26

PAD

HUMANIZING ENERGY

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

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

Humanizing Energy. Design and Art for Energy Transition 006
by Barbara Di Prete, Agnese Rebaglio & Lucia Ratti

I. VALUES: ENERGY CULTURES & BEHAVIORAL CHANGE

Re-Crafting Energy-Related Household Routines. The Integration of Design Methods in Behavioural Change Theory to Foster More Sustainable Routines 024
by Giovanni Profeta, Francesca Cellina, Desirée Veschetti, Evelyn Lobsiger-Kägi, Devon Wemyss & Pasquale Granato

Towards Design Fiction for Human-Centered Energy Transitions. Imagining Infrastructures and Worldbuilding 047
by Gijs van Leeuwen & Abhigyan Singh

Environment/Data/People. [Eco] Participatory Data Physicalization as Design Strategic Tools for Engaging, Sensitizing, and Educating the Community to Energy Transition 066
by Alessio Caccamo & Anna Turco

Design for Temporary and Sustainable Music Festivals. New Values and Informal Educational Systems for Humanizing Energy Transition 091
by Marco Manfra & Grazia Quercia

Talking About Energy: Design and Language for the Energy Transition 116
by Barbara Di Prete, Agnese Rebaglio & Lucia Ratti

II. MODELS: ENERGY COMMUNITIES & COLLABORATIVE LANDSCAPES

Services to Design Change: Gamification Opportunities to Generate Virtuous Behaviors and Design Sustainability Pathways 142
by Debora Giorgi, Claudia Morea, Chiara Rutigliano, Letizia Giannelli & Luca Incrocci

Energy to Design Communities. Energy Communities and Communities of Practice to Support Marginal Areas in Abruzzo 167
by Rossana Gaddi, Raffaella Massacesi, Luciana Mastrolonardo & Davide Stefano

Enhancing Wind Farm Projects: A Systemic and Strategic Design Approach to Community Acceptance and Engagement 194
by Carla Sedini, Francesco Zurlo, Stefania Palmieri, Mario Bisson & Silvia Peluzzi

Powered by the People. Human-Powered Energy Generation as Lifestyle Choice 225
by Andreas Sicklinger & Adrian Peach

Designing Community-Driven Energy Solutions. Reflecting on Design for Future Social Systems and the Ability to Shape Change 249
by Valentina Auricchio, Marta Corubolo, Stefana Broadbent, Beatriz Bonilla Berrocal & Chenfan Zhang

III. TOOLS: ENERGY TECHNOLOGIES & DIGITAL AWARENESS

Solar Biota. Co-Living with Solar Ecologies 282
by Suzanna Törnroth

From the *Cloud* to the Ground. A Data-Driven Research to Build Informative Heritage on the Internet's Energy Footprint 307
by Fabiola Papini, Francesca Valsecchi & Michele Mauri

Towards Energy Sustainability in the Digital Realm. A Compass of Strategies between Natural and Artificial Intelligence 329
by Michele De Chirico, Raffaella Fagnoni, Carmelo Leonardi, Ami Licaj, Giuseppe Lotti, Manfredi Sottani & Annapaola Vacanti

Understanding the Energy Transition by Analyzing the IT Revolution. An Infrastructural Reading to Direct Design Approaches toward Energy Sustainability 354
by Davide Crippa & Massimiliano Cason Villa

III. BIOGRAPHIES

About the Authors 375

II

MODELS

ENERGY COMMUNITIES & COLLABORATIVE LANDSCAPES

Services to Design Change

Gamification Opportunities to Generate Virtuous Behaviors and Design Sustainability Pathways

Debora Giorgi
Università degli Studi di Firenze
Orcid id 0000-0002-4640-1702

Claudia Morea
Università degli Studi di Firenze
Orcid id 0000-0001-6032-0004

Chiara Rutigliano
Università degli Studi di Firenze
Orcid id 0000-0001-9021-0017

Letizia Giannelli
Università degli Studi di Firenze
Orcid id 0009-0005-1465-3250

Luca Incrocci
Università degli Studi di Firenze
Orcid id 0009-0008-3014-2655

Keywords
Behavioral Design, Education, Awareness, Energy Transition, Key Enabling Technologies.

