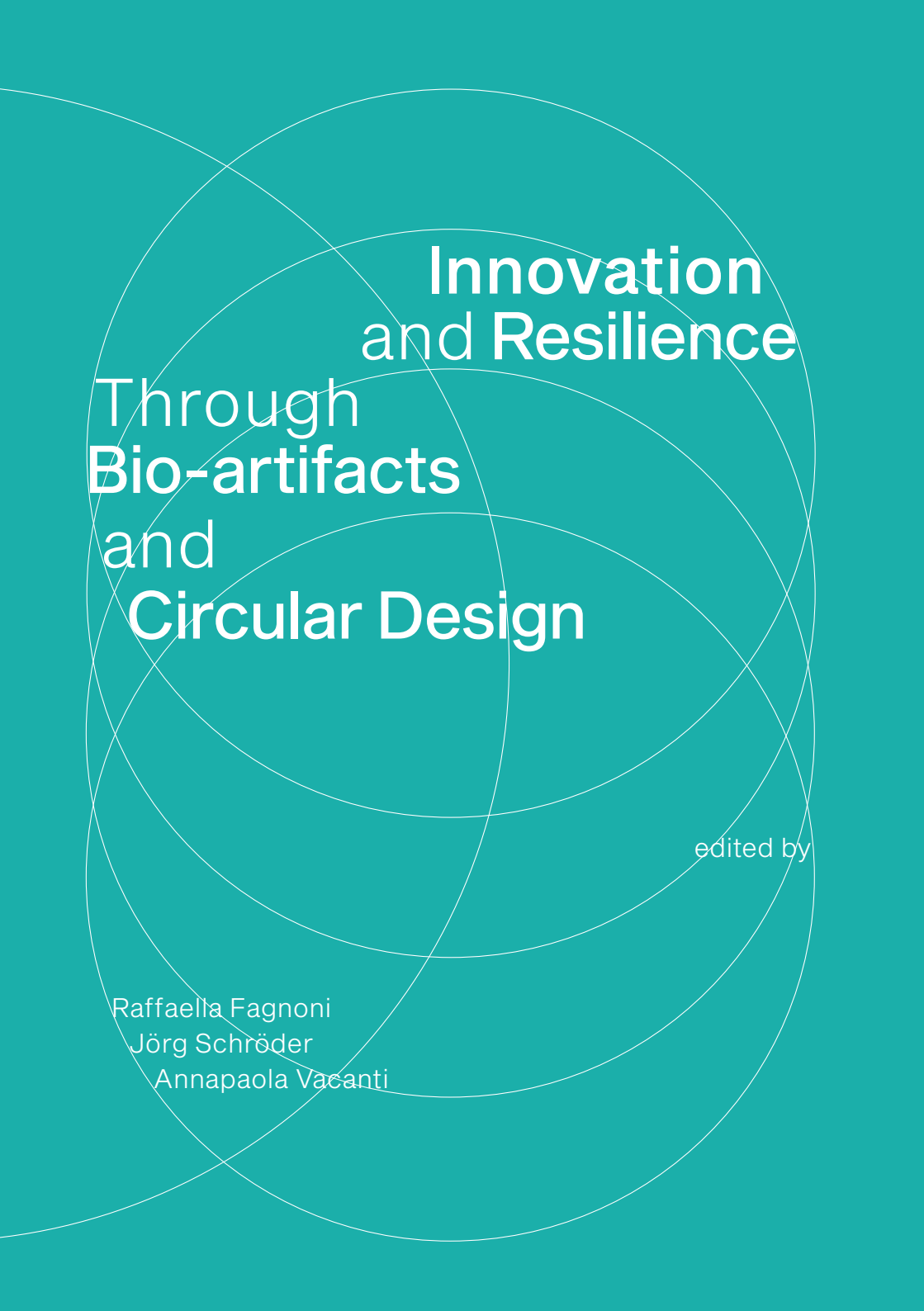


The background is a solid teal color. Overlaid on this are several thin, white, overlapping circles of varying sizes. These circles intersect to form a complex, web-like pattern that frames the text. The main title is centered within this pattern.

Innovation and Resilience Through Bio-artifacts and Circular Design

edited by

Raffaella Fagnoni
Jörg Schröder
Annapaola Vacanti



Innovation and Resilience Through Bio-artifacts and Circular Design

Research exchange and doctoral training by CTRL+JUNK LAB at
Università IUAV di Venezia and the Territorial Design group at Leibniz
University Hannover

Edited by Raffaella Fagnoni, Jörg Schröder, and Annapaola Vacanti
Design: Annapaola Vacanti, Massimiliano Cason Villa
Cover: Massimiliano Cason Villa
Peer review for the articles on pages 14, 106, 140, and 180

© 2025

Territorial Design LUH and CTRL+JUNK LAB IUAV

Texts by kind permission of the authors, pictures by kind permission of
the photographers/holders of the picture rights.
wAll rights reserved.

Published with DOI by Repository Repository of Leibniz Universität
Hannover <https://doi.org/10.15488/20103>

Published by:

Repository of Leibniz Universität Hannover,
by TIB Leibniz Information Centre for Science and Technology

ISBN 978-3-946296-52-2

Published by:

Regionales Bauen und Siedlungsplanung, Leibniz Universität Hannover
Herrenhäuser Str. 8, D-30419 Hannover
<https://www.staedtebau.uni-hannover.de/en/territorial-design-and-urban-planning/>

Published in the framework of:

CiD Circular Design Innovation Alliance

Erasmus+ Innovation Alliance Grant 10111686

Co-funded by the European Union

Views and opinions expressed are however those of the authors only
and do not necessarily reflect those of the European Union or the
granting authority EACEA European Education and Culture Executive
Agency. Neither the European Union nor the granting authority can be
held responsible for them.



To Manuel Gausa Navarro
*with the gratitude of those
who will continue to advance
architecture and design
with open minds.*

This book grows out of a series of research experiences
we had the privilege of sharing with Manuel, colleague,
mentor, and friend.

