aesthetics would allow us to interiorize the natural environment, anchoring it in the lived human experience to answer to the sensitivity crisis, facilitating the local ecosystems integration in our way of life.

4. FINAL CONSIDERATIONS: A LOCAL PROPOSAL TO ADDRESS THE ANTHROPOCENE CHALLENGES

These reflections made it possible to outline a first theoretical framework to face the Anthropocene challenges. The first part, dedicated to the catastrophe challenge, showed the livelihood importance (or anthropic environment), in the subjective/objective interface, which could constitute a reference for the Anthropocene crises and their impacts analysis, from the Environmental Humanities point of view (hypothesis 1). Remembering that Environmental Humanities is the study of the environment through human and social sciences. The second, dedicated to the territorialization issue, provided a possible solution to face the Anthropocene crises on a metropolitan scale, the constitution of a project territory, a resilient bioregion, which articulates territories, communities and local ecosystems (hypothesis 2). Emphasizing that the bioregion means opening the livelihood to other living beings. The third, dedicated to the challenge of difficult human coexistence with other living beings, provided an original perspective, the environmental aesthetic, to bring alive this heterogeneous territory that is a bioregion. The aesthetic animation of a bioregion could rehabilitate a sensitive conception of the living environment to anchor it in the lived human experience (hypothesis 3).

These three hypotheses outline a research program whose object will be the constitution of resilient bioregions that articulate territories, communities and ecosystems that adapt to the Anthropocene consequences. The research program, in development, will define a framework of actions for the State of São Paulo to be able to face the local consequences of the Anthropocene crises. It will articulate a complex set of complementary activities:

- understand the contribution of human practices and activities in the development of Anthropocene's environmental crises and how these crises reciprocally transform anthropic environments and threaten the habitability of metropolises and rural areas of São Paulo (academic research);
- experimenting with tools and methods in pilot areas to sensitize residents, institutions and companies, and hypotheses for transforming these problematic situations (action-research = experimentation);
- use this knowledge to review existing public policies and to define and implement new *public policies for the anthropic environment* which

proposes to develop resilient bioregions to prevent Anthropocene crises, or at least minimize their impacts (institutional innovation).

This operationalization approach will allow us to achieve the central objective of our project: to conduct research in social sciences that can transform public policies so as to allow the coexistence between human beings and other living beings and all environmental entities.

NOTES

¹ Poetics, as defined by Tassara & Rabinovich (2001), as a human dimension common to all men, in which the person transcends his own history. These authors, based on Heidegger (1958) and Paz (1973), place that poetics would be the consecrated moment, becoming a man by becoming a poet and, thus, recover in itself, at that moment, the humanity of all men. The poetic experience would then be the revelation of the human condition, the freedom contained in the human condition, which would be present in becoming a poet, leading to a transformation, it would be a unique and unrepeatable moment that gives rise to history. Poetics being a human dimension common to all men, although it may be a feeling of only one person, it somehow shares something that comes from the long chain of human beings before and after, it is nourished by the history that transcends it.

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20 / THE SUBTLETIES OF THE ANTHROPOCENE: FROM OVERARCHING NARRATIVES TO THE CONSTRUCTION OF ALTERNATIVE FUTURES

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ABSTRACT

This paper focuses on the ways actors articulate global contexts and issues, such as the Anthropocene, the climate change or biodiversity crisis, with situated events and conditions, as well as specific visions of the future, including varying levels of determination and ethics relative to the choices to be made. The opening of alternative futures can indeed not be achieved without questioning the existing overarching narratives which are the supposed matrix of all coming events.

While the crafting of the notion of Anthropocene seemed to have produced a sort of wake-up call for many, the understanding embedded in the term of the relation between humanity and geology became contested by numerous actors, who critiqued the attribution of responsibility to the “humans” as an undifferentiated whole and aimed to offer other readings of the history with other implicit or explicit moral and political relations and implications (see for example Smyngedouw and Ernstson 2017 for a discussion). They thus forged alternative terms to put forward their own interpretations of the causes of the current situation, like the Capitalocene or the Thermocene (respectively putting the responsibility over capitalism or fossil fuels), or even offered alternatives, like the Gynocene, proposing to end the woes induced by patriarchal domination, and the famous Chthulucene of Donna Haraway, who plead to reject simplistic narratives and “stay with the trouble” of a more complex reality with tentacular connections (Haraway, 2016).

