26

PAD

HUMANIZING ENERGY

PAD. Pages on Arts and Design
International, peer-reviewed,
open access journal
founded by Vanni Pasca in 2005

Publishing Consultant
Vincenzo Castellana, Architect, Italy

Art Direction
Francesco E. Guida

Web Site
Pietro Forino, www.pietroforino.com

Correspondents
Amina Agueznay (Morocco), **Hèla Hamrouni** (Tunisia), **Vesna Kujovic** (Montenegro), **Can Özcan** (Turkey), **Ana Perkovic** (Croatia), **Filip Roca** (Montenegro), **Azadeh Sabouri** (Iran), **Marco Sousa Santos** (Portugal), **Pascale Wakim** (Lebanon)

Reviewers
Anna Anzani, Venanzio Arquilla, Michela Bassanelli, Marco Boffi, Luca Botta, Laura Carugati, Mauro Ceconello, Annalinda De Rosa, Barbara Di Prete, Susana Gonzaga, Chiara Lecce, Francesca Maria Mauri, Dario Pedrabissi, Nicola Rainisio, Lucia Ratti, Agnese Rebaglio.

PAD
via Francesco Soave 15 – 20135 Milano – Italy
via Roma 171 – 90133 Palermo – Italy
info@padjournal.net – editors@padjournal.net

Publisher
Aiap Edizioni
via A. Ponchielli 3 – 20129 Milano – Italy
aiap@aiap.it – www.aiap.it

PAD © ISSN 1972-7887
#26, Vol. 17, June 2024
www.padjournal.net

0. EDITORIAL #26

I. VALUES: ENERGY CULTURES & BEHAVIORAL CHANGE

II. MODELS: ENERGY COMMUNITIES & COLLABORATIVE LANDSCAPES

III. TOOLS: ENERGY TECHNOLOGIES & DIGITAL AWARENESS

III. BIOGRAPHIES

I

VALUES

ENERGY CULTURES & BEHAVIOURAL CHANGE

Environment/Data/People

[Eco] Participation through Data Visualization as Design Strategic Approach for Engaging, Sensitizing, and Educating the Community to Energy Transition

Alessio Caccamo
La Sapienza Università di Roma
Orcid id 0000-0002-2045-6385

Anna Turco
La Sapienza Università di Roma
Orcid id 0009-0006-5922-8191

Keywords
Information Visualization, Affective Visualization, Interactive Data Visualization, Energy Transition, Environmental Education.

Abstract
In the face of a polycrisis marked by environmental, social, and economic upheavals, the transition to sustainable energy has become a global imperative. This transition is not only a matter of policy and infrastructure but also hinges on the individual citizen, who initiates and completes the process. Therefore, it is crucial for citizens to possess adequate energy literacy in line with the 2030 SDGs. Information Design plays a significant role in this scenario by creating communicative artifacts that narrate complex topics in an easily understandable manner to a broad audience. Moving from the cold, intangible dimension of data to a warm, tangible, human dimension can be achieved using visual metaphors, the creation of new levels of meaning, and the co-creation and participation in the visualization project. The physical and digital involvement with data can design a unique communicative bridge between people, the environment, and stakeholders. In this context, the participatory visualization and physicalization of data for eco-educational purposes termed [Eco] Participatory through Data Visualization - could be a promising area of investigation in communication design research and practice.

1. Introduction

In the current scenario, promoting the change towards sustainable energy sources requires an approach that actively involves both the individual and the community, including all economic and productive actors, to steer personal choices towards social responsibility (Leonardi, et al., 2023, translated by the Author). While, on the one hand, the role of social and political agencies is evident, on the other hand, it's crucial that the individual citizen who is the beginner and the finisher of the energy transition process and who, therefore, needs proper sustainability and energy literacy (IRENA, 2022) according to the SDGs 2030 (United Nations, 2015). Visual Communication Design, both in Information Design (Kirk, 2019) and Environmental Graphic Design (Calori & Vanden-Eynden, 2015), is able to make a relevant contribution in the energy transition scenario, by designing communicative artefacts capable of narrating complex topics in a quick and easily understandable way to a wide audience (Tufte, 1982).

2. The Importance of Being Energy Literate: the Role of Participation as Driver of Emotional Involvement

Energy literacy is a fundamental aspect in encouraging energy-saving behaviors and fostering sustainability. Energy transition is surely not only about technological change, but it must also reflect socio-cultural and environmental transformations on the local level (Chodkowska-Miszczuk, et al., 2021). In this sense, on the one hand, energy literacy encompasses cognitive, affective, and behavioral domains, influencing individuals' understanding of energy consumption, production impacts, conservation needs, and renewable energy

development (Aguirre-Bielschowsky et al., 2015), and, on the other hand, it focuses on the ability to assess energy-related problems, and the adoption of appropriate behavioral strategies (Usman et al., 2021). Energy literacy at all educational levels is crucial for promoting energy-saving practices (Cotton et al., 2016). This is particularly relevant in the "greening" agenda in higher education, where developing students' energy literacy is a key aspect (Cotton et al., 2015).

In the energy transition context, energy literacy is crucial for increasing public awareness and participation in energy-related issues (Hendinata et al., 2022). It is also linked to wider sustainability issues, making it a good proxy for measuring sustainability in educational institutions (Cotton et al., 2017). That's because energy awareness comes down to understanding the basic concepts, rules, theories, energy transfers, transformation processes, and the role that energy plays in everyday life (Chodkowska-Miszczuk et al., 2021). Moreover, energy literacy is considered a minimum required capacity for developing a sustainable society that actively engages in discussions on energy and environmental issues (Akitsu & Ishihara, 2018). The involvement of the education sector in promoting energy literacy is seen as a strategy to build awareness in students from an early age (Rohmatulloh et al., 2021; Putri et al., 2022). Furthermore, an energy-literate individual not only possesses basic energy-related knowledge but also comprehends both the environmental impacts of human energy activities on the ecosystem (Khuc et al., 2023) and the necessity of developing the skills to address energy-related challenges (Puspitasari, 2020; Usman et al., 2021).

To achieve these abilities, participation is an essential key strategy for fostering informed decision-making, promoting sustainable energy practices, and empowering individuals to contribute to energy transition efforts. Research has emphasized the importance of participation in enhancing energy literacy levels and encouraging engagement in energy-related issues (Ryghaug et al., 2018). Actively engaging in energy-related activities and discussions allows individuals to deepen their understanding of energy concepts, contribute to energy citizenship, and support the transition towards renewable energy sources (Ryghaug et al., 2018). Community awareness and participation are vital for driving changes that reduce climate change impacts and greenhouse gas emissions (Mohamad & Osman, 2022). For instance, engaging communities in energy-related discussions and initiatives can lead to collective action toward mitigating environmental challenges and promoting sustainable energy practices (Mohamad & Osman, 2022). Furthermore, involvement in energy literacy initiatives can increase awareness of energy consumption patterns, which is crucial for effective engagement in transitioning energy systems (Zanocco et al., 2022).

Adding to these, participation in the sense of being emotionally involved into the energy issue topic defines a crucial role to foster energy literacy through the design and fruition of data art experience. Information design strategies – such as

Data Visualization[1], Data Art[2] and Data Physicalization[3] – are essential for enhancing energy literacy by effectively conveying complex information in a more understandable and engaging manner, improving decision-making, changing attitudes, and reducing risky behaviors (García-Retamero & Cokely, 2013).Indeed, data art plays a significant role in communicating environmental data by evoking emotional responses and fostering connections with nature, creating empathy for ecological issues, influence pro-environmental attitudes, and encourage pro-environmental behavior (Curtis et al., 2012; Curtis, 2009; Brock et al., 2022). Through data visualization artifacts, individuals can develop a sense of empathy toward environmental concerns and engage in meaningful dialogues about sustainability (Sommer & Klöckner, 2021). Moreover, the emotional engagement facilitated by data art can lead to increased environmental awareness and sensitivity to ecological issues (Wang et al., 2022). Combining science and art opens new avenues for research and discussion on environmental matters, providing emotional and human contexts that enhance the understanding of complex environmental topics (Valentini & Nesci, 2021). To achieve these

1 Data visualization involves creating visual representations of data using common graphics like charts, plots, and infographics. These visual displays help convey complex data relationships and insights in an easily understandable manner.