In those moments, we came to know and appreciate his
extraordinary humanity, his intellectual vitality, and his
rare ability to combine rigour with curiosity, openness with
depth, turning every encounter into a meaningful exchange,
and every project into a truly collective learning experience.

His generous and forward-looking vision fostered encounters
across disciplines, cultures, and perspectives, leaving a lasting
impression on all those who had the good fortune to work with
him, the mark of a research practice that was alive, humane, and
shared, always accompanied by his distinctive joyfulness and
convivial spirit.

Contents

Introduction — 06

Laboratory for Survival – 14

Waste studies,
Hyperlocal, Social
and Circular Design

Lagoon — 52

Thinking Venice
Archipelagically

Venice — 70

A Vision for Sustainable
and Circular
Transformation

Venice as a stage and — 88
medium for ideas of
circularity

Exploring filmmaking
as form of urban
knowledge creation

Collective Eco - — 106
Innovation

Designers and citizen
communities promoting
ecological change
through informal
practices

Circular Tools — 140
and Processes
in Architecture
and Design

A shared Framework

Bridging — 180
Circular Design
and Territorial
Planning through
rice waste
enhancement

The Rice house case

Collective eco-innovation

Designers and citizen communities promoting ecological change through informal practices

André Araújo Almeida, Carmelo Leonardi, Maria
Manfroni, C. Mattia Priola

1. Community centered approaches

Current social and environmental transformations have driven researchers and designers to face global challenges, interdisciplinary strategies, and collaborative practices. Such bottom-up or horizontal territorial experiences (Santos, 2005) bring collective meanings, favouring organic approach and integration of design to daily life and to the existing order in local territories (Almeida, Alvim, 2024). Adopting participatory methodologies, in which designers can collaborate with communities (Manzini, 2018) and activate collective experimentation practices, may involve updated knowledge and skills to generate new ways of acting (Meroni, Selloni, 2022). In this context, we face the development of new practices in which designers often adopt open approaches (Eco, 1997).

Cooperative actions promoted by different groups of people, citizens together with designers, can bring impactful changes through community-centred approaches, including activism, collective learning, shared design strategies, DIY self-production models, organic practices, and development of low environmental impact solutions, and even self-managed spatial planning. In recent years, a growing interest has emerged in the concept of 'social sustainability' and related aspects. Although a complex conceptual field, sustainable development is seen as socially imperative,

requiring informed, theoretically sound, and pragmatic solutions (Chick, 2012). Social innovations are seen as enhancing society's capacity to act (Murray, Caulier-Grice & Mulgan, 2010) by actively involving affected individuals and empowering them in decision-making. The process of social interactions between individuals, addressing certain social needs, involves several actors and stakeholders who have an interest in solving the problem and empowering the beneficiaries in developing new solutions. Place-connected communities (Manzini, Thorpe, 2018) are characterised by resilience and provide great potential for design and collaboration to benefit community development and attachment. In the field of design, we are moving towards designing for and with local communities, for territories and contexts in which we live and operate (Fagnoni, 2018; 2022), through a holistic, strategic, and systemic approach to address the complexity of contemporary problems.

In this perspective, the community-centred approach (Villari, 2021) refers to those initiatives in which designers involve communities, considered as main users and project actors, for the activation of knowledge, the use of local resources, and the creation of value for the community.

Such projects seem to adopt the 'collaborative commons' perspective prefigured already 10 years ago by Rifkin (2014), where shared resources are collectively managed for the common good. Experimental urban and energy models, interpreted as incu-

bators of innovation policies for transition, provide fertile ground for developing new sustainable policies and practices (Crippa et al., 2024).

2. Framing communities and collaborative design concepts and practices

The increasing dialogue between designers and citizens in recent years has facilitated the emergence of Creative Communities (Meroni, 2007) and citizen movements capable of implementing alternative sustainable solutions. These communities are described as groups that autonomously, and often informally, develop innovative strategies to enhance their daily lives, typically in response to unsatisfied social needs. They arise from bottom-up initiatives, characterised by the sharing of resources, knowledge, and local practices, thereby promoting social innovation through self-organisation and collaboration. In this context, design serves to support and facilitate these initiatives without necessarily leading them. Conversely, Changing Communities (Gonzaga et al., 2023) extend beyond creative self-organisation, emphasising active transformation through structured co-creation processes. In this framework, community members not only devise solutions to meet their needs but also engage actively in a broader, institutionalised design process that involves designers, stakeholders, and

researchers. These communities evolve through continuous interaction with design, interaction with design, not only supporting but also guiding social and cultural transformation in response to global challenges such as climate change.

Also the concept of Circular Communities (Leclercq, Smit, 2023) has recently emerged, highlighting collaboration among residents, businesses, and governmental agencies. These collaborative initiatives contribute to the creation of multiple values—economic, social, ecological, cultural, and aesthetic—and underscore the necessity for a systemic approach to resource management. The “Circular Value Flower” method is employed to assess various aspects of these circular initiatives and to guide the development of sustainable neighbourhoods (Leclercq, Smit, 2023). Additionally, the concept of Eco-communities (Cattaneo, 2014) has been articulated as intentional communities designed to promote sustainable living and ecological principles. These communities seek to foster sustainable lifestyles through resource sharing, cooperative labor, and reduced consumption, with a focus on achieving well-being through ecological balance and community cooperation.

Framing communities within collaborative design proposals reveals a rich landscape of interaction and engagement. Traditional communities thrive by fostering local collaboration, building strong relationships through direct connections. Developing these approaches, we can cultivate resilient

and inclusive structures that address contemporary challenges and improve social cohesion.