Embracing this idea of stressing complexity and plurality, this will first take an example showing the troublesome relations between global narratives and regional or local observations with regard to biodiversity, and then analyses the origin of those troubles and how it relates to the different ways actors may try to fix a particular vision of the future with performative impacts on the present.

Keywords: Anthropocene; Climate change; Responsibility; Alternatives.

1. INTRODUCTION

Recent reports described a catastrophic and degrading state of biodiversity, and were projecting quite a gloomy future. The most widely known is the Global Biodiversity Assessment published by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services in 2019 (IPBES 2019), for which the media coverage insisted on the most shocking and clearest data, which was the fact that about one million species were threatened by extinction¹. But assessments of biodiversity have to take into account its complexity, which poses in return problems of communication. This was well illustrated by interesting news feature written by Gayathri Vaidyanathan published in August 2021 by Nature, and titled “The world’s species are playing musical chairs: how will it end?” (Vaidyanathan, 2021), described recent studies (Danneyrolles et al., 2021; Leung et al., 2020; Svenningsen et al. 2020) which showed that the global trend portraying a biodiversity decline (like the flying insect biomass decline shown by Hallmann et al. 2017) wasn’t often observed locally, therefore nuancing the announced global collapse. Indeed, as researchers investigated particular regions, to their surprise in some places the species diversity was rising. According to one researcher that they quote, “there should be some caution about using these really broad-based global metrics, even though they are pretty powerful statements. But they can mask a whole lot of variation and be driven by extreme outliers”. Another expressed that “ecosystems don’t work at the global scale”, and that they were more “interested in what is happening to biodiversity at the local scale, because that’s the scale that we experience”.

LINKING GLOBAL, REGIONAL AND LOCAL BIODIVERSITY

One of the studies that the article discusses focused on “scale-dependent changes in tree diversity” (Danneyrolles et al. 2021) and showed that disturbances led to both increased diversity within landscapes and homogenization at the regional scale. They were thus concluding that their “results support the idea that human-induced impacts on biodiversity are strongly scale-dependent and not necessarily associated with biodiversity loss”. Another study considered that “the distillation of many trends into a global mean index obscures the variation that can inform conservation measures and can be sensitive to analytical decisions”, and that the value of the global indicator was driven by extreme (declining) outliers (Leung et al., 2020).

Actually, there are numerous difficulties with the concept of biodiversity and especially with regard to the metrics that should best represent it. Thus, depending on the types of dynamics that are considered the most relevant and the scales of study, the resulting picture can often greatly differ. In this regard, timescales are also determinants, since the same number of species extinction, for example, had to be interpreted very differently if it occurs over a year, a century or a million years.

¹ See for example the article published by the IPS news agency: *As Planet Burns, One Million Species in World’s Eco-System in Danger of Extinction*, Thalif Deen.
<http://www.ipsnews.net/2020/02/planet-burns-one-million-species-worlds-eco-system-danger-extinction/>

WHEN THE EXPECTED POLITICAL USE OF KNOWLEDGE SHAPES KNOWLEDGE PRODUCTION

Interestingly, the article by Vaidyanathan mentions that a paper written by Vellend *et al.* (2013), and which also contrasted the global decline narrative, was first rejected by Nature. It seems that some reviewers worried that journalists may use it to downplay biodiversity issues, while the researchers explain that their integrity has even been questioned. This shows the strong perceived connection between knowledge production and communication, visions of the future and moral implications regarding the type of actions required to be undertaken.