2 Data Art, or Information Art, is a visual medium that draws inspiration from and integrates data, computer science, information technology, artificial intelligence, and related data-driven disciplines. It leverages data as source material to craft visually captivating and meaningful representations, conveying emotions to the audience by revealing insights, patterns, or hidden stories in an accessible and creative manner.

3 Data physicalization explores the use of physical artifacts to represent data. It intersects with various research domains, including information visualization, scientific visualization, visual analytics, tangible user interfaces, shape-changing interfaces, personal fabrication, graphic design, architecture, and art.

goals, emotional involvement with the data is mandatory because the participation with the content domain is a crucial determinant of the effects of interactivity (Wojdynski, 2015). In this sense, people participate in the visualization because in a dynamic data visualization – dashboard or interface – the result of the visualization is linked with the interaction and determines a custom result.

3. Participation through Data Visualization to Foster Energy Transition: Designing *Affective* Visualization

Through his action, the designer facilitates the co-creation of individual awareness and collective consciousness through the involvement of all actors (Rizzo, 2009) and by addressing personal choices toward social responsibility (Leonardi et al., 2023). The resistance of communities to understanding data – both due to a low level of graphicacy (Cairo, 2017) and relativism towards environmental issues – necessitates data humanization strategies (Bertling, 2023) to instill collective empathy towards the energy transition; a holistic approach that keeps in mind environment, data and people. Let's move from the cold and intangible dimension of data to a warm and tangible – human – dimension that is the result of both the use of visual metaphors and the creation of new levels of meaning (Lupi in Lange, 2019) and the co-creation and participation in the visualization project and ultimately the physical materialization of the information itself. It is possible to design a particular communicative bridge between people, the environment and stakeholders. To enhance energy literacy and support energy transition, participatory design strategies are essential for engaging stakeholders in the design and development of ener-

gy-related initiatives. Participatory design involves incorporating end-users, such as community members, in decision-making processes to ensure that resulting solutions align with their needs and preferences Tuhkala (2021). This approach can lead to enhanced quality and usability of energy-related designs, increased acceptance of innovations, improved comprehension of energy concepts, and more effective implementation of energy transition initiatives (Könings et al., 2007). In energy literacy, participatory design can entail collaborative efforts among educators, policymakers, and community members to co-create educational materials, workshops, and programs that deepen understanding of energy production, consumption, and conservation practices (Könings et al., 2010). By involving stakeholders in the energy literacy initiatives' analysis, design, and implementation stages, participatory design can guarantee that resulting interventions are pertinent, engaging, and successful in promoting energy literacy (Könings et al., 2010). In these terms, it is possible to assume that the participatory visualization of data (Moretti & Mattozzi, 2020) applied for eco-educational aims (Bertling, 2023) – a so-called [Eco] Participation through Data Visualization – could be an approach capable of considering thinking, attitudes, emotions, motivations (IxDF, 2016). Indeed, environmental data storytelling can trigger an emotional reaction, harnessing the power of motivation, imagination and personal values, the driving forces behind the most effective and lasting forms of social change (Lack, 2020, Translated by the Author). In this sense, data visualization should be humane, ethical, and do good to society (Lan, Wu & Cao, 2024): in a few words, it should be an effective visualization design.

3.1. Data Visualization and Community Interaction: Environmental Data as Participatory Interface

Integrating participation for building and staging data is key to engaging communities and improving understanding of environmental challenges. Individuals can participate in a tangible and engaging experience beyond traditional data dissemination methods. Participatory methods have been identified as a way to empower the public and prevent the reinforcement of existing power dynamics (Lorenz & Kolb, 2009). This approach democratizes access to information and promotes active involvement in energy-related decision-making processes. Through data visualizations, viewers and participants are immersed in a collective experience that raises awareness and encourages discussions about the energy transition.

Figure 1. Insidius Riding. Sample of the data visualization interface. © Hyphen Labs. Fair Use.

Figure 2. Insidius Riding. Sample of the data visualization interface. © Hyphen Labs. Fair Use.

Heartbeat of the Earth (2009 – ongoing) is a continuous initiative by Google Arts & Culture Lab that brings together artists and scientists in a unique participation, to use technology creatively to interpret, communicate, and expand upon environmental data. A first reference to the Google project is the mobile-first data story titled Insidio*us Riding* (2022) (Fig. 1). This project is the brainchild of the globally recognized artist collective Hyphen Labs, in collaboration with the Union of Concerned Scientists and Allison Akootchook Warden, a renowned poet and Indigenous spokesperson. The interactive narrative invites users to embark on a tactile journey, exploring the multifaceted challenges that our planet currently faces (Fig. 2). These issues are represented through the depiction of a melting glacier, a poignant reminder of the urgent need for environmental action.

One of the key concepts explored in this artwork is the ecological cascade effect. This phenomenon refers to a chain of secondary extinctions set into motion by the primary extinction of a pivotal species within an ecosystem. The loss of such a species can disrupt the balance of the ecosystem, leading to unforeseen consequences and potentially triggering a domino effect of extinctions. *Insidius Riding* delves into the intricate interconnections within our environment, highlighting the potential cascade effects of accelerated global warming, the thawing of the cryosphere, and rising sea levels. The artwork vividly depicts how these interconnected issues could precipitate an ecological collapse. For instance, the thawing of the cryosphere could lead to the emergence of prehistoric viruses locked away in ice for millennia. Similarly, the accelerated warming of our planet and rising sea levels could have cascading effects on our agriculture, leading to the disappearance of essential pollinators like bees and the consequent vanishing of crops. Through its immersive narrative and interactive design, *Insidius Riding* is a powerful environmental education tool. It encourages users to engage with the pressing issues of our time and fosters a deeper understanding of the delicate balance that sustains life on our planet. The story underscores the urgency of collective action and the need for each of us to play our part in preserving our shared home for future generations.

There is also a need to incorporate emotional and storytelling data elements into these visualizations, which can effectively convey complex information and elicit meaningful responses. As highlighted by Kennedy & Hill (2017), emotional engagement with data is essential for making sense of information,

emphasizing the importance of incorporating emotional components into data visualization strategies. In this sense, the second case study of the Google Project titled *Plastic Air* (2021) by Giorgia Lupi has surfaced, offering a profound exploration of microplastics' impact on our environment and health (Fig.3). As it turns out, discarded plastic remains. Instead, it degrades into increasingly smaller fragments known as microplastics. These minuscule particles eventually enter our air, becoming an invisible yet pervasive presence in our atmosphere. Through the work, viewers are provided with a unique lens, enabling them to "see" and explore the omnipresent plastic particles that fill the air around us. It incorporates published research from many esteemed institutions, including the University Fernando Pessoa, the University of Plymouth, the University of Georgia, the University of Victoria, the University of Strathclyde, Utah State University, and Université Paris-Est.

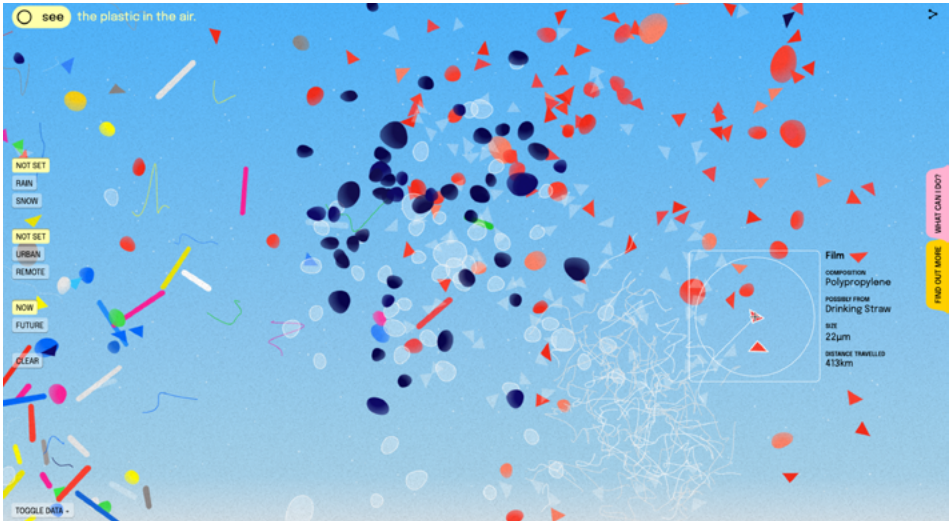


Figure 3. Plastic Air. Sample of the data visualization interface. © Giorgia Lupi. Fair Use.