3. Methodology

This study focuses on the opportunities offered by adopting a cooperative approach to design, exploring the role that designers and citizens can play in promoting this approach and developing new solutions. This paper discusses the current request for active citizenship in order to contribute to the development of eco-communities, capable of positively dealing with contemporary challenges. In this context, an important question arises: what innovative contribution may citizens bring from local knowledge to sustainable development? It is already known how local activism, usually strong in a DIY do-it-yourself community, can bring answers to complex problems with simple and low-cost solutions (Roversi, et. al., 2021). From these concerns, this paper aims to bring experiences of civic engagement that promote innovation from bottom-up creative experiments conducted by local citizens within informal practices of participatory design and community planning. It is expected to see how their territorial knowledge and local identity may empower circular communities through the activation of local dynamics that contribute to technological/sustainable cultural transition.

In order to achieve these objectives, a short case study method is adopted based on the analysis of experimental pathways initiated in the last decade.

Through a qualitative investigation and the analysis of significant cases, we aim to highlight the potential impacts that interdisciplinary collaboration between designers and citizens could have in the field of eco-innovation. Remote observation was applied to external projects, while direct observations were conducted in cases already included within the authors' research activities, enabling a deeper contextual understanding. There were also conducted semi-structured interviews with local citizens in the role of community leadership within the case of self-spatial planning.

Worldwide significant projects led by local communities will be analysed in a collaborative environment formed by a network of supporters of local institutions, experts, designers and public agents, bringing a system of knowledge oriented towards the development of sustainability solutions. The criteria adopted for the selection of the case studies are: 1) semantic adherence, realities that carry out research activities and favour the dissemination of practices for the involvement of local communities; 2) time frame, realities operating between 2010 and 2025; 3) project approach, realities that adopt democratic design, production models and community planning, involving citizens and local realities through DIY practices; 4) field of application, cases which promote integration between diffe-

rent knowledge systems for the development of ecological solutions, related to four fields: social innovation, bio-design, low environmental impact and self-managed spatial planning.

In particular, community-centred cases and projects are examined (tab. 1).

bio-communities	low-impact communities	social communities	self-planning communities
DIYbiosphere.org, online A global platform for DIY biology, offering resources like tutorials, guides, forums, and tools to democratize science and biotechnology. Dutch DIY Bio Group, Amsterdam A community for biology and designers, providing workshops, materials, and a collaborative environment for biotechnological innovation. OpenSpace Biolab, New York A community lab offering STEAM education, cultural events, and support for researchers and entrepreneurs.	Schoonschip, Amsterdam A sustainable floating neighbourhood utilizing solar energy and efficient water management. Developed by citizens, it promotes energy self-sufficiency and ecological living. Mediamatic, Amsterdam A cultural center with an urban aquaponics project combining plant cultivation and fish farming. It fosters sustainability, recycling, and environmental education through DIY workshops.	Kiosk of Reciprocity A mobile platform promoting discussions about the solidarity economy and collaborative matters. It aims to connect citizens and experts, fostering dialogue to activate a proximity economy in Milan's socio-cultural spaces. Fabrique de Quartier A modular device that involves residents in their neighbourhood using virtual tools to gather ideas. It creates a space for exchange and aims to engage the community in public space planning.	Popular Plan to Casa do Porto Neighbourhood An urban planning process conducted by residents in cooperation with local designers and planners, sponsored by the Brazilian Chamber of Architects in Fortaleza, Ceará, in a shared learning environment oriented to local sustainable development and political empowerment to deal with urban struggles and disputes over a maritime territory.

Tab. 01.
Different forms
of eco-communities

3.1 Bio-communities

To address the complex challenges of sustainability and the production of sustainable materials, designers investigate biological processes of nature, involving living organisms in the design process (Priola, 2024). Alternative practices, such as Biodesign (Myers, Antonelli, 2012), which combines design and biology (Oxman, 2016) and encourages the use of collaborative biotechnological processes (Priola, Manfroni, 2024) for the development of ecologically compatible products (Fagnoni, Manfroni, Priola, 2024), are rapidly spreading alternative practices. The result is a matured degree of collaborative practices that foster the dissemination and promotion of both individual and collective self-production models (Rognoli, 2015). In this sense, DIYbio communities, such as DIYbiosphere.org is a platform that promotes DIY biology and accessible scientific innovation through the sharing of biological resources and knowledge. It is a community composed of a global network of biology enthusiasts, scientists, designers, students, and citizens who work together to explore new frontiers in biotechnology. The platform offers tutorials, practical guides, discussion forums, and access to materials and tools necessary to start biological experiments in small independent laboratories. The main goal is to democratize access to science and biological technology, making it available and accessible. The Dutch DIY Bio Group in Amsterdam (fig. 1), It is a community of biology enthusiasts



Fig_01
Dutch DIY Bio Group
meetup.com/dutch-diy-bio/

and designers who come together to explore and innovate in the field of biotechnology through practical experiments and collaborative projects with the aim of democratizing access to scientific knowledge. The group organizes discussion workshops where members can learn from each other and work on projects that push the boundaries of DIY biology. They also offer access to a variety of materials and equipment, allowing members to conduct experiments and develop new biotechnological solutions in a supportive and collaborative environment. The Genspace Biolab in New York (fig. 2) is a community biology lab that provides hands-on STEAM education programs for youth and adults, cultural and public outreach events, and a membership program to support New York's community of creative researchers and entrepreneurs. These community realities offer spaces for

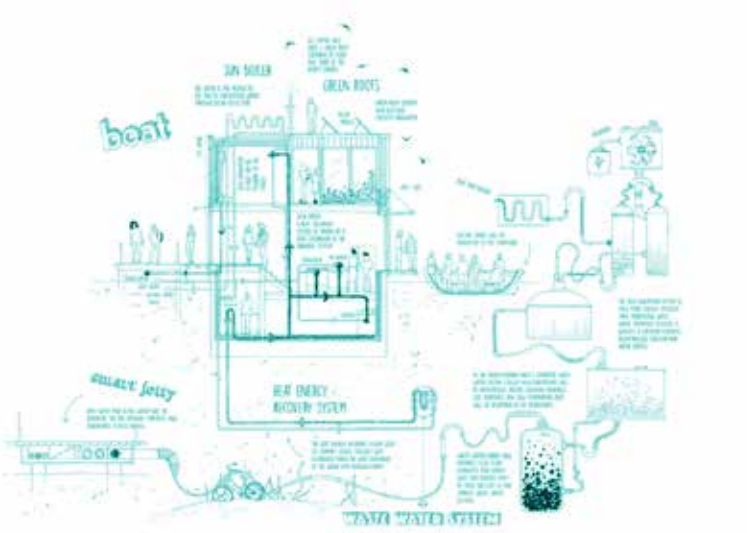
collaboration between experts, designers and citizens, supported by approaches that favour the development of projects and experiments through the use of biomaterials.