The cautiousness in the reception of the study comes from a fear that their call for a stronger protection of the biodiversity might become weaker, but is also due to the fact that those issues, in all their complexity, at the different scales and in a variety of public arenas, are at the centre of controversies and are often contested. For example, the IPBES had published on their website a response to critics of their “one million threatened species” figure, including some calling their models as being just “electrons on a hard drive”². The problem that is often put forward by researchers is how to do justice to the complexity of some issues without impeding action by confusing their audience over the nature of the problem or by blurring the criteria of morality of the action to be taken to “solve” the problem, which leads them to be occasionally in the ambiguous situation of having to defend the factuality of the potential extinction of one million species.

THE TROUBLE WITH MODELS AND SCALES

The preceding example invite to point out a few difficulties relative to the use of global assessments and statements. Firstly, the analysis of the biodiversity decline is highly sensitive to geographic and temporal scales. Indeed, it was demonstrated in the field of ecology not only that the detection of patterns depended on the level of observation, but that observations at different levels may even appear to be contradictory (Sayre, 2015; Wiens, 1989). Nonetheless, the issue isn't just about choosing one scale over another, but about understanding the specificities of issues at their different scales (or, conversely, to be able to consider different events involving different scales as being related in some ways), instead of invisibilizing their non-scalable properties (Tsing, 2012).

Secondly, there is also a persistent trade-off between drowning in too high levels of detail and erasing local differences by generating averages and global pictures. Indeed, when considering global impacts at anything smaller than a geological scale, observed events can only be described in terms of radical transformation or statistical deviation, which is often problematic when trying to integrate them in decision-making processes.

² A million threatened species? Thirteen questions and answers, Andy Purvis (Coordinating Lead Author of the IPBES Global Assessment).
<https://ipbes.net/news/million-threatened-species-thirteen-questions-answers>

Thirdly, the envisioned potentialities for a change of trajectory largely differ between the physical models which assume a strong inertia and socio-political theories of change which may consider that change can happen quickly and in unpredictable ways. Controversies therefore also emerge with regard to the type of changes that are actually possible (or still possible in the case of the Anthropocene or a potential collapse), and new potentialities can also be created by the revision of the models. For example, the 2021 Intergovernmental Panel on Climate Change report (IPCC, 2021) seemingly aimed at restoring hope that, despite a degrading panorama, changes in our emission patterns could have a relatively quick relieving impact, contrarily to what was thought before.

Fourthly, not all changes are progressive and some rapid transformations are considered to potentially happen abruptly when crossing certain turning or tipping points, which can be seen as moments of bifurcations and changes of temporality. Moreover, non-linearity not only applies to temporal scales but also to transformations along other types of scales, like the famous example of the butterfly effect or as was shown through the metrological controversies on the effect of low doses (contesting the adage from the 16th century toxicologist Paracelsus which expressed that “the dose makes the poison”) as well as on endocrine disruptors (see for example Chateauraynaud, Deba & Fintz 2013). Following the idea of ‘planetary boundaries’, to which they relate, tipping points became more and more crucial in the analysis of the potential transformations of the climate (a well-known example being the possibilities of “collapse” of the gulf stream) as well as of the biodiversity (in particular with regard to the deforestation of the Amazon), and the notion of social tipping points is now emerging. Some researchers are now even looking into ways for “tipping positive change” (Lenton, 2020), while a recent joint workshop by the IPBES and the IPCC reunited scientists to try to understand how the climate, biodiversity and society, including their specific tipping points, were interacting (Pandit *et al.* 2021).

Finally, another issue is that, when interpreting a series of events and their meaning for the future, the classical dilemma lies in the opposition between views proclaiming that they are the produce of long-term trajectories and others which stress their singularity and the non-linear characteristics of the bifurcation they represent. But, pragmatically, three interacting modalities of transformation can be observed: catastrophic or sudden events, events resulting from strategies of the actors, and the convergence of series previously unlinked.

A SOCIOLOGICAL PRAGMATISM AGAINST THE FATALISM AND DETERMINISM OF THE ANTHROPOCENE

A way to overcome the fatalism and determinism of the Anthropocene is to adopt a pragmatic sociological approach, which is the one favoured by my laboratory in Paris, the Pragmatic and Reflexive Sociology Group (GSPR/EHESS). In the

case of the Anthropocene, we can observe competing ideas of the era as either the advent of the human mastery on the earth system, or as the sign of the forthcoming inevitable global catastrophe.