Figure 4. Plastic Air. Sample of the data visualization interface. © Giorgia Lupi. Fair Use.

Plastic Air is a stark reminder of the far-reaching consequences of our reliance on plastic. It highlights the insidious journey of plastic from our hands to our atmosphere and, ultimately, back to us as we inhale these microplastics (Fig. 4).

The project underscores the urgent need for more sustainable practices and invites viewers to reflect on their consumption habits. Citizen participation, as emphasized by Chitsa et al. (2022), is critical to driving bottom-up transition and policy development, particularly within urban communities. Involving citizens in creating and staging data visualizations can help communities develop a sense of ownership and empowerment, leading to more effective climate change mitigation and adaptation efforts. Indeed, *Plastic Air* is a call to action, a plea for awareness, and a testament to the power of art in conveying complex environmental issues. It challenges us to reconsider our relationship with plastic and to strive for a future where clean air is not a luxury but a right.

3.2. Data Visualization and Community Involvement: Environmental Data as a Participatory Artifact

Adopting data visualization strategies can make otherwise complex and remote information accessible to the public. This process increases energy literacy and promotes concrete action on crucial environmental issues. In an era of widespread climate change denial and pervasive inertia on the part of citizens and governments, the ability to communicate clearly and engagingly through data physicalization becomes even more relevant to translate data into artifacts that are simultaneously tangible, visible, and perceptible with senses other than vision. As a reference, World Primary Energy (2020) is a data physicalization exhibit that blends technology, data, and design. It offers a comprehensive, interactive, and visually appealing perspective on the future of energy consumption. It serves as a reminder of the importance of renewable energy and its role in our future. This exhibit is a collection of 25 meticulously 3D printed pillars, each symbolizing the anticipated future energy consumption (Fig. 5). The data exhibit designers embarked on a journey to scrutinize the global progression of energy consumption. They looked ahead from 2020 to 2100 across five prospective scenarios. But the exhibit doesn't stop there. It goes further by incorporating factors such as population growth and temperature rise. These factors are seamlessly integrated into the exhibit via rear projection through a laser cut. The exhibit is interactive and controlled via an app. The data fueling this exhibit is sourced from a reputable institute dedicated to climate impact research, the Potsdam Institute. The data presents many perspectives and interdependencies, offering a comprehensive view of our energy future.

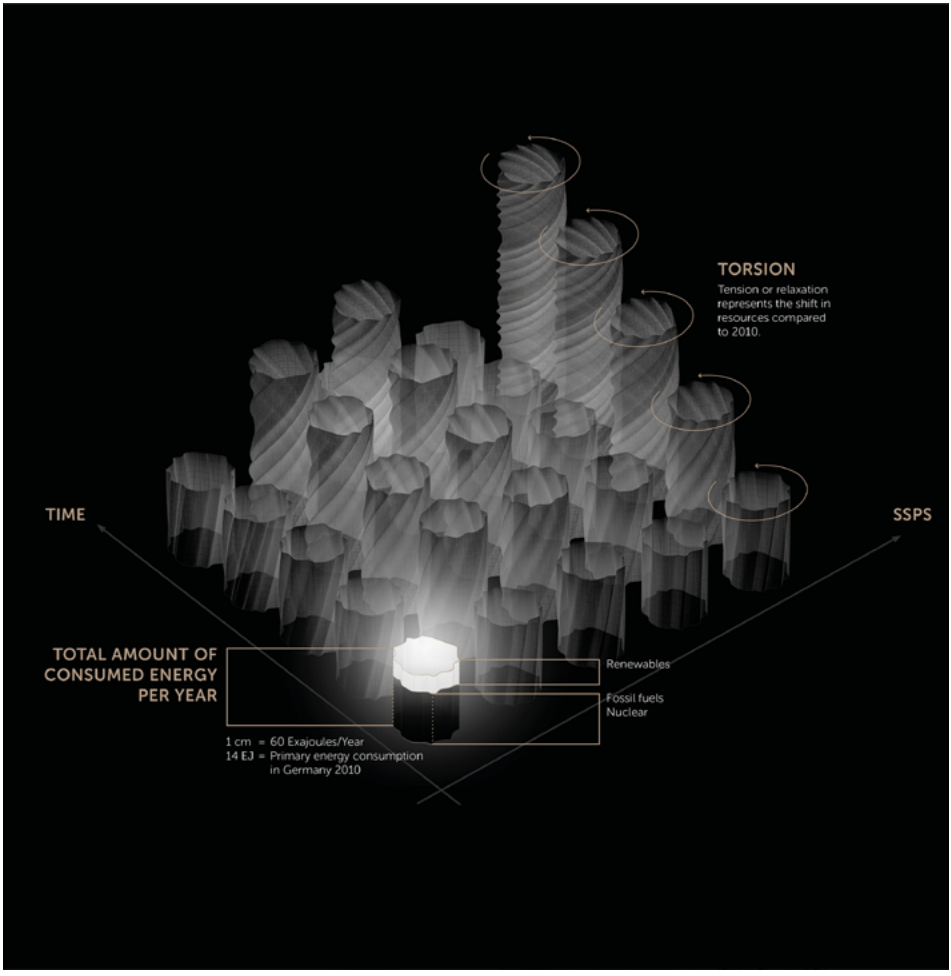


Figure 5. World Primary Energy. Sample of the data physicalization © Katja Budinger, Stéphane Flesch, Roman Grasy, Kathi Veitengruber. Fair Use.

The physical representation of the data aids in the analysis and comparison of database excerpts. Each pillar's height corresponds to the annual global consumption of primary energy. Furthermore, each pillar is bifurcated into two sections (Fig. 6). Renewable energies are depicted in white, while a combination of fossil fuels and nuclear resources is depicted in black.

This color-coded system provides a clear visual representation of the energy sources. The rotation of the form is another intriguing aspect of the exhibit. It illustrates the distortion of energy developments in future scenarios, providing a dynamic view of potential outcomes. The pillars are strategically arranged on a two-dimensional grid. The y-axis represents the timeline from 2020 to 2100, providing a chronological view of energy consumption. The x-axis, on the other hand, represents the Shared Socio-economic Pathways, offering a socio-economic perspective on energy usage.

Figure 6. World Primary Energy. Sample of the data physicalization © Katja Budinger, Stéphane Flesch, Roman Grasy, Kathi Veitengruber. Fair Use.

3.3. Data Visualization and Community Engagement: Environmental Data as Participatory Space

As Rosing and Eliasson (2018) emphasize, one of the most pressing challenges of our time is the sense of alienation and distance that many people feel to major global issues, thus losing a sense of belonging to the worldwide community. Indeed, data are a means to understand a complex world but not the end: we must always maintain sight of what lies behind the numbers, and to design practical tools and stories, we must learn to look through them (Lupi, 2022). In this sense, we could look at Artboat as a case study.

ArtBoat: Magazine Beach (2015-2020) is a unique data-art installation that breathes life into public green-blue spaces. It uses light as a medium and transforms the river into a canvas (Fig. 7). This i-project is powered by SeeBoat, a remote-controlled boat fitted with sensors and LEDs.

Figure 7. ArtBoat: Magazine Beach. Sample of the data physicalization © Laura Perovich, MIT. Fair Use.

Figure 8. ArtBoat: Magazine Beach. Sample of the data physicalization © Laura Perovich, MIT, Ph Neil Gaikwad. Fair Use.Use.

These components measure and visually represent water quality data in real-time. The project is the brainchild of Laura Perovich from the MIT Media Lab. It responds to the "Sky Art Conferences" by MIT's Center for Advanced Visual Studies, which used the sky as an installation site. Now, the water has become the primary site for artistic display. The project aims to make environmental data more interactive and understandable for communities and researchers. During ArtBoat installations, communities gather at riverside public parks. They collaboratively create light paintings on the water using a color-mixing board (Fig. 8). This board helps formulate light palettes, which are then used to control the color of a remotely operated ArtBoat. Essentially, this system serves as a paintbrush, and the river becomes its canvas.