Fig_02
Genspace Biolab
genspace.org/

3.2 Low-impact communities

In the energy transition, low-impact communities have emerged, where collective well-being replaces individual interests. Schoonschip (fig. 3), a floating neighbourhood on Amsterdam’s Johan van Hasselt canal, is a prime example. Developed between 2010 and 2021 by a citizens’ association, it’s recognized as Europe’s most sustainable neighbourhood. Its eco-friendly homes use local energy, efficient water management, solar



Fig_03
Schoonschip
schoonschipamsterdam.org/

panels, and heat pumps, promoting energy self-sufficiency (Leonardi et al., 2023). Schoonschip emphasises collaboration and sustainable living integrated with nature. Urban communities also face food supply challenges. Mediamatic, a cultural centre in Amsterdam, explores urban cultivation through aquaponic systems, combining plant growing and fish farming. Its Miniponics project (fig. 4) introduces aquaponics in homes and schools, using recycled materials. Workshops teach participants about water conservation, waste reduction, and ecosystem care.



Fig_04
Miniponics
mediamatic.net/en/page/46742/miniponics

3.3 Social communities

The active involvement of citizens forms the core of The Kiosk of Reciprocity (fig. 5). Acting as a mobile platform between various socio-cultural hybrid spaces, it promotes exchange and dialogue on the solidarity economy and collaborative welfare. The goal is to encourage conversations between citizens and experts to activate a proximity economy in Milan's hybrid socio-cultural spaces and neighbourhoods. At the Salone del Mobile 2024, the kiosk was part of Stecca3's Crafting Dialogues, a programme featuring public discussions,



Fig_05
The Kiosk for Reciprocity
temporioso.org/

design exhibitions, and installations focused on the intersection of design, knowledge, and ecological transition. Similarly, the Fabrique de Quartier (fig. 6) is a participatory tool that invites neighbourhood inhabitants to rethink their daily lives through visual and graphic tools. This installation is an urban workbench that encourages DIY actions to address local challenges. It offers citizens a platform to share ideas that could form the basis for future projects, while actively transforming their everyday spaces.



Fig_06
Fabrique de Quartier
plateforme-socialdesign.net/

3.4 Self-planning communities

Social protagonism is a relevant topic also to spatial planning issues, bringing important findings to design innovation regarding technical method and limits, as well as the role of designers as community partners in a collective, complex and multidisciplinary context. Even though there are several and diverse cases of participatory spatial planning to be explored worldwide, significant experiences in Latin America reveal tendencies of active citizenship outperforming institutionalised participation processes. Social participation often results in invited action spaces, while self-managed processes have high potential to generate invented action spaces (Miraftab, 2016, p. 368). Parti-

cipatory processes are widespread marked by governmental limits and contradictions, while self-planning community processes, as other commoning practices, inspire new contributions to creatively change local governance through informal practices (Maricato, 2014; Boeri et al., 2020).

Public management oriented to a market-business format represents a disconnection from the core role of the state, as a mediator agent between different interests and guarantor of civil rights and sustainable development, especially to those communities that do not enjoy the city as an economic entity, but as a living environment. Tendencies of contemporary urban planning based on a market-oriented format are leading Latin American cities to a “predatory urbanism” (Maricato, 2014) that forces local territories into deepening socioeconomic inequalities and promoting unsustainable ways of living. This situation is forcing reactions from local groups towards self-competence improvements to promote community autonomy in self-managed spatial planning. One of the most recent cases in Brazil is happening in the Cais do Porto neighbourhood, in the Northeastern city of Fortaleza (Ceará State): a community resistance against constant state efforts to develop urban projects that promote forced removal of local residents. This case was chosen not to develop an exhaustive analysis, considering that there are many different conditions and other situations in the continent, but to show a representative example of local interaction between residentes, academics, designers

and other stakeholders in a co-planning reactive experience.

Titanzinho community is organised in local resident commissions and neighbourhood associations (fig. 7, fig. 8), supported by a network of local partners dealing with right to the city issues. They conducted a spatial planning process from 2021 to 2022 resulting, at the beginning of 2023, in the Plano Popular (Titan; Titanzinho, 2022) to Cais do Porto ZEIS, a Special Zoning for Social Interest, a regulatory legal instrument defined in the City Plan. A substantial part of this work was sponsored by Ceará State Chamber of Architects (CAU) with earmarked funds for technical assistance.

The Plan includes six strategic axes hereinafter: 1) housing; 2) environment and infrastructure; 3) open spaces and public facilities; 4) socioeconomic conditions and eco-solidarity economy; 5) cultural development; and 6) community development. The methodology and the whole approach were developed in an integrated and propositional format, embracing territorial diagnosis, data analysis, and collective proposals for urban interventions and local services implementation, everything built in an inclusive and community-led planning process involving residents and partners.