Distinctively, a pragmatic approach proposes to not take global narratives as mere factual realities equally valid in all contexts, but to take a step aside by seeing on one hand how actors work to create them, render them performative or to discredit them and, on the other, by putting complexity back into the description. This can be done by focusing on the ways through which the variety of experiences in the wide diversity of milieux hosting a multiplicity of life forms with their unique assemblages create uncertainties (destabilization of overarching narratives) and open new futures (possibilities of deviation from uniform consequences foreseen by the narratives), in particular through the generation of new paths and trajectories (Chateauraynaud & Debaz 2021).

This leads as well to the necessity to account for and study the ruins, margins and interstices (Tsing, 2015) within which alternatives are built by actors in ways aiming to subtract them from the hold of the dominant and homogenizing paradigms. Indeed, as people weave very different types of relations with the living milieux, they also produce specific and situated forms of knowledge about the problems that are faced and about their possible solutions, depending on the approach they take and the type of actions they envision. As they observe and are taken into the frictions caused by the interaction of heterogenous milieux, the actors not only take into account variations of scale, but they also produce and conjure scales as they interpret the causalities linking events and processes.

DETERMINING THE FUTURES, AS ONGOING PROJECTS OF THE ACTORS IN THE PRESENT

To better show that considering the predominance of global issues is just one way to envision the future, I will now present briefly the fourth matrix of futures elaborated by two members of my laboratory: Francis Chateauraynaud and Josquin Debaz (2019). Describing four distinct regimes of enunciation aimed at fixing the future, this matrix helps to see the different supports through which distinct futures are sketched by actors, and therefore to perceive that each of those futures only represents one alternative produced by a specific regime of enunciation, and not an all-encompassing fatality.

The first regime is based on the idea that current emerging crises will amplify and that the worse will come soon or later; the second in the upper right corner focuses on the promises of upcoming radical technological breakthroughs which will help overcome the current and unfolding crises; the third regime, bottom right, is the world of the regulatory dispositifs and governance instruments and put forward the evolution of the procedures through which they are enacted

and the renewal of the power relations between institutions and critical actors leading to possible redefinitions of the common good. Finally, the fourth regime, bottom left, is the one over which pragmatist researchers may put emphasis, since it takes seriously the possibilities for creating alternatives deriving from tensions, frictions and critical processes which may be seized by actors in unpredictable ways, therefore allowing bifurcations to happen at various scales.

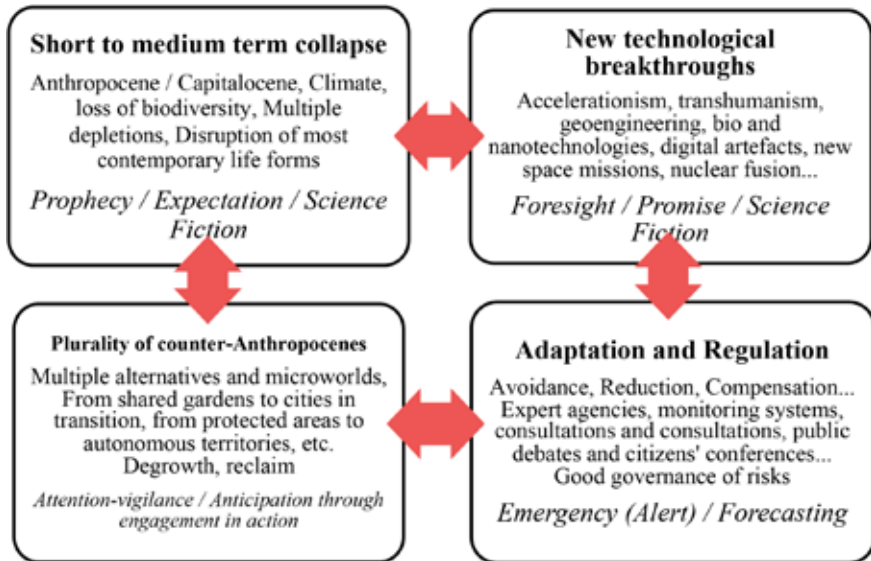


Figure 1. Four regimes of enunciation aimed at fixing the futures (matrix of futures n^4), adapted and translated from Chateauraynaud and Debaz 2019.