Community photographers capture these moments of shared creation, community development, and public space ownership. They use long-exposure images to offer a fresh perspective of urban space. SeeBoat takes ArtBoat a step further by merging it with water quality sensors. This allows communities to color the river based on water quality data, enhancing their understanding of the environmental and climate challenges we face as a community. The project emphasizes the importance of community understanding of environmental pollution. This is particularly relevant given that many facilities in the US significantly violate their Clean Water Act permits. The initiative explores new ways to engage communities in environmental data and foster meaningful civic conversations. In doing so, it hopes to inspire a new wave of environmental awareness and action. In this context, data physicalization in public space emerges as a crucial tool for creating awareness and understanding of energy use, which is often "hidden" or "not directly apparent" to most people (Broms et al., 2010). By democratizing energy data through physical visualizations such as physicalizations of energy, communities can interact with and understand energy-related information in a more accessible and engaging way (Morais et al., 2021). Overall, incorporating participatory data visualization into public spaces increases public awareness and discourse and enables individuals to contribute to the energy transition movement actively.

4. Conclusion

From the thawing of the cryosphere to the emergence of prehistoric viruses, from the impact of microplastics to energy consumption and water quality, the projects presented

challenge us to reconsider our relationship with consumption, highlighting scenarios and perspectives of [Eco] Participation through Data Visualization as a tool for raising awareness and educating on environmental issues. Information design-led approaches, using a visual code that mediates between abstract concepts – data – and concrete objects – visualization – may indeed be able to bridge the gap between traditional and scientific knowledge, arousing interest and motivating concrete actions. However, what emerges is the need for a holistic approach capable of implementing strategies for humanizing data that consider their visualization and physicalization, the storytelling linked to them, improving the process of use and focusing on the active participation of citizens. Despite significant progress – from practice to research – there are some limitations, including making data accessible and understandable to a broader audience, the need for more sophisticated interactive tools, and integrating different data sources meaningfully. In addition, there is a disparity in access to the technologies needed for data visualization, which could increase the gap between different socio-economic communities. To address these limitations, future development areas should focus on creating more inclusive and accessible platforms, developing technologies that facilitate data interactivity and integration, and implementing participatory methodologies that actively involve local communities. In addition, it is essential to foster interdisciplinary collaborations that combine technical, scientific, and humanistic skills to develop more engaging and persuasive narratives. Thanks to the integration of participatory approaches and interaction with data through interfaces, objects, and spaces, users are encouraged

to engage with the urgent issues of our time, fostering greater sustainability literacy. A so-called [Eco] Participatory Data Visualization can increase motivation, awareness, and active involvement in addressing complex issues such as energy transition (Rappold et al., 2019; Provenzi & Barello, 2020). Investing in these strategies helps us understand environmental challenges better and brings us closer to achieving a more equitable, prosperous society in harmony with the planet. It is, therefore, necessary for professionals and policymakers to adopt a proactive approach in encouraging the use of data visualization for environmental education by investing in technology and data literacy programs, promoting collaboration between public and private entities to create interactive and accessible platforms, and supporting community initiatives that use data visualization to raise awareness and engage citizens. It is possible only through a collective effort to effectively address environmental challenges and promote the transition towards a sustainable future.

References

Aguirre-Bielschowsky, I., Lawson, R., Stephenson, J., & Todd, S. (2015). Energy Literacy and Agency of New Zealand Children. *Environmental Education Research*, *23*(6), 832–854. https://doi.org/10.1080/13504622.2015.1054267

Akitsu, Y., & Ishihara, K. (2018). An Integrated Model Approach: Exploring the Energy Literacy and Values of Lower Secondary Students in Japan. *International Journal of Educational Methodology*, *4*(3), 161–186. https://doi.org/10.12973/ijem.4.3.161

Bertling, J. G. (2023). *Art Education for a Sustainable Planet: Embracing Ecopedagogy in KĐ12 Classrooms*. Teachers College Press.

Brock, A., Browning, R., Campanie, A., Pal, S., & Williams, I. D. (2022). Developing Public Communication Methods by Combining Science, Creative Arts and Intergenerational Influence: The TRACE Project. *Detritus, 21*, 114–128. https://doi.org/10.31025/2611-4135/2022.17230

Broms, L., Katzeff, C., Bång, M., Nyblom, A., Hjelm, S.I., & Ehrnberger, K. (2010). Coffee Maker Patterns and the Design of Energy Feedback Artefacts. In K. Halskov, & M. Graves Petersen (Eds.), *DIS '10: Proceedings of the 8th ACM Conference on Designing Interactive Systems* (pp. 93–102). ACM. https://doi.org/10.1145/1858171.1858191

Cairo, A. (2017). Uncertainty and Graphicacy: How Should Statisticians, Journalists, and Designers Reveal Uncertainty in Graphics for Public Consumption? In J. Errea, & Gestalten (Eds.), *Visual Journalism: Infographics from the World's Best Newsrooms and Designers*. Gestalten.

Calori, C., & Vanden-Eynden, D. (2015). *Signage and Wayfinding Design: A Complete Guide to Creating Environmental Graphic Design Systems*. John Wiley & Sons.

Chitsa, M., Sivapalan, S., Singh, B. S. M., & Lee, K. E. (2022). Citizen Participation and Climate Change Within an Urban Community Context: Insights for Policy Development for Bottom-Up Climate Action Engagement. *Sustainability*, *14*(6), 3701. https://doi.org/10.3390/su14063701

Chodkowska-Miszczuk, J., Kola-Bezka, M., Lewandowska, A., & Martinát, S. (2021). Local Communities' Energy Literacy as a Way to Rural Resilience – An Insight from Inner Peripheries. *Energies*, *14*(9), 2575. https://doi.org/10.3390/en14092575

Cotton, D., Miller, W., Winter, J., Bailey, I., & Sterling, S. (2015). Developing Students' Energy Literacy in Higher Education. *International Journal of Sustainability in Higher Education*, *16*(4), 456–473. https://doi.org/10.1108/ijshe-12-2013-0166

Cotton, D., Shiel, C., & Paço, A. (2016). Energy Saving on Campus: A Comparison of Students' Attitudes and Reported Behaviours in the UK and Portugal. *Journal of Cleaner Production*, *129*, 586–595. https://doi.org/10.1016/j.jclepro.2016.03.136

Cotton, D., Winter, J., Miller, W., & Valle, L. (2017). Is Students' Energy Literacy Related to Their University's Position in a Sustainability Ranking? *Environmental Education Research*, *24*(11), 1611–1626. https://doi.org/10.1080/13504622.2017.1395394

Curtis, D. (2009). Creating Inspiration: The Role of the Arts in Creating Empathy for Ecological Restoration. *Ecological Management & Restoration*, *10*(3), 174–184. https://doi.org/10.1111/j.1442-8903.2009.00487.x

Curtis, D., Reid, N., & Ballard, G. (2012). Communicating Ecology Through Art: What Scientists Think. *Ecology and Society*, *17*(2). https://doi.org/10.5751/es-04670-170203

García-Retamero, R., & Cokely, E. (2013). Communicating Health Risks with Visual Aids. *Current Directions in Psychological Science*, *22*(5), 392–399. https://doi.org/10.1177/0963721413491570

Hendinata, L., Ardiwinata, T., & Pratama, F. (2022). The Role of Energy Literacy in Supporting Energy Conservation: Perspective from Indonesian Citizens. *Indonesian Journal of Energy*, *5*(2), 105–113. https://doi.org/10.33116/ije.v5i2.113

Interaction Design Foundation - IxDF. (2016, May 25). *What is Holistic Design?* Interaction Design Foundation - IxDF. https://www.interaction-design.org/literature/topics/holistic-design

Irena. (2022, November 11). *IRENA's New Network Advances Education on Energy Transition*. https://www.irena.org/News/articles/2022/Nov/IRENAs-New-Network-Advances-Education-on-Energy-Transition

Kennedy, H., & Hill, R. L. (2017). The Feeling of Numbers: Emotions in Everyday Engagements with Data and Their Visualisation. *Sociology*, *52*(4), 830–848. https://doi.org/10.1177/0038038516674675

Khuc, Q., Tran, M., Nguyen, T., Nguyen, A., Dang, T., Tuyen, D., … & Dat, L. (2023). Improving Energy Literacy to Facilitate Energy Transition and Nurture Environmental Culture in Vietnam. *Urban Science*, *7*(1), 13. https://doi.org/10.3390/urbansci7010013

Kirk, A. (2019). *Data Visualisation: A Handbook for Data Driven Design*. SAGE.