Regarding institutional planning processes, this self-planning format brings several advantages. Considering the previous discussion about “predatory urbanism” and the human dimension of sustainability, the main important gain is local empowerment; understood as the self-insertion of residents



Fig_07
Titanzinho Community landscape (July 2024)
André Araújo Almeida archives



Fig_08
Participants in local commissions and neighbourhood associations
Source: Titan, Titanzinho, 2022, p. 104 [free translation: “Titan (community) is not on sale”];

as leading actors, undertaking protagonism in the urban planning processes instead of the current consultancy role without deliberation powers. A popular plan is a positive tool due to its potential to reinforce and/or consolidate local instances. Such a plan becomes also a political instrument, able to face unsustainable urbanisation models and landscape erasure threats that may lead to community removal top-down decisions from public projects acting over this territory. The sustainable proposals presented in the Popular Plan refer to the human dimension of sustainable development, specially regarding the development of local people facing socio economic challenges such as inequalities and poverty, social inclusion and city and civic rights. It is also remarkable, due to the territorial connection of local residents, how they are able to promote ecological changes in their own cities through eco-innovation proposals in a Popular Plan. In the case of Titanzinho Popular Plan, it is also significant the presence of eco-innovative proposals, related to low-cost initiatives, low-tech and low-complexity design that may be developed by the own community with their own resources (or partner's), to face environmental threats of urban density and lack of urban infrastructure that are not target of public investment over the years. It happens in parallel to eco-solidarity economic proposals, where intelligent and responsible forms of using local resources promote socio-economic progress and overall well-being. We may affirm, from this case, that the local approach of a self-plan-

ning community allows it to overcome public-institutional plan constraints beyond the technical-political-economic triad, incorporating local conditioning, such as environmental, cultural, and social dimensions, pertinent issues to the sustainability of local territories.

4. Design focus, the value of relations

This section presents a comparative qualitative analysis of different mapped case studies, with the aim of highlighting the value of design and urban planning in addressing complex socio-environmental challenges. This approach explores specific parameters to analyse how collaborative design practices promote citizen interaction, awareness and participation in heterogeneous community contexts, offering a detailed view of the impact created by such projects (tab. 2, tab. 3, tab. 4, tab. 5).

Analysing the values generated by these initiatives means exploring not only tangible outcomes, such as developed products or services, but also the transformative effect that design and planning can have on the communities involved. In particular, social innovation projects stand out for their ability to generate profound impacts, improving collective well-being, promoting self-sufficiency and fostering cultural change; but it is often a challenge to try to measure this. The qualitative approach adopted in this analysis,

therefore, allows us to observe how design contributes to building social networks and stimulating participatory practices, both through access to scientific knowledge and support for participants' autonomy. The impact of these initiatives, often aimed at democratising science, collaborative resource management and building ecological scenarios for the city, highlights the role of design and planning as an engine of innovation and social change. By studying the scale of interventions, stakeholder engagement and collaborative design practices, this analysis aims to understand how design and urban planning are able to produce not only concrete results but also indirect benefits for communities, supporting a transition towards more responsible and inclusive living models.

The qualitative analysis here applied is structured around five main parameters:

- Intervention Scale

Examining the local, regional, and international scopes of the initiatives;

- Stakeholders

Identifying the composition and collaboration of community members involved;

- Design Practices

Analysing the collaborative approaches and contributions of design;

- Output

Evaluating the developed projects and services;

- Impacts

Measuring the direct and indirect benefits of these initiatives.

The analysis results reveal a complex landscape, characterised by a multitude of initiatives that vary according to context. Biocommunities operate to promote interdisciplinary practices for sharing biological knowledge and democratizing access to biological sciences in independent laboratories and for the diffusion of do-it-yourself practices that support self-production. Social communities promote participatory visual and graphic tools to facilitate the sharing of ideas and urban transformation, DIY actions, dialogue, co-creation and encourage engagement in the proximity economy. Their actions strengthen communities, promote the adoption of green practices and stimulate active citizen participation in urban transformation.

The analysis of low-impact communities highlights the importance of participatory and collaborative design in promoting sustainability and social cohesion. Through the integration of ecological technologies, the utilization of local knowledge, and circular models, design supports resilient and self-sufficient communities capable of addressing global challenges. These projects serve as sustainable prototypes for future urbanization, inspiring environmentally and socially inclusive policies.

The main contributions of the studied self-planning community to this work are regarded the independent approach from institutional public instances, a key element that brought new possibilities to local awareness and residents' responses to urban challenges. It was seen emerging new capabilities

through self-governance and shared learning in local networks as well as impulses to creativity and innovation in planning proposals for urban interventions and services, as suggested by Krätke (2011). It may be underlined that local knowledge was put in action when this community was stressed by unsustainable and undemocratic urban project; leading residents to civic engagement in resistance social movements. The social empowerment feeling historically existing in this territory was potentialized by partnership between residents and academic and local non-profit organisations that catalysed community competences in urban planning conduction; an strategic issue to stimulate creativity and to bring innovative proposals to urban plans in vulnerable territories. Low-impact and bio-communities demonstrate that integrating ecological technologies and circular models can lead to self-sufficient systems that inspire environmentally responsible behavior. These models can serve as scalable prototypes for future urbanization, encouraging policies that support environmental stewardship and social inclusivity. Bio-communities and related DIY initiatives highlight the importance of interdisciplinary practices that democratize access to science and technology. Sharing resources and fostering a collaborative atmosphere allows for grassroots innovation, supporting wider adoption of sustainable practices and empowering individuals to engage with complex problems. Self-planning communities show that in-

dependence from institutional bodies can foster creative and resilient responses to urban challenges. Through partnerships with academics and non-profits, these communities have strengthened their capacity for strategic urban planning, facilitating adaptive solutions tailored to local contexts. The integration of design in these communities helps build stronger social bonds by fostering collaboration and collective problem-solving. In social and low-impact communities, this leads to greater resilience and the development of a support system that can better navigate environmental and socio-economic challenges.