Abstract
The paper investigates the application of *Design for Behavior Change* (DfBC) practices to promote sustainable energy consumption. By employing user-centered strategies, DfBC fosters the adoption of long-term behavioral modifications that contribute to energy sustainability. This methodological framework leverages real-time data acquisition, personalized feedback, and engaging narrative techniques. The research process fosters positive change and encourages the autonomous adoption of new virtuous behaviors. By strategically applying these tools and combining design-driven methodologies with social psychology research, sustainable energy choices can be transformed from perceived obligations into personal choices desired in everyday life. The article highlights the promotion of activities that contribute to both energy and environmental well-being, emphasizing the positive societal benefits generated by such endeavors, with a particular focus on the potential of technological advancements. It presents two case studies demonstrating the effectiveness of design methodologies and practices in raising public awareness about climate change, particularly regarding energy sustainability. Through analyzing these cases, the paper offers valuable insights into how design can promote an energy transition driven by collective commitment. This radical change requires not only technological interventions but also social, cultural/behavioral, institutional, and organizational change.

1. Research Background: Understanding Barriers to Sustainable Behavior and Opportunities from Technology

Our current energy system is a major driver of global warming, accounting for about 75% of total Greenhouse gas emissions (IPCC, 2023). As a response to the threat of climate change, the transformation of the global energy landscape is therefore of fundamental importance to mitigate climate change and achieve the goals set out in the Paris Agreement (UNFCCC, 2015). According to the International Energy Agency (IEA), achieving these ambitious goals requires significantly faster and more widespread progress than has been seen to date (IEA, 2022). Western cosmology is predominantly anthropocentric, placing humanity at the center of the universe and distinct from nature. Rooted in the historical and social evolution of Western societies, this perspective has fostered a view of nature as a resource for human advancement, neglecting its intrinsic value and need for protection. However, the recent surge in new technologies, such as electric vehicles, solar photovoltaics, batteries, and heat pumps, has ignited optimism for a potential turning point in combating climate change and reducing greenhouse gas emissions (IRENA, 2023). Although the widespread adoption of these technologies represents a significant step forward, it is insufficient for a successful transition. Achieving this transition necessitates a concurrent paradigm shift within the cultural domain towards sustainability, alongside more ambitious and impactful political commitments (IEA, 2022). Moreover, the deployment of these technologies is not without its drawbacks. They also present a range of geopolitical challenges that require further investigation.

Designers play a crucial role in shaping sustainable user behavior and facilitating cultural transitions towards a sustainable energy system. Their influence arises from their twofold role: shaping the production processes and supply chains of their products, as well as influencing how users interact with those products. Understanding and influencing human behavior are therefore becoming critical aspects of the design process for a sustainable future. Climate change awareness campaigns fail to promote long-term behavioral change due to their sole focus on mitigation measures, energy efficiency, and sustainability, neglecting adaptation of the human aspect. This approach can make energy systems seem complex and distant from people's daily lives, leaving them overwhelmed by the vastness of environmental issues or disconnected from the immediate impact of their choices.

Espen Stoknes, a Norwegian psychologist, in his 2015 book "*What We Think About When We Try Not to Think About Global Warming*" identifies five psychological defense mechanisms that impede effective action on climate change: Distance, Doom, Dissonance, Denial and Identity. First of all, the concept of *Distance*, where climate change is perceived as a distant issue. When climate change is framed as an encroaching disaster that can only be addressed by loss, cost, and sacrifice, it creates a wish to avoid the topic (*Doom*). Furthermore, cognitive *Dissonance*, which arises from the discomfort of holding conflicting beliefs, leads us to deny or feel powerless in the face of information that contradicts our convictions and reality. Even when aware of concerning facts, we tend to act as if we are not (*Denial*). As we filter information through our cultural identity, we often filter away what challenges our existing values and notions. Therefore, if new information requires us to change ourselves, then we experience resistance to calls for change in self-identity (*Identity*). These defense mechanisms collectively hinder individuals from taking action. To address this, Stoknes proposes making climate change more tangible and personal by highlighting its local and immediate impacts. This requires clear and constructive communication of the issue, fostering a shared collective identity, emphasizing membership in a broader group fighting for a common future, and showcasing the solutions and concrete actions individuals and communities can take to make a difference.