As researchers, focusing on the plurality of counter-Anthropocenes particularly matters because it allows avoid the pitfalls of focusing strictly on the seemingly self-sufficient and hegemonic doomed, greenwashed or 'good governance' scenarios put forward by a diversity of groups and institutions. Nonetheless, as the arrows indicate, beyond perceiving and describing the separate use of the different regimes, it is also crucial to focus on the circulation that actors may operate between them, and which allows bringing back complexity in the determination of futures.

Finally, this paper hoped to show that what is described as the most pressing issues of our times globally, allegedly to foster change, can have very different implications across scales and unequally affect forms of life and populations, thus requiring to refrain from simplified understandings of their consequences. Moreover, as those issues get embedded by the different actors into visions of the future, which can be produced through the articulation of different regimes, a simplification of the narratives may impede capabilities to produce new alternatives at the margins and open futures not yet envisioned, thus having potentially opposite effects to what may be intended.

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21 / NATURAL ECONOMY

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ABSTRACT

The economic system of humanity is characterized by being unilateral, that is, in one direction or sense, which in this case and obviously is that of the sole and exclusive benefit of humans. Instead, we can go towards a two-way economic system, taking into account the other parties and also their benefit. In addition, this approach is based on something as simple and original as exchange, the potlatch that nature has taught us but that we have forgotten because of the chrematistic interests that dominate in this omnipresent and transcendental activity of our existence.

Planning a new economic system may seem utopian, impossible, a chimera or entelechy, even something crazy. But less is nothing, even if it is only an idea, and especially if it is necessary, as the events and the situation are developing towards where our current way of living and producing is leading us. Although from its base or principle, the urgent and peremptory cannot lead us to make the same mistakes or others that may arise from wrong approaches, as often happens when we only think of our own benefit. For all these reasons, this proposal for a new or another economic model already starts from a different basis and can be summarized in a single point, idea or approach for its development: the multilateral nature of our activities and, specifically, of the productive one. That is to say, having the planet from which we obtain the resources, compared to the one-sidedness of the current system, in which we only look for ourselves. By simply assuming this principle and starting point, we would already be changing, improving and taking a great step in the right existential direction

Keywords: Economic system. Environment, natural.

1. INTRODUCTION

From the origin of our species to the two great most global systems, capitalism and communism, all our economic activity can be said to have had as its main objective - almost the only one - ourselves. A quick review following studies of Anthropology indicates that the origin of our economic activity was, first, without expecting anything in return, what is known as "gift or gift economy", since it was based on moral "obligation" and the ethics of returning what was given or given to us; as thus stated by the anthropologists Bronislaw Malinowski (1884-1942), who at the beginning of the 20th century studied the Kula in the Trobriand Islands, and Marcel Mauss (1872-1950), who expanded and distinguished different concepts and forms of this activity. We have also gone through the so-called "collaborative, shared or exchange economy", in force until 1885 (when it was banned by the Canadian government) among North American Indians on the west coast (Haida, Salish, Kwakjut, Tlingit, etc.) and which consisted of in sharing and exchanging goods between the tribes, which is known as "potlach", already introducing in these cases the differences of status, hierarchy, fame or prestige depending on how large and valuable the exchanged was. While the current economic activity is based on what is known as barter (without money, corresponding to the so-called "subsistence economy") or on trade, the cornerstone of the so-called "market economy", based on the price or value of things and its popular "law of supply and demand."