bio-communities	Intervention scale	Stakeholders	Design practices	Output	Impacts
DYBiosphere.org online Dutch DIY Bio Group Amsterdam Genespace Bedlab New York	Local (research labs, independent labs, public and community spaces) International (online) networks and open-source platforms	Designers, biologists, materials engineers, students, citizens	Promotion of collaborative practices and projects through the integration of design and biology Collaboration with scientists and citizens to develop biotechnological initiatives using an interdisciplinary approach Coordination of workshops to create practical guides and tools that facilitate information sharing	Collaborative biological projects focused on biomaterial experimentation Workshops and practical guides to share scientific and technical knowledge Publications documenting experiments and findings through articles, blogs, and forums	Promotion of interdisciplinary practices for sharing biological knowledge Democratization of access to biological science Provision of materials for experiments in independent labs Dissemination of DIY practices supporting self-production

Social communities	Intervention scale	Stakeholders	Design practices	Output	Impacts
The Kiosk of Reciprocity Fabrique de Quartier	Local (neighbourhoods, public and community spaces) Both projects operate at the local level, focusing on communities and socio-cultural hybrid spaces	Citizens, neighbourhood inhabitants, experts of socio-cultural hybrid spaces, local designers, civic organisations	Participatory visual and graphic tools to facilitate idea sharing and urban transformation, DIY actions, dialogue, co-creation and to encourage engagement in proximity economy	Projects generate public discussions, design exhibitions installations, urban workshops facilitating DIY initiatives for sharing ideas and addressing local challenges	Community empowerment, promote the adoption of ecological practices and stimulates the active participation of citizens in urban transformation

Tab_02; 03
Bio-communities analysis;
Social communities analysis

Low-impact communities	Intervention scale	Stakeholders	Design practices	Output	Impacts
Schoonschip Medanste	Neighbourhood in urban space	Citizens, designers, local governments, environmental groups, civic organisations	Eco-friendly architectural design, renewable energy integration, sustainable water and waste management	Energy-efficient homes, urban agriculture DfY systems, self-sufficient energy infrastructure	Enhanced environmental sustainability, reduced carbon footprint, strengthened community collaboration

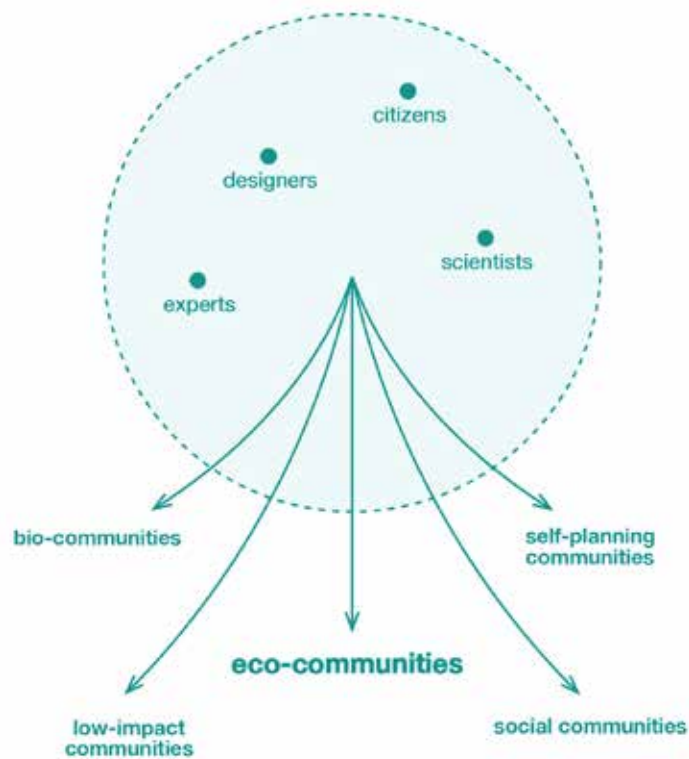
Self-planning communities	Intervention scale	Stakeholders	Design practices	Output	Impacts
Plano Popular de ZEP Gas do Porto	Local range of influence (community public spaces and its surrounding territories)	A Neighbourhood Committee, the association of residents supported by professional council and architects, urbanists, and other professionals and academics acting also in the Third Sector, involved with urban issues.	Integrated and proactive approach, embracing territorial proportional diagnosis, data analysis, and collective / participatory design decisions for community urban interventions and local services improvement.	The popular plan itself is the main output of this self-made urban planning process as a technical and political instrument to demand the right for the city principles...	Shared learning between local partners in order to overcome institutional planning constraints beyond the technical / political / economic triad, incorporating local conditioning, such as environmental, cultural, and social dimensions, pertinent issues to the sustainability of local territories. Community empowerment through self-insertion of residents as leading urban actors, undertaking protagonism in local planning processes. Contribution to consolidation of community's territorial management instances.

Tab_04; 05
Low-impact communities analysis;
Self-planning communities analysis

5. Different forms of eco-communities

The observed cases and experimental paths have made it possible to identify the potential positive impacts that interdisciplinary collaboration between different levels of knowledge could generate in the field of design. These practices call for an in-depth reflection not only on the current state of development of current experiences, but also on the possible future results that could be generated by the interaction between designers and local communities. In this perspective, design can be seen as an agent of change (Amatullo, 2022) capable of developing, together with communities (fig. 9) alternative scenarios of more sustainable planning, design, production, and consumption.

The analysis of case studies across bio-communities, social communities, low-impact communities, and self-planning communities underscores the transformative role of design in fostering resilience, sustainability, and social empowerment. Design practices that involve community members directly encourage a sense of active participation. This approach enables communities to harness local knowledge and create tailored solutions to meet their unique needs. In self-planning and social communities, participatory tools stimulate creative thinking and enhance civic engagement, resulting in more democratic and inclusive urban development.