Technological innovation is emerging as a key driver of systemic change towards a more sustainable future, smart homes and energy consumption control are clear examples. Specifically, the integration of new technologies like artificial intelligence (AI), the Internet of Things (IoT), and Digital Twins (DT) into change-oriented services can accelerate the energy transition and promote sustainable user behavior.
The Internet of Things (IoT) plays a crucial role in powering Digital Twins, which have the potential to help users understand their energy consumption and improve efficiency. The deployment of smart sensors in buildings, industrial facilities, and power grids facilitates the capture of valuable data on critical parameters like temperature, energy consumption, and operational conditions. This continuous data stream feeds into Digital Twin technology, creating a comprehensive and dynamic virtual representation of the physical system. Beyond

mere replication, the Digital Twin, empowered by this rich data, transforms into a powerful tool for simulation and optimization. Through the creation of hypothetical scenarios, inefficiencies can be proactively identified, and alternative solutions can be tested before real-world implementation. Chevron Corporation, for example, has adopted artificial intelligence to develop digital twins and optimize operations. By using predictive data analysis, the company has significantly reduced the number of required drillings and improved the efficiency of maintenance activities. This approach enables proactive optimization of energy performance, resulting in cost reductions and a minimized environmental impact.

Artificial intelligence can be implemented in sustainable energy by customizing recommendations and providing real-time feedback. Recent studies (Ayan et al, 2020; Li et al, 2020, Chiesa et al, 2020) highlight how these systems, based on microcontrollers such as Arduino and Raspberry Pi, enable automatic adjustment of light intensity, remote control of luminaires and the creation of custom scenarios. The use of motion, light and temperature sensors allows lighting to be optimized according to space occupancy, daylight availability and individual preferences helps users to analyze their energy consumption data, offering personalized and targeted energy-saving recommendations, helping them to understand the impact of their behavior on energy consumption. This approach takes into account users' specific needs, habits and characteristics, suggesting effective actions based on climate, home comfort and energy costs. Machine learning allows AI systems to adapt to user preferences, continuously improving recommendations. Intelligent automation simplifies the process, freeing users from the need to remember energy-saving actions and allowing them to focus on strategic aspects such as communication, engagement and impact assessment. These technologies help design efficient strategies to promote sustainable energy behavior.

2. Research Methodology

This study explores the application of Design for Behavioral Change strategies through two case studies. The first case involved developing a user-friendly interface for a database containing energy audit results from school buildings. This platform aimed to enhance accessibility and comprehension of complex energy data for stakeholders, ultimately promoting informed decision-making regarding energy usage within schools. The second case study showcases a disciplinary workshop about carbon footprint. Students were able to understand and apply the concept of carbon footprint by analyzing their daily consumption habits. This interactive exercise increased the students' awareness of their environmental impact, encouraging them to switch to more sustainable practices.
The "*Design-driven*" approach (Verganti, 2010) to energy production goes beyond merely considering technical efficiency or economic cost. Instead, it places the very meaning of energy and its value for people and communities at the forefront (Badalucco, Chiapponi, 2009). Such an approach demands interdisciplinary and coordinated actions, involving experts from engineering, architecture, design, urban planning, social sciences, economics, and more. It is crucial to overcome disciplinary fragmentation and adopt a systemic view of energy production, considering its social, environmental,