Könings, K., Brand-Gruwel, S., & Merriënboer, J. (2007). Teachers' Perspectives on Innovations: Implications for Educational Design. *Teaching and Teacher Education*, *23*(6), 985–997. https://doi.org/10.1016/j.tate.2006.06.004

Könings, K., Brand-Gruwel, S., & Merriënboer, J. (2010). Participatory Instructional Redesign by Students and Teachers in Secondary Education: Effects on Perceptions of Instruction. *Instructional Science*, *39*(5), 737–762. https://doi.org/10.1007/s11251-010-9152-3

Lack, B. (2022, December 26). Cambiamento climatico, sarà lo storytelling a salvare il pianeta? *Wired Italia*. https://www.wired.it/article/cambiamento-climatico-storytelling-salvera-pianeta/

Lan, X., Wu, Y., & Cao, N. (2024). Affective Visualization Design: Leveraging the Emotional Impact of Data. *IEEE Transactions on Visualization and Computer Graphics*, *30*(1), 1–11. https://doi.org/10.48550/arXiv.2308.02831

Lange, A. (2019, May 25). Can Data be Human? The Work of Giorgia Lupi. *The New Yorker*. https://www.newyorker.com/culture/culture-desk/can-data-be-human-the-work-of-giorgia-lupi

Leonardi, C., Crippa, D., Di Prete, B., & Pasteris, P. (2023). Il design per la transizione energetica tra INtuizione e INtenzione. *Techne,* (26), 53–60. https://doi.org/10.36253/techne-14479

Lorenz, L. S., & Kolb, B. (2009). Involving the Public Through Participatory Visual Research Methods. *Health Expectations*, *12*(3), 262–274. https://doi.org/10.1111/j.1369-7625.2009.00560.x

Mohamad, W., & Osman, K. (2022). A Systematic Literature Review on Citizen Awareness of Energy. *Malaysian Journal of Social Sciences and Humanities*, *7*(10), e001803. https://doi.org/10.47405/mjssh.v7i10.1803

Morais, C., Moreira, L., Teixeira, A., Aguiar, T., Coelho, A. F., Pereira, V. M., … & Rosa, M. (2022). Visitors Come to Experience Science: Towards a Non-Obtrusive Evaluation Method Based on Immersive Virtual Reality. *Journal of Science Communication*, *21*(01), A04. https://doi.org/10.22323/2.21010204

Moretti, M., & Mattozzi, A. (2020). Participatory Data Physicalization: A New Space to Inform. In E. Cicalò (Eds.), *Proceedings of the 2nd International and Interdisciplinary Conference on Image and Imagination. IMG 2019. Advances in Intelligent Systems and Computing*, vol 1140. Springer. https://doi.org/10.1007/978-3-030-41018-6_86

Provenzi, L., & Barello, S. (2020). The Science of the Future: Establishing a Citizen-Scientist Collaborative Agenda after Covid-19. *Frontiers in Public Health*, *8*, 282. https://doi.org/10.3389/fpubh.2020.00282

Puspitasari, H. (2020, June 4). *Analysis Conception in Review of Attitudes and Behaviors on Energy Roles in Life Based on Energy Literacy Framework*. https://doi.org/10.31219/osf.io/2z6t7

Putri, I., Setiawan, A., & Nasrudin, D. (2022). Energy Literacy Profile of Vocational High School Teacher Candidates for Renewable Energy Engineering Expertise Program. *Jurnal Ilmiah Pendidikan Teknik Dan Kejuruan, 15*(2), 99–108. https://doi.org/10.20961/jiptek.v15i2.67623

Rappold, A., Hano, M., Prince, S., Wei, L., Sen-wei, H., Baghdikian, C., & Hubbell, B. (2019). Smoke Sense Initiative Leverages Citizen Science to Address the Growing Wildfire-Related Public Health Problem. *GeoHealth*, *3*(12), 443–457. https://doi.org/10.1029/2019gh000199

Rizzo, F. (2009). *Strategie di co-design. Teorie, metodi e strumenti per progettare con gli Utenti*. FrancoAngeli.

Ryghaug, M., Skjølsvold, T., & Heidenreich, S. (2018). Creating Energy Citizenship through Material Participation. *Social Studies of Science, 48*(2), 283–303. https://doi.org/10.1177/0306312718770286

Rohmatulloh, R., Hasanah, A., Syah, M., & Natsir, N. (2021). Energy Literacy and Education: The Viewpoint of Stakeholders to Promote Energy Literacy in Education. *E3S Web of Conferences, 317*, 03017. https://doi.org/10.1051/e3sconf/202131703017

Rosing, M., & Eliasson, O. (2015). *Ice, Art, and Being Human*. Studio Olafur Eliasson. https://olafureliasson.net/icewatchcopenhagen/images/Eliasson_Rosing_on_Ice_Art_and_Being_Human_zmnsfk.pdf

Sommer, L., & Klöckner, C. (2021). Does Activist Art Have the Capacity to Raise Awareness in Audiences? A Study on Climate Change Art at the Art-Cop21 Event in Paris. *Psychology of Aesthetics Creativity and the Arts*, *15*(1), 60–75. https://doi.org/10.1037/aca0000247

Tufte, E. R. (1982). *The Visual Display of Quantitative Information*. Graphics Press.

United Nations (2015). *Transforming Our World: The 2030 Agenda for Sustainable Development*. SDGS. https://sdgs.un.org/sites/default/files/publications/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf

Usman, M., Suyanta, S., Pujianto, P., & Huda, K. (2021). Energy Literacy of Junior High School Students in Indonesia: A Preliminary Study. In M.S., Paidi (Eds.), *Proceedings of the 6th International Seminar on Science Education (ISSE 2020)* (pp. 609–614). Atlantis Press. https://doi.org/10.2991/assehr.k.210326.088

Valentini, L., & Nesci, O. (2021). A New Approach to Enhance the Appeal of the Italian Territory Through Art: Three Study Cases from Marche Region. *Arabian Journal of Geosciences*, *14*(3), 144. https://doi.org/10.1007/s12517-020-06415-2

Zanocco, C., Sun, T., Stelmach, G., Flora, J., Rajagopal, R., & Boudet, H. (2022). Assessing Californians' Awareness of Their Daily Electricity Use Patterns. *Nature Energy*, *7*(12), 1191–1199. https://doi.org/10.1038/s41560-022-01156-w

Wang, J., Yang, X., Xi, Y., & He, Z. (2022). Is Green Spread? The Spillover Effect of Community Green Interaction on Related Green Purchase Behavior. *International Journal of Environmental Research and Public Health*, *19*(11), 6571. https://doi.org/10.3390/ijerph19116571

Wojdynski, B. W. (2015). Interactive Data Graphics and Information Processing: The Moderating Role of Involvement. *Journal of Media Psychology: Theories, Methods, and Applications*, *27*(1), 11–21. https://doi.org/10.1027/1864-1105/a000127

IV

BIOGRAPHIES

Valentina Auricchio
Assistant professor of the Design Department of the Politecnico di Milano. Her research is focused on Design Methods and managing strategic design projects with small and medium industries including Design Thinking processes. Her main interest is in design processes, methods and tools and their application within different sectors for strategic innovation. Member of Polimi DESIS Lab and of the international DESIS Network.
valentina.auricchio@polimi.it