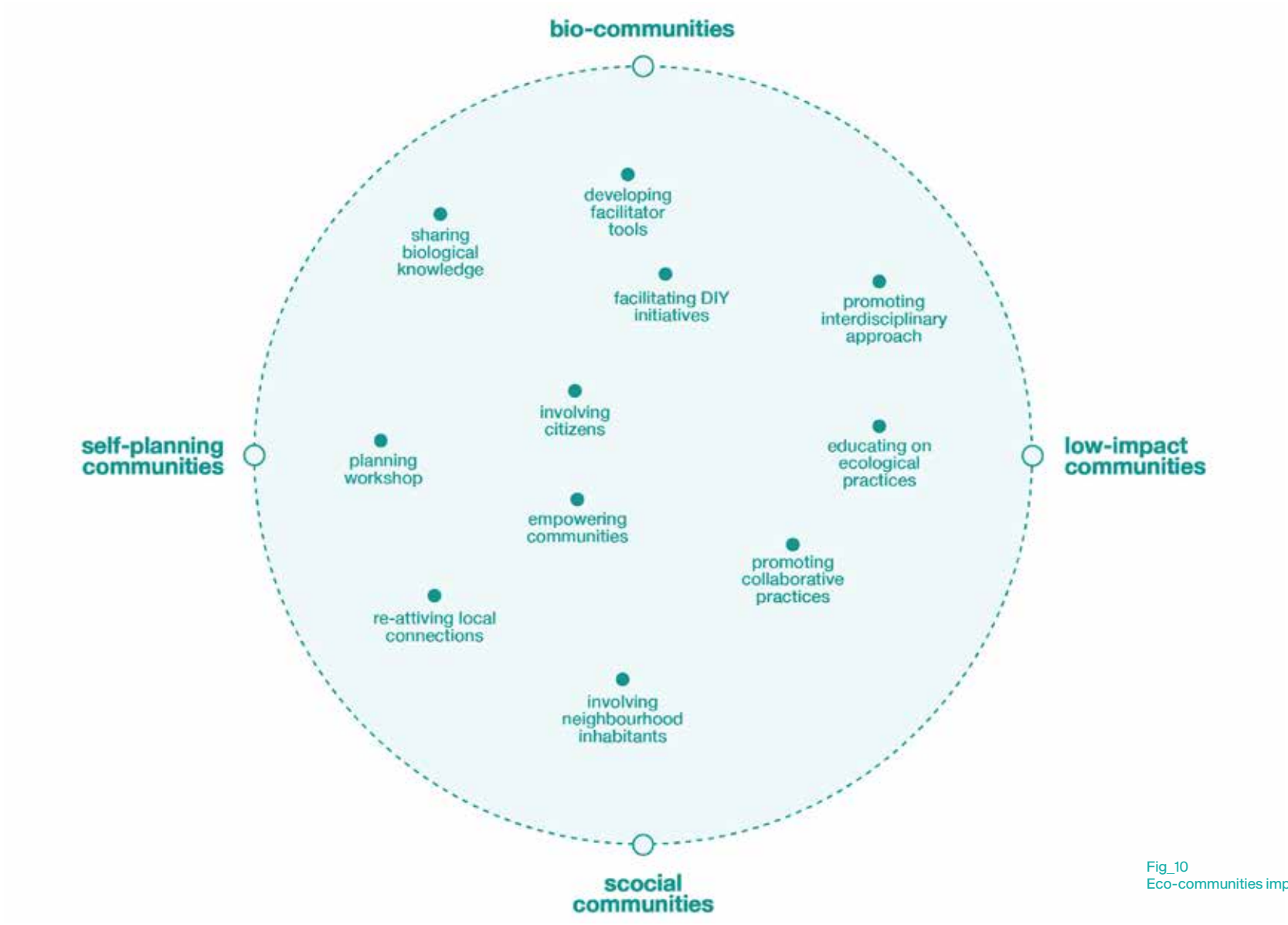
Fig_09
Different forms of
eco-communities

By encouraging collaboration, leveraging local knowledge, and incorporating sustainable practices, design not only responds to immediate community needs but also lays the foundation for long-term resilience and adaptability in the face of global challenges.

A critical issue that emerged during the collection of case studies was the lack of available information, which affected the completeness and depth of the analysis. To address this challenge, it may be necessary to explore additional data sources or implement more effective information-gathering strategies to ensure a more comprehensive and accurate framework.

Despite the realities found, there are still areas and aspects to be explored. The further development of this research hopes to investigate and evaluate how these projects and the action of eco-communities may be able to maintain their value over time (fig. 10). In addition to the lack of clear definitions or frameworks for each identified community type, another critical aspect is the ambiguity surrounding the participants involved. The fact that the individuals engaging in these activities may change over time can significantly impact the consistency and direction of the projects, adding a layer of complexity to their sustainability and effectiveness.

To maximise their impact, it is essential to implement transformational strategies that foster multi-level cooperation and address the challenges related to scalability and long-term sustainability. Future research



Fig_10
Eco-communities impacts

should focus on further exploring the role of design and designers in these processes, with particular attention to identifying and elaborating the disciplinary tools that can effectively support the development and sustainability of DIY community initiatives, thereby enhancing their scalability and durability over time.

Author contribution statement

The contribution is the result of a common reflection of the Authors, who defined the main concept for the research activity.

Moreover, the paragraphs “Community-centred approaches” and “Social communities” are to be attributed to Manfroni M., the paragraphs “Framing communities and collaborative design concepts and practices” and “Bio-communities” to Priola C. M., the paragraphs “Methodology” and “Self-planning communities” to Araújo Almeida A., “Low-impact communities” and “Different forms of eco-communities” to Leonardi C.

The paragraph “Design focus, the value of relations” is to be attributed to all authors.

References

Almeida, A. A. & Alvim, A. A. T. B. (2024) Estudos territoriais: Contribuições teóricas à praxis da Arquitetura e do Urbanismo. In: V Seminário Internacional AEAULP - Proximidades Distantes, Brasília. Anais. Lisboa: AEAULP Academia de Escolas de Arquitetura e Urbanismo de Língua Portuguesa, v. II. p. 1054-1062. ISBN: 978-989-53462-5-7

Amatullo, M., Boyer, B., May, J., & Shea, A. (Eds.). (2022). Design for Social Innovation: Case Studies from Around the World. Routledge, Taylor & Francis Group.