and territorial implications. Engaging the society is a key element, since the energy transition cannot be imposed from above; rather, it must be the outcome of a shared process that engages citizens and other local stakeholders.
Ceschin e Gaziulusoy (2016), Explains about the Design for Sustainable Behaviour evolution of Design for Sustainability. The authors highlight that an ecodesign approach can provide designers with a set of design strategies to reduce the environmental impact of a product throughout its whole life cycle, however, the way in which consumers interact with products can produce substantial environmental impacts.
As noted by Niedderer et al. (2014) there are many different designs for behavior change approaches because there are many different models of behavior change in social sciences. For example: the Design for Sustainable Behaviour model developed at Loughborough University (Bhamra et al., 2011; Lilley, 2009) is grounded on behavioral economics and proposes a set of design intervention strategies based on informing, empowering, providing feedback, rewarding and using affordances and constraints; Design with Intent (Lockton et al., 2010) draws from a variety of fields and proposes eight lenses (Architectural, Error Proofing, Interaction, Perceptual, Cognitive, Security, Ludic and Machiavellian lenses) by which to understand and influence aspects of personal behavior and contexts.

Behavioral design, coupled with collaborative practices, can facilitate the energy transition by fostering spaces for dialogue and exchange. This collaborative approach promotes public awareness of energy issues and aids in identifying user needs and challenges. Consequently, the design discipline assumes a multifaceted role: acting as a collector of user experiences, a social mediator, and a facilitator in the process of assigning new meanings to energy use. By doing so, design enables actions that promote and communicate social innovation. Accessible educational processes are then triggered, shaping citizens' behaviors and incentivizing the adoption of sustainable practices. This design approach aligns with the field of social psychology. Studies have shown that leveraging theoretical frameworks from social psychology allows for the evaluation of user needs and barriers. This evaluation is crucial for implementing interventions aimed at behavior change. The COM-B model (Michie et al., 2011), for instance, facilitates an assessment of the factors influencing the adoption of energy-sustainable behaviors. It also enables the development of targeted interventions to overcome barriers and promote change (Fig.1).

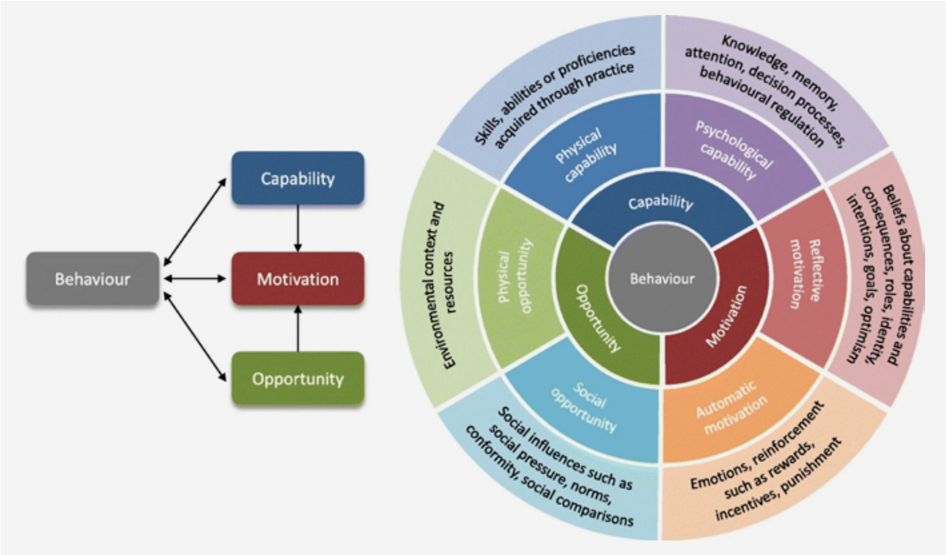


Figure 1. Michie et al., The COM-B model for understanding behavior of the behavior change wheel. 23 COM-B, capability, opportunity, motivation-behavior, 2011.