Leire Bereziartua Gonzalez
She is an Industrial Design Engineer, from the Mondragon Polytechnic School (Mondragon Unibertsitatea) and Politécnico di Milano. She is currently part of the Deusto Design Research Group team and teaches at the Faculty of Engineering, at the Bilbao campus of Deusto University. She teaches several subjects related to Technical Graphic Expression in different engineering studies, both at grade level and master level, also "Sustainable Design" and "Laboratory III: Experience and Service Design" in Industrial Design engineering studies. She is also part of the Deusto FabLab team (creativity, innovation and development centre for new products, services and experiences) as FabExpert, she has made FabAcademy during 2018. In addition, since 2018 she collaborates with projects within the Digital Industry Cathedra. In 2014 she holds a master's degree in Teaching Training, which helped develop her teaching skills further, and since the 2019/2020 course she is in PhD adventure, specializing herself in Circular Economy, new technologies and Renewable Energies.
leire.bereziartua@deusto.es

Mario Bisson
Associate Professor at the Department of Design of Politecnico di Milano where he teaches and has taught Industrial design, Visual elements for the project and Color at the School of Design. He is currently Scientific Director of the Color Laboratory of the Department of DESIGN, he is promoter and co-founder of the Interdepartmental Laboratory of Politecnico di Milano EDME (Environmental Design and Multisensory Experience). In 2013 he is co-founder of the MDA Association (Mediterranean Design Association) that deals with topics related to Environmental design.
mario.bisson@polimi.it

Beatriz Bonilla Berrocal
PhD candidate in Design at the Design Department of Politecnico di Milano, member of Polimi DESIS Lab. Her research interests focus on Design for Social Innovation and its application both in business and communities.
beatriz.bonilla@polimi.it

Stefana Broadbent
Associate Professor in the Design Department of Politecnico di Milano. Between 2014 and 2016 she was Head of Collective Intelligence at Nesta, UK's innovation agency. Previously Stefana was a Lecturer in Digital Anthropology at University College London where she led the Master in Digital Anthropology. Her research interests are in the area of digital and sustainable social practices.
stefana.broadbent@polimi.it

Alessio Caccamo
Alessio Caccamo, PhD (1991) is Information Designer and Junior Researcher (RTDA) at Sapienza – University of Rome. He combines theoretical research with applied research in Communication Design - specifically in Data Visualization and Information Design - focusing on pedagogical, sociological and critical aspects, i.e. the human-data interaction. Co-Head of the SID Group – Design for Education, he specializes in Design for Learning, researching through design hybrid projects both analogue and digital for learning environments.
alessio.caccamo@uniroma1.it

Massimiliano Cason Villa
Designer and Ph.D. Student at Iuav Universtiy of Venice, he pursued his education with an interdisciplinary outlook, somewhere between Interior and communication design, attending the environment of makers and digital fabrication.

Since 2019 he has been collaborating with the startup Design Differente, taking care of participatory didactics projects on Circular Design topics, with partners such as the Municipality of Milan, La Triennale di Milano and the SOUx school of Milan. Since 2022 he has been teaching at the New Academy of Fine Arts in Milan; today he is a student at the Doctorate in Science of Design at the Iuav University of Venice, with a research focus on Design and Circularity studied under the lens of product life cycle assessment tools.
mcasonvilla@iuav.it

Francesca Cellina
Researcher at the University of Applied Sciences and Arts of Southern Switzerland (SUPSI), Francesca Cellina has a background in both environmental engineering (master) and social sciences (PhD). She performs trans-disciplinary research activities to foster the transition towards a low carbon society, particularly in the domains of mobility and household energy consumption. She exploits ICT tools and devices in participatory, living lab interventions that leverage co-creation and co-design methodologies to engage individuals and stakeholders in real-life interventions aimed at triggering societal transitions.
francesca.cellina@supsi.ch

Davide Crippa
Architect and Ph.D. in Interior Architecture and Exhibit Design, he attended the masters of Italian design, completing his training with an interdisciplinary outlook. In 2004, he founded the Ghigos studio and since then has been pursuing a wide-ranging research among exhibitions, installations and projects of international relevance. From 2007 to 2021 he taught at the Milan Polytechnic and the New Academy of Fine Arts in Milan; today he is a Researcher at the Iuav University of Venice, where he is investigating the potential of interaction design and new digital fabrication technologies with a view to the circular economy, with a thematic focus on the sustainability of installations.
dcrippa@iuav.it

Marta Corubolo
Researcher at the Design Department of the Politecnico di Milano. Her research interests cover service and strategic design and social innovation, community centered design and collaborative services, with a specific focus on the incubation and growth of local initiatives and their relationship with the private and third sector. She is a member of the Polimi DESIS Lab.
marta.corubolo@polimi.it

Michele De Chirico
He is a PhD student in Design Sciences at Università Iuav di Venezia. His research relates to design of materials, focusing on design for the sustainable management of production waste and on materials as contextual actors and cultural meaning-makers. Since 2020, he has also been engaged as a lecturer in courses dealing with design and materials and design history and criticism.
mdechirico@iuav.it

Barbara Di Prete
Architect and phd in Interior Architecture and Exhibit Design, is an associate professor at the Design Department of the Politecnico di Milano, where she carries out research between urban, exhibit and interior design. In 2004 she founded the Ghigos studio, designing exhibitions, installations and projects for institutions of international relevance (Maxxi, Expo2015, MoMA, Milan Triennale, Venice Biennale). Since 2015 she has been coordinating the Specializing Master in "Design for Public Space" provided by POLI.design. She is currently following funded research for ENEA, CAP, Regione Lombardia, investigating the instances of sustainability in the energy, environmental and social fields.
barbara.diprete@polimi.it

Raffaella Fagnoni
She is full professor of Design at Università Iuav di Venezia, where she teaches design laboratories and civic space design. She also directs the PhD school in Science of Design. She has lectured abroad, in Iran and China, and has coordinated local and international research groups, both public and privately funded. Her research topics focus on design for social impact,

service design for public interests, social innovation, reuse and recycling, and design for sustainability, with the aim of intervening in emerging issues through active stakeholder involvement and the enhancement of local heritage. She is focused on the ongoing role of design in contemporary society, considering environmental emergencies and the state of alert in which our planet finds itself, working on the circular economy, local territory, waste recovery, and care for people and habitats.
rfagnoni@iuav.it

Rossana Gaddi
Designer and PhD. Associate Professor at the Department of Architecture of the University "G. d'Annunzio" of Chieti-Pescara, where she deals with Communication Design and enhancement of local resources and the territory. She took part in national and international seminars and research programs on the topics of innovation for cultural and territorial enhancement, and Communication and System Design for social inclusion.
rossana.gaddi@unich.it

Letizia Giannelli
Research fellow affiliated with the Service Design Laboratory at University of Florence. With a background in video production in the documentary film industry, her current focus is on research on Service Design and its applications in the textile industry.
letizia.giannelli@unifi.it

Debora Giorgi
Phd and Architect, she is Associate Professor in Design (ICAR/13) at the Department of Architecture, University of Florence (DIDA-UNIFI). President of the CdL in Textile & Fashion Design, visiting professor in international Universities, she teaches the Laboratory of Service Design at the CdLM in Design and works on design for services with a particular focus on social innovation and collaborative services.
debora.giorgi@unifi.it

Pasquale Granato
MSc in Computer Engineering, he has built a long career developing complex applications across various domains. He is currently a researcher at SUPSI (University of Applied Sciences and Arts of Southern Switzerland), focusing on renewable energy, particularly solar energy, and sustainable mobility. Pasquale is also an expert in games and gamification, integrating innovative approaches to enhance engagement and learning.
pasquale.granato@supsi.ch

Luca Incrocci
Industrial and UX/UI designer with a background of experience in graphic and service design. He is currently a researcher at the Service Design Lab at the University of Florence, focusing on service design methodologies applied to the textile industry.
luca.incrocci@unifi.it

Carmelo Leonardi
Product designer and Ph.D student in Design Sciences at Università Iuav di Venezia, Carmelo Leonardi graduated from the same university in 2022, with a master thesis titled "Melior de cinere surgo, design of a new ecological material derived from Tephra and its applications" which allowed him to deepen the concepts of social and environmental sustainability in design.
cleonardi@iuav.it