Boeri, A., Longo, D., Massari, M., Roversi, R., Sabatini, F. (2020) Il commoning nella pratica della governance urbana. L'esperienza del progetto OBRAS. AGATHÓN – International Journal of Architecture, Art and Design, n. 08. Bologna: UNIBO. p. 180-187. <https://dx.doi.org/10.19229/2464-9309/8172020>

Cattaneo, C. (2014). Eco-communities. In Degrowth (pp. 165-168). Routledge.

Chick, A. (2012). Design for Social Innovation: Emerging Principles and Approaches, *Iridescent*, 2:1, 78-90, DOI: 10.1080/19235003.2012.11428505

Crippa, D., Di Prete B., Fagnoni, R., Leonardi, C. (2024). Distretti energetici collaborativi: laboratori urbani per un'energia di prossimità, AGATHÓN | International Journal of Architecture, Art and Design, for no. 15 | 2024, which will be published in June, has proposed the subject INNOVABILITY© (part III) | Energy Transition

Eco, Umberto (1997). *Opera Aperta: Forma e indeterminazione nelle poetiche contemporanee*. Milano: Bompiani.

Fagnoni R. (2018). Da ex a next. Design e territorio: una relazione circolare basata sulle tracce, *MD Journal* [5] 2008, pp. 16-27.

Fagnoni R. (2022). Design in allerta. *MD Journal* [14] (2022), pp. 12-23.

Fagnoni, R., Manfroni, M., & Priola, C. M. (2024). Hyperlocal material activism. Biodesign practices for a biocultural and an ecological transition. *Cambridge Open Engage*. <https://doi.org/10.33774/coe-2024-1jtd7>

Gonzaga, S., Nam, K., Rebaglio, A., & Selloni, D. (2023). [Changing] Communities. In *Proceedings of IASDR 2023*:

Life-changing Design (pp. 1-12). Design Research Society.

Krätke, Stefan (2011). *The Creative Capital of Cities: interactive knowledge creation and the urbanization economics of innovation*. Chichester, UK: Wiley-Blackwell.

Leonardi, C., Crippa, D., di Prete, B., & Pasteris, P. (2023). Designing for the energy transition from INTuition to INTention. *TECHNE - Journal of Technology for Architecture and Environment*, (26), 53–60. <https://doi.org/10.36253/techne-14479>

Leclercq, E. M., & Smit, M. J. (2023). *Circular Communities: The circular value flower as a design method for collectively closing resource flows*. TU Delft OPEN Publishing.

Manzini, E. (2018). *Politiche del quotidiano. Progetti di vita che cambiano il mondo*. Edizioni di comunità, Roma.

Manzini, E., Thorpe, A. (2018). Weaving People and Places: Art and Design for Resilient Communities. *She Ji: The Journal of Design, Economics, and Innovation* 4(1): 1–9. <https://doi.org/10.1016/j.sheji.2018.03.003>.

Maricato, E. (2014). *O impasse da política urbana no Brasil*. Petrópolis, RJ: Vozes.

Meroni, A., Selloni, D. (2022). *Service Design for Urban Commons*. Springer International Publishing.

Meroni, A. (2007). *Creative Communities. People Inventing Sustainable Ways of Living*. Edizioni Polidesign, Milano.

Miraftab, F. (2016) Insurgência, planejamento e a perspectiva de um urbanismo humano. *Revista Brasileira De Estudos Urbanos e Regionais*, v. 18, n. 3. Associação Nacional de Pós Graduação e Pesquisa em Planejamento Urbano e Regional. Recife: ANPUR. p. 363-377. <https://doi.org/10.22296/2317-1529.2016v18n3p363>

Myers, W., Antonelli, P. (2012). *Bio design: Nature, science, creativity*. Thames & Hudson Ltd, Londra.

Murray, R., Caulier-Grice, J., Mulgan, G. 2010. *The open book of social innovation*. London: The Young Foundation & NESTA.

Oxman, N. (2016). *Age of Entanglement*. Design and Science, MIT Media Lab, MIT Press, Massachusetts, 1-11.

Priola, C.M. (2024). Design and living organisms. Grow-made processes of biocompatible materials. In: Gambardella,

C. (eds) *For Nature/With Nature: New Sustainable Design Scenarios*. Springer Series in Design and Innovation, vol 38. Springer, Cham.

Priola, C. M., Manfroni, M. (2024). DIYbio community e attivismo locale. Come gli approcci collaborativi promuovono l'innovazione nel Biodesign. *Criticapratica*. Per una critica della normalità: nuove visioni e paradigmi progettuali, Simposio presso l'Università di Genova, DAD Dipartimento Architettura e Design, 29 Novembre, Genova, Italia.

Rifkin, j. (2014). *The zero marginal cost society: the internet of Things, the collaborative commons, and the eclipse of capitalism*. New York: Palgrave MacMillan.

Roversi, R., Longo, D.; Massari, M., Orlandi, S., Turazzi, B. (2021). Il patrimonio culturale come attivatore di dinamiche urbane circolari. *Techne – Journal of Technology for Architecture and Environment*. n. 22, Firenze: FUP - Firenze University Press.

Santos, M. (2005). *O retorno do território*. OSAL: Observatório Social de América Latina. Buenos Aires: CLACSO. 6 (16): 255-260. <http://bibliotecavirtual.clacso.org.ar/ar/libros/osal/osal16/D16Santos.pdf>.

Titan, Comissão; Titanzinho, Associação de Moradores do (2022). *Plano Popular da ZEIS Cais do Porto*. Fortaleza: CAU / CE – Conselho de Arquitetura e Urbanismo do Ceará.

Villari, B. (2021). Community-centered design: a design perspective on innovation in and for places. *The International Journal of Design in Society*, 16(1), 47.