This behavior change framework proposes three necessary components for any behavior (B) to occur: Capability (C), Opportunity (O), and Motivation (M). By assessing these components, it is possible to understand why a specific behavior occurs and how to create targeted interventions that lead to effective change. For instance, if a lack of capability is identified, training or education interventions can be designed to increase users' knowledge and skills. The COM-B model provides a foundation for the Theory of Change which allows for the explicit articulation of the logical linkages between the identified solutions and their related activities, with the expected mid-term results, long-term goals, and desired impacts throughout the change process. Therefore it works as an effective tool for monitoring and evaluating whether the implemented activities effectively lead to the expected change.

Furthermore, recognizing the limitations of solely disseminating information, Engagement Design strategies were employed to ensure user engagement and maximize the effectiveness of the implemented infrastructures, in order to encourage consumers to adopt sustainable choices:

- *Gamification:* The simplest definition of gamification is 'the use of game features in non-game situations to enhance user experience and engagement' (Deterding et al., 2011). Gamification projects often rely on elements such as points, badges and leaderboards to motivate users and encourage sustained engagement (Huseynli, 2024). Incentives and penalties, as integral components of gamification, have been shown to be powerful tools for shaping user behavior and achieving desired outcomes (Gamma et al., 2021). This fosters a sense of participation and achievement, motivating individuals to strive for continuous improvement. Beeta represents an innovative digital solution that, by exploiting game dynamics, promotes energy awareness among users. Indeed, the application invites users to participate in challenges and competitions, incentivising them to monitor their consumption and adopt more sustainable behavior. The results suggest that gamification can be an effective tool to stimulate behavioral change in the energy field.

- *Personalized Feedback and Insights:* by providing real-time customized feedback on their energy consumption patterns, users can identify areas for improvement and track progress over time, fostering a sense of accountability and awareness. Energy, being inherently abstract and intangible, has traditionally been difficult for users to perceive and understand (Burgess & Nye, 2008). To overcome this challenge, recent studies have focused on strategies that increase the visibility of energy use, such as real-time home displays (Pahl, et al. 2016). These tools have proven to be effective in reducing energy consumption, but their long-term effectiveness depends on the ability to actively engage users. Therefore, the design of these tools requires a careful approach to comprehensibility and interactivity in order to provide personalized feedback and promote lasting behavioral change (Nasrollahi, et al., 2023). Numerous applications are commercially available related to raising awareness of a more conscious use of energy, e.g. Vemer's Energy Wi-Fi app to remotely control your consumption, Energy Consumption

Analyzer to calculate the average rate of energy consumption, MyWatt Plug to remotely monitor electrical outlets and keep costs under control.

- *Storytelling and Emotional Connection:* storytelling can frame sustainability within a compelling narrative and can create a deeper emotional connection to the issue. Storytelling techniques highlight the positive environmental and social impact of energy conservation, inspiring users to become active participants in the solution.

- *Networking and Social Learning* enable users to share experiences, compare results, and learn from each other's successes. These services offer significant scalability, fostering network buildingreaching a wider audience and reinforcing positive behaviors through social interaction. Social interaction strengthens motivation and consolidates sustainable behaviors (Cialdini, 2009). For example, Opower provides users with personalized energy-saving tips and gamification elements, making energy saving fun and competitive. Nest, a smart thermostat, monitors home energy consumption and offers social networking features to share consumption data with friends and family, encouraging conservation through social sharing. Enercities connects local communities engaged in the energy transition, allowing users to share experiences, best practices, and resources, and participate in collaborative projects. This community-based approach promotes energy conservation by providing support and a sense of belonging.

The presented best practices provide examples that can illustrate the implementation of the proposed strategies and demonstrate their effectiveness in promoting sustainable energy behaviors.