In all this historical and development process of our economic activity, which can also be extrapolated to other areas of our existence, above all we have obtained the resources of nature and, generally, without taking into account the other parties. In other words, we have "squeezed" and "exploited" the Earth, even going so far as to "force" it to obtain what we wanted. In addition to doing, it in such a way that little or almost nothing we have returned or exchanged in this regard with the planet that sustains and shelters us. So the "balance" (be it accounting, moral, between what is given and received, etc.) is clear: we have an immeasurable debt to our environment, of which we have taken advantage to the point of exhaustion (extinction and trafficking of species, mining operations, aquifers and oil or gas, construction of all kinds of infrastructures, deforestation, desertification, contamination, etc.), without returning, giving, giving, exchanging or paying anything in exchange on our part. A shameful, unfair and amoral imbalance that begins to "take its toll" on us and that is seriously endangering our existence, among many others. So, we have to do something about it, especially in view of the climate and planet crisis that we are causing. It is time to correspond something to our "mother nature", which has given us life, has nourished us and has served to develop us; but which, on the other hand, we have mistreated, without taking it into account either.

All the pharmacology or medicines that heal us come from nature, as well as food, energy, materials, etc. In the past there were rites, ceremonies, deities or thanks

associated with this "sustenance" and, even, some ways of trying to "return" something of what was received; such as the rituals of offerings and / or sacrifices to obtain crops, fishing, hunting or good weather. Except for these ancient exceptions, the behaviour in this regard has always been characteristic of serving the planet as we wish. But how much better would an entente of understanding and collaboration with it be than the selfish and catastrophic anthropocentrism that we are carrying out?

What I propose is a New Economy, which changes the meaning and direction of this characteristic human activity so that, instead of being solely and exclusively by and for us, it also includes or takes into account our environment, other beings and entities of this planet that shelter us and that is our "home". An economy based on natural entrepreneurship, thus defining this new activity in relation to and in comparison, to current business entrepreneurship and the so-called "social entrepreneurship" (which is giving such good results but, as always, only for our species and fellow humans). In the case of natural entrepreneurship, we would not only be the target of economic activity but the planet; This does not mean that there is no "benefit" but that it is about other / new values. In this "new economy", based on "natural entrepreneurship", the main value would be that of existence, in its broadest and most extended sense; something natural, objective and of undoubted appreciation for all entities and beings on the planet, unlike money and other artificial tinsel, created by and for ourselves, without further benefit.

With these principles, this "new economy" would also require training, research, entrepreneurship, human resources, specialists, companies, industries, etc. In other words, a whole system can be built around the New Natural Economy. Starting from something as simple as having the rest, with what surrounds us (animals, vegetables, environments, etc.). It is something as logical and effective as serving the planet, since with this we are also improving our lives. I am not talking about returning the Sea of Azov to its state, or cleaning the oceans of plastics, or preventing deforestation of the Amazon or the huge dams on the Turkish stretch of the Tigris and Euphrates rivers; In other words, I am not just talking about possible unilateral good actions on our part, even if we think that they benefit nature. Rather, I propose that we have it, that we include it in our relationships, such as when we want to propose to the other party a business or sell a product or service. Among other novelties, it would be the first time that such an important aspect of our existence as sapiens, such as the economy, had more actors or parts than ourselves.

This idea and proposal are also based on a first phase of investment in understanding, in knowing the communication and expressions (the "language") of animals, plants and other beings and entities; that is, that we begin by trying to communicate with them, in order to understand each other better. Something about which we already have some indications and achievements, such as the recent discovery that plants communicate with each other, as well as sound when

they suffer, according to research led by Itzhak Khait, from Tel Aviv University (Israel); while it was already known that when a plant is pruned or deprived of water it changes shape, color and smell. Other scientists have also discovered that the electrical network had already been invented by nature with electroactive bacteria, which produce natural electricity, capable of altering ecosystems and controlling the chemistry of the Earth, including the oceans; as for example the microbiologist John Stolz, from the University of Dusquense (Pittsburgh, USA) has shown when he affirms that "we have an electric planet" wired with bacteria. A "bioenergy" that, according to researchers at the University of Asrhus, in Denmark, forms natural electric currents in the seabed, a live electrical line capable of transferring electrons, as stated by Professor Lars Peter Nielsen; This has also led to speculation about a possible planetary "brain" that, for example, would release methane when it "angered", thus causing or helping the famous five mass extinctions on our planet. While, with respect to animals we also know that they communicate through auditory, chemical (such as pheromones), visual or tactile signals, with a branch of science, Zoosemiotics, which studies these forms of communication; which, in addition to expanding in terms of objectives, could also be extended to more branches of our science, thus giving rise to others such as Biosemiotics or even Naturesemiotics.