Ami Licaj
Research Fellow at the Laboratory of Design for Sustainability at the University of Florence with a PhD in Design, obtained in 2018, on Data Visualization entitled "Information Visualization. Intersubjective Liquid Discipline." Passionate about processes - and the "designerly" way of dealing with them - applied to all things digital/social/intangible/future. Academic career includes activities as Visiting Professor, national and international seminars by invitation, and design courses in other universities.
ami.licaj@unifi.it

Evelyn Lobsiger-Kägi
MSc Environmental Sciences ETH, she has been researching and teaching sustainable development and energy behaviour at the ZHAW (Zurich University for Applied Sciences) for 15 years and is now co-leading the "Energy Behaviour" Team at the Institute for Sustainable Development. Her main focus is on the participatory development of sufficient and energy-efficient interventions at household and neighbourhood level. She works in a transdisciplinary manner with cooperatives, energy supply companies, municipalities and NGOs to develop and test practice-oriented approaches.
kaev@zhaw.ch

Giuseppe Lotti
Full professor of Industrial Design, is President of the Degree Course in Product, Interior, Communication and Eco-Social Design of the Department of Architecture (DIDA) of the Università degli Studi di Firenze. He is scientific manager of research projects at the European Union, national and regional level. He is the author of publications on the culture of the project. He has been curator of design exhibitions in Italy and abroad. He is the technical-scientific coordinator of the Interior and Design District of the Tuscany Region – dID.
giuseppe.lotti@unifi.it

Marco Manfra
PhD candidate in Innovation Design at the University of Camerino and former research fellow at the University of Ferrara. He was Visiting PhD(c) at the Architecture Faculty of Lisbon University. He is professor of the course "Processi del design per l'impresa sostenibile" in the I and II level Master's degree program in "Design della Comunicazione per l'Impresa" at the University of Ferrara. He carries out research activities mainly in the field of design for social and environmental sustainability - with eco-social approach -, theories and culture of the project, media ecology, and regeneration of marginal territorial contexts.
marco.manfra@unicam.it

Raffaella Massacesi
Architect and PhD. Communication designer. She is Assistant Professor in Design at the Department of Architecture of the "G. d'Annunzio" University of Chieti-Pescara, and sole director of university spinoff SOS-Habitat. Her research interests relate to digital design, webdesign, environmental communication, communication for public utilities.
raffaella.massacesi@unich.it

Luciana Mastrolonardo
Architect and PhD. Assistant Professor at the Department of Architecture of the University "G. d'Annunzio" of Chieti-Pescara where she deals with Architectural Technology and process sustainability. She took part in national and international seminars and research programs on the impact of sustainability at various scales and in different dimensions, through metabolic and qualitative studies.
l.mastrolonardo@unich.it

Michele Mauri
Researcher at Politecnico di Milano—Design Department, he's co-director of DensityDesign Lab. Within the laboratory, he coordinates the research, design, and development of projects related to the visual communication of data and information, particularly those related to born-digital data and Digital Methods.
michele.mauri@polimi.it

Claudia Morea
Architect and PhD in Design for Sustainability, she is currently adjunct professor at BA Textile & Fashion Design, University of Florence. Expert in Life Cycle Assessment, she focuses her research on the spread of sustainability assessment capabilities, with specific regard to engagement and sustainability empowerment.
claudia.morea@unifi.it

Stefania Palmieri
Associate Professor at Politecnico di Milano, PhD in Industrial Design. She is Head of Relations with Businesses and Professions for the School of Design - Integrated Product Design. Her research and teaching activities deal with methods and processes, with particular attention to innovation processes in relation to different productive, organizational and cultural contexts, in which to enhance and strengthen the collaboration between University and business. She is part of the Scientific Committee of the interdepartmental laboratory EDME, which deals with digital technologies, immersiveness, new relationships and synergy of knowledge.
stefania.palmieri@polimi.it

Fabiola Papini
She holds a double degree in Communication Design from the School of Design, Politecnico di Milano, and the Shanghai International College of Design and Innovation, Tongji University. She is co-founder of an independent magazine and digital designer at a Milan-based information design agency. Her interests range from data visualisation to digital design, sustainability, and editorial design.
fabpapini@gmail.com

Adrian Peach
He is a practicioner and teacher, has spent three decades working with a diverse range of international brands from Alessi to 3M, with prestigious architectural practices including Antonio Citterio and David Chipperfield, with artisans and industries. He has collaboration with several research centres and universities in Europe and Middle East, like Academy of Art, Architecture and Design (UMPRUM, Prague), Domus Academy (Milan), German University in Cairo (Berlin and Cairo), German International University (Cairo), Istituto Marangoni (London), KLC (London), Istituto Europeo di Design (Milan), Hochschule Hannover, Hochschule für Technik und Wirtschaft (HTW-Berlin), Hochschule der Bildenden Künste Saar (Saarbrücken), Kunsthochschule Weißensee (Berlin) and Università di Bologna.
info@adrianpeachdesign.com

Silvia Peluzzi
Designer, she graduated with honors at Politecnico di Milano in the Master's deree of Product Service System Design. In 2022, she participated in an international mobility program at FH Salzuburg where she studied Design & Product Management. With a background in Interior Design achieved with distinction in the year 2021, she had a previous mobility at LAB University of Applied Sciences in Finland.
peluzzi.silv@gmail.com

Giovanni Profeta
Giovanni Profeta holds a PhD in Design from Politecnico di Milano, where he completed his thesis titled "Displaying Open Cultural Collections: Design Guidelines for Cultural Content Aggregators" within the DensityDesign research lab. As a researcher at the Institute of Design of the University of Applied Sciences and Arts of Southern Switzerland (SUPSI), he conducts applied research projects focusing on data visualization and algorithmic methods for accessing and analysing cultural collections. Additionally, he is also the teacher of the Interaction Design course in the Bachelor of Visual Communication and the Master of Arts in Interaction Design and the teacher of the Data Visualization course in the Bachelor of Data Science and Artificial Intelligence.
giovanni.profeta@supsi.ch

Grazia Quercia
PhD in Communication, Social Research and Marketing from Sapienza University of Rome and Adjunct Professor of "Laboratorio di Design Transmediale" at University Guglielmo Marconi, she is a member of the editorial board of the "Transmedia" series by Armando Editore and a member of the research unit GEMMA (Gender and Media Matters). Her research interests include cultural and creative industries, media ecology, transmedia design, participatory culture, sustainability communication and gender studies.
g.quercia@unimarconi.it

Lucia Ratti
Designer and Ph.D. student at the Design Department of Politecnico di Milano, her research activity touches different intersections between design and sustainability, ranging from urban biodiversity to circular exhibit design, to the energy transition and its diffusion. Since 2019 she has been an assistant in didactic activities in the Interior Design Bachelor Degree of Politecnico's School of Design, and in 2020 she started working with the association Repubblica del Design, where she takes care of the design and implementation of participatory design-didactic workshop, with partners such as the Municipality of Milan, Milan Triennale, ans SOUx school of architecture for children.
lucia.ratti@polimi.it

Agnese Rebaglio
Designer and Ph.D., Associate professor at the Design Dept. of Politecnico di Milano. Her research activity focuses on designing innovation processes of urban contexts, from a perspective of sustainability and social inclusion. Scientific director of the Specializing Master "Design for Public Spaces" provided by POLI.design. She is currently developing research on design for urban regeneration and energy sustainability promoted by design. Promoter, for the Interior Design Degree Course, of GIDE (Group for International Design Education), a network of European design schools that collaborates in educational programs.
agnese.rebaglio@polimi.it

Chiara Rutigliano
PhD candidate in Sustainability and Innovation for the Design of the Built Environment and Product System at the University of Florence. Designer with experience in graphic and innovative service design, particularly in the study of user experience and relationships in complex systems. Currently his research is focusing on traceability and transparency in the textile industry.
chiara.rutigliano@unifi.it

Carla Sedini
She is an Assistant Professor at the Design Department of Politecnico di Milano and PhD in Sociology. She is a member of the D+S research group at Polimi, where she combines and integrates social research and design. She has been researching and teaching issues related to Territorial Development, Social Innovation, and Quality of Life, with specific attention to fragile populations. She published a book titled "Collectively Designing Social Worlds. History and Potential of Social Innovation".
carla.sedini@polimi.it