3. Case Study 01: User-Friendly Platform for Energy Efficiency in School Buildings

The project, conducted by BexLab (Building Environmental eXperience) and coordinated by Professor Antonella Trombadore, in collaboration with the Service Design laboratory led by Professor Debora Giorgi, developed a user-friendly interface prototype (Fig. 2). This interdisciplinary research is part of the Eni CBC Med program, Mediterranean University as Catalyst for Eco-Sustainable Renovation - Med-EcoSuRe, focusing on cost-effective energy renovation in university buildings with the potential to extend results to the entire public building sector. The methodology is based on a Living Lab approach, creating an innovative physical and virtual research and learning space.

Figure 2. Service Design Lab, UX and UI for Bexlab Platform, prototype of the user interface, 2021.

Here, researchers, stakeholders, and students can collaboratively experiment to improve energy efficiency, indoor quality, and well-being in building retrofit processes, fostering environmental awareness. Advanced technologies such as *Building Information Modeling* (BIM), dynamic environmental monitoring systems with sensors, and the *Internet of Things* (IoT) are used to implement the concept of a *Digital Twin*. This enables data availability through user-friendly ICT platforms, promoting knowledge of environmental issues and conscious behavior. Leveraging Digital Twin technology, predictive virtual scenarios assess the technological and economic feasibility of proposed solutions. Real-time monitoring systems gather data and experiential feedback, enriching the virtual model and providing a solid foundation for further enhancements. In-depth analysis within BexLab involved active stakeholder engagement, including students, faculty, technical staff, and administrators. Data collection through real-time questionnaires and field observations provided insights into stakeholders' perspectives, concerns, and behaviors related to environmental and energy comfort in school buildings.

Our contribution included the design of scenarios (Fig. 3) and storyboards aimed at reflecting real-life situations and actions that users could take to optimize environmental and energy comfort. These scenarios, presented as suggestions based on real-time perception of environmental energy, actively encourage users to participate in the process of environmental and energy improvement. The creation of storyboards were focused on actions and scenarios within the virtual user experience (digital twin), and it facilitated a multi-user and multi-level perspective on the collected data.

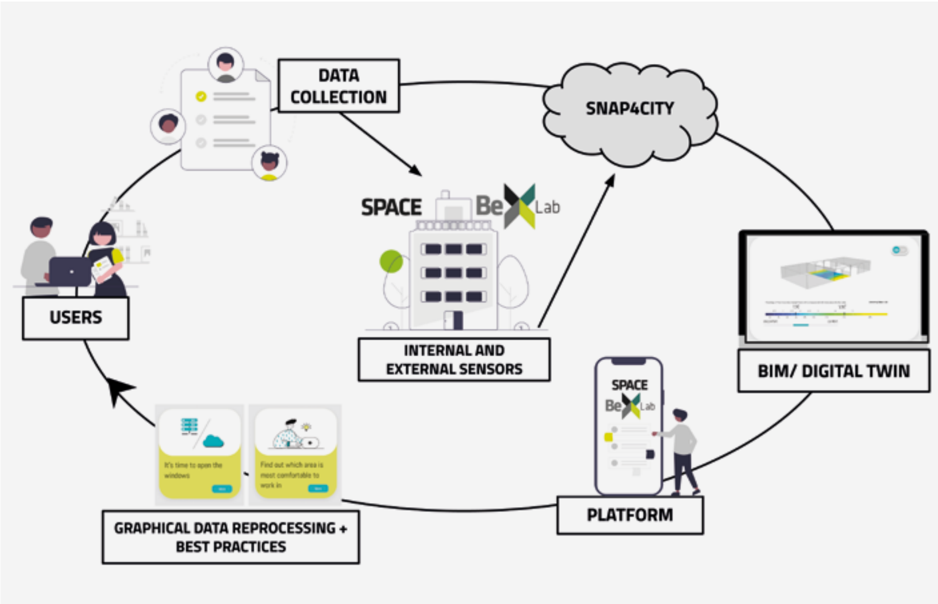


Figure 3. Service Design Lab, UX and UI for Bexlab Platform, construction of interested parties in the project system, 2021.