Therefore, we are in a position to initiate a new relationship and entente between us and the planet, starting by trying to communicate and, also, so that our main activity, encompassed in the economy, we do it taking into account this new scenario, multilateral and not only one-sided. So, rather, it would be a matter of expanding this field of our knowledge, as well as applying it to achieve a satisfactory symbiotic relationship with the planet. In fact and in some way this is what we have done sometimes, very few and possibly unconsciously, when we have learned and imitated certain behaviors and tactics of others, as recently done by a farmer in the Sahel who, faced with desertification, copied his termites from the termites. system to retain water, thus managing for the first time to stop this process and offer hope for the area.

Thus, and imagining a little, what could be the prevention and effects of phenomena such as El Niño and La Niña, hurricanes, etc. if we understood and understood the oceans more or otherwise? Or, in relation to plants, could we exchange information so that we know what they want or what is good for them, while for their part perhaps they provided us with the natural pharmacopoeia, or they reported on polluted and stressed environments, or they warned us of earthquakes thanks to its intricate roots, or to the incompatibilities and benefits of some combinations in crops or in our homes, gardens and orchards? While, in other biological orders, what would it be like to truly communicate with and understand so-called "domestic animals"? Could we obtain food in another way or from other sources and, above all, without causing death trauma or separation from the offspring of the beings that we now exploit?

The possibilities, projection or future of this New Natural Economy, based on understanding with the planet instead of its unilateral exploitation, I think may constitute an immeasurable (re) evolution of our species, perhaps the largest and most appropriate that we can undertake, this time for EVERYONE.



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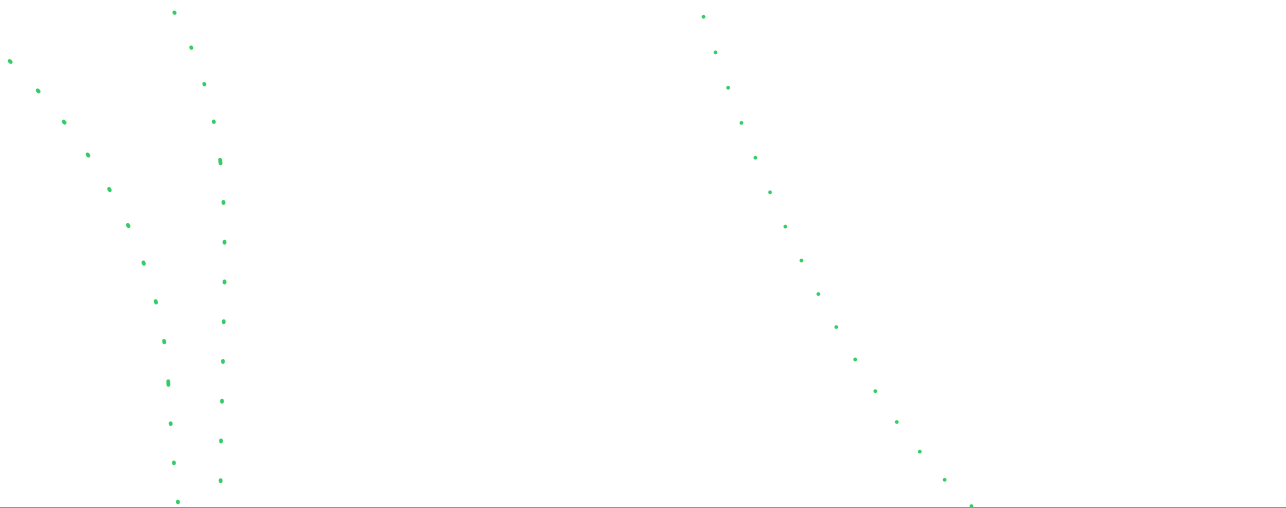
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