Andreas Sicklinger
He is Full Professor in Industrial Design, focuses his research interests on three main fronts: Design as Science (human factors and new human factors), Design Education and Future Aesthetics, Design for Territory and the Mediterranean. He worked for Aldo Rossi on the projects Schuetzenstrasse e Landdsberger Allee in Berlin, covered the role of Product Manager in the retail sector. He has been professor and head of department at the German University of Cairo from 2012 to 2018. He has published books and articles on topics of his research interest. He is member of the Committee of the Institute of Advanced Studie of University of Bologna and Distinguished Visiting Professor at Malaysia Italy Design Institute, Kuala Lumpur.
andreas.sicklinger@unibo.it

Abhigyan Singh
Assistant professor at the Department of Human-Centered Design of Delft University of Technology (TU Delft), The Netherlands. With a background in new media design, anthropology, and IT engineering, his research examines social, cultural, and economic aspects of emergent local energy systems and services. His research makes theoretical, conceptual, and methodological contributions to the emerging disciplines of design anthropology and energy research. Abhigyan's work has earned him awards such as the WWNA Apply Award (2021) from the European Association of Social Anthropologists' Applied Anthropology Network (EASA-AAN) and Cumulus Association's 'Young Creators for Better City & Better Life' Award. In addition to his academic work, he is Co-lead of the Social and Economic Value Sub-task of the International Energy Agency's Global Observatory on Peer-to-Peer Energy Trading (GOP2P).
a.singh@tudelft.nl

Manfredi Sottani
He is a Designer and PhD Candidate (Curriculum in Design) at the Department of Architecture, University of Florence. He carries out research activities at the Design Sustainability Lab (Department of Architecture, University of Florence, scientific supervisor Prof. Giuseppe Lotti), specifically in the field of Digital Design, Sustainability Design, Communication Design and Strategic Design for Territorial Systems. He also participates in regional R&D as well as in international and European projects.
manfredi.sottani@unifi.it

Davide Stefano
Architect and PhD. Researcher in Real Estate Valuation at the Department of Architecture, "G. d'Annunzio" University of Chieti-Pescara, where he deals with cost estimation of post-earthquake reconstruction, relationships between urban quality and real estate values, and price formation of raw materials in the construction sector.
davide.stefano@unich.it

Suzanna Törnroth
She is an Associated Senior Lecturer (PhD) in Design at Luleå University of Technology, Sweden. She researches on the feminist technoscience perspectives of emerging technologies in human and non-human worlds. Particularly, her recent research delves into the ecological and multispecies perspective of solar energy technologies, following a dissertation titled called: "Solarscape: The power of humanity in designing solar imaginaries, entangled worlds, and critical sustainable futures". She also has a practice-based design and urban planning background in Sweden, Singapore, Dubai, Copenhagen and Maldives.
suzanna.tornroth@ltu.se

Anna Turco
She holds a degree in Design, Visual and Multimedia Communication from Sapienza University of Rome. She is the recipient of a research scholarship entitled "Visual Communication Design for Natural Capital and Material and Immaterial Cultural Heritage." Since 2022, she has been pursuing a PhD in Design at the Department of Planning, Design, and Architecture Technology at Sapienza University of Rome and works as a teaching assistant in the Communication Design Laboratory, the Public Space Design Laboratory, and the Design and Representation Laboratory. She has participated in the European project "Conference on the Future of Europe" in Brussels, Strasbourg, and Warsaw, addressing issues related to climate change, environment, and health. Her areas of scientific research focus on Visual Communication Design, specifically Environmental Graphic Design, applied to public space for reactivation and regeneration purposes.
anna.turco@uniroma1.it

Annapaola Vacanti
She is a Research Fellow at Università Iuav di Venezia, where she teaches in design laboratories for the curricula of Product design and Interior design of the master degree design courses. She obtained a PhD in Design at the University of Genoa in 2022. Her research focuses on Interaction Design and the opportunities offered by data-driven tools and Artificial Intelligence for design, exploring the challenges that lie at the intersection between technology, human factors, and sustainability issues. She is working within the iNEST (Interconnected Nord-Est Innovation Ecosystem) project, funded by the National Recovery and Resilience Plan (PNRR). Alongside her academic career, since 2018 she has been art director and organizer of TEDxGenova, an autonomous event operating under official TED license for the local dissemination of valuable ideas.
avacanti@iuav.it

Francesca Valsecchi
She is an Associate Professor at the College of Design and Innovation at Tongji University and director of the Ecology and Cultures Innovation Lab. She develops research on more-than-human design and the challenges of the post-development paradigm. Her research includes published, speculative, and exhibition works about mapping ecosystems, ethnography of waterscapes, ecological data, and urban-nature interaction.
francesca@tongji.edu.cn

Gijs van Leeuwen
PhD Candidate at the Department of Human-Centered Design of Delft University of Technology (TU Delft), The Netherlands. His research is concerned with relations of power and politics, and how these co-evolve with emerging energy infrastructures and technologies. Methodologically, he is developing a transdisciplinary approach that is based on design anthropology. He has a multidisciplinary background with two Master's degrees in Energy Science and Philosophy of Science, Technology, and Society.
g.e.vanleeuwen@tudelft.nl

Desirée Veschetti
Designer and research and teaching assistant at the University of Applied Sciences and Arts of Southern Switzerland (SUPSI), she has been involved in research dissemination projects concentrating on accessibility and cultural heritage. With her background in editorial and interaction design, she incorporates these skills into SUPSI's Bachelor in Visual Communication program, teaching in courses centred on Creative Coding with Machine Learning and User Interface Design.
desiree.veschetti@supsi.ch

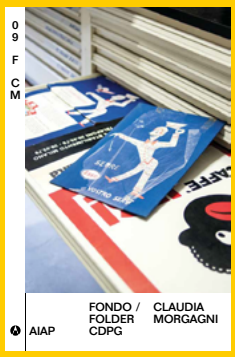
Devon Wemyss
PhD Science and Technology Policy Studies, she has been researching in the field of energy digitalisation and behaviour change at the ZHAW (Zurich University of Applied Sciences) for 10 years. Her main focus is on collaborative processes to activate climate-relevant behaviour change, particularly looking at how digital tools can support these changes in the long-term and at large scale to move beyond research.
wemy@zhaw.ch

Chenfan Zhang
PhD candidate of the Design Department of the Politecnico di Milano. Her research interests include design for social innovation, community and community development, and service design. Member of Polimi DESIS Lab and of the international DESIS Network.
chenfan.zhang@polimi.it

Francesco Zurlo
Ph.D., he is Dean of the School of Design of Politecnico di Milano. He is full professor of Industrial Design. His research interests are concentrated in strategic, systematic and creative research through design, focusing to the impact of business innovations and human flourishing. Professor Zurlo is the Director of the Design + Strategies research group, he is a member of the scientific committee of the Observatory of Design Thinking for Business of the School of Management of Politecnico di Milano, and of ADI Index (the most important organization for assessing the best design in Italy).
francesco.zurlo@polimi.it

Progetto Grafico
From 2003, the only Italian magazine totally dedicated to graphic design

AWDA
The International AIAP Women in Design Award



CDPG Folders
Booklets dedicated to the AIAP's Archives Funds and personalities of Design History.

CAMPO GRAFICO 1933/1939
The Birth of Graphic Design

AIAP PUBLISHES BOOKS, MANUALS, POSTERS, A MAGAZINE AND A JOURNAL. GRAPHIC DESIGN, COMMUNICATION DESIGN, DESIGN.

aiap.it/libreria/

AIAP EDIZIONI

AIAP CDPG
The Archives of Italian Graphic Design
Documents, Histories, Researches, Exhibitions, Publications, Tours

AIAP CDPG
ASSOCIAZIONE ITALIANA
DESIGN DELLA COMUNICAZIONE VISIVA

AIAP
via Amilcare Ponchielli 3
20129 Milano

www.aiap.it
aiap@aiap.it
biblioteca@aiap.it

PAD. Pages on Arts and Design
International, peer-reviewed,
open access journal
ISSN 1972-7887

#26, Vol. 17, June 2024

www.padjournal.net

AIAP
associazione italiana design
della comunicazione visiva