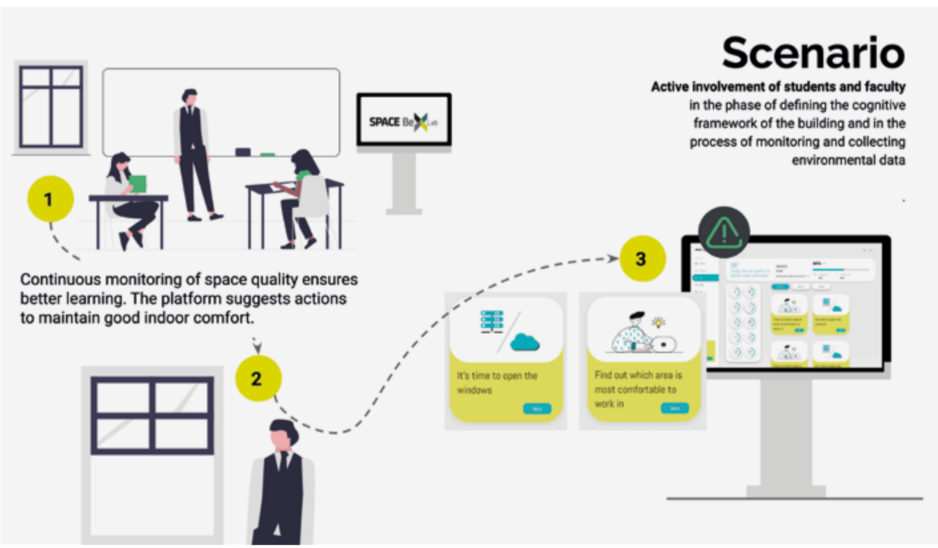


Figure 4. Service Design Lab, UX and UI for Bexlab Platform, example of illustrated scenario, 2021.

This approach enhanced everyone's ability to understand and interpret the information (Fig. 4). The User Experience methodology led to a user-friendly interface tailored to different user groups. Intuitive and eavsy to use, the interface provides clear information on energy consumption and environmental parameters. The final output includes a dashboard with sections for real-time sensor data and overall comfort perception, suggesting actionable steps to improve resource management. Continuous improvement is fostered through user feedback questionnaires, ensuring the platform remains adaptable to emerging needs and provides a progressively better user experience. The interaction between physical and virtual models, mediated by ICTs, transforms into an innovative experience aimed at improving building life quality, stimulating creativity, and encouraging collaboration among users. This data management and communication platform fosters a collaborative environment. Informed by real-time data, administrators and technicians can devise intelligent solutions and test them within the digital model. Residents, empowered with this knowledge, can then implement practical measures and provide feedback, creating a continuous improvement cycle.

The s*martness* of the building, through enabling technologies, enhances innovation, knowledge, learning, and *problem-solving skills*, contributing to raising awareness and changing behaviors towards a culture of sustainability.

4. Case Study 02: The Use of Ecodesign Tools to Raise Awareness of Domestic Consumption and Promote Sustainable Practices

The activities described in this case study illustrate how Design-driven approaches can effectively educate and raise awareness about environmental and energy sustainability, particularly regarding household consumption. This case study emerged from a workshop within the Service Design course for the academic year 2022/23, aimed at equipping future designers with the tools and methodologies necessary for service ideation, definition, and development (Stanford d.school, 2024).

The training was structured around a group project for three participants, tasked with designing and prototyping a social innovation service for the Macrolotto Zero district of Prato. The course focused on understanding household consumption patterns to achieve two main objectives. First, it aimed to raise student awareness of the environmental impact of daily domestic practices, particularly by linking everyday habits to household energy consumption and resulting CO2 emissions. Second, it sought to bridge the gap between theoretical design principles and their practical application. By using tools and methodologies from the Service Design course, students were empowered to define, map, and represent the domestic environment as a complex ecosystem.

The activities involved designing tools based on a Design Thinking approach. Templates were created and shared on Miro's jamboard. For four weeks, students documented their household consumption patterns, logging data on water, electricity, food, transportation, and waste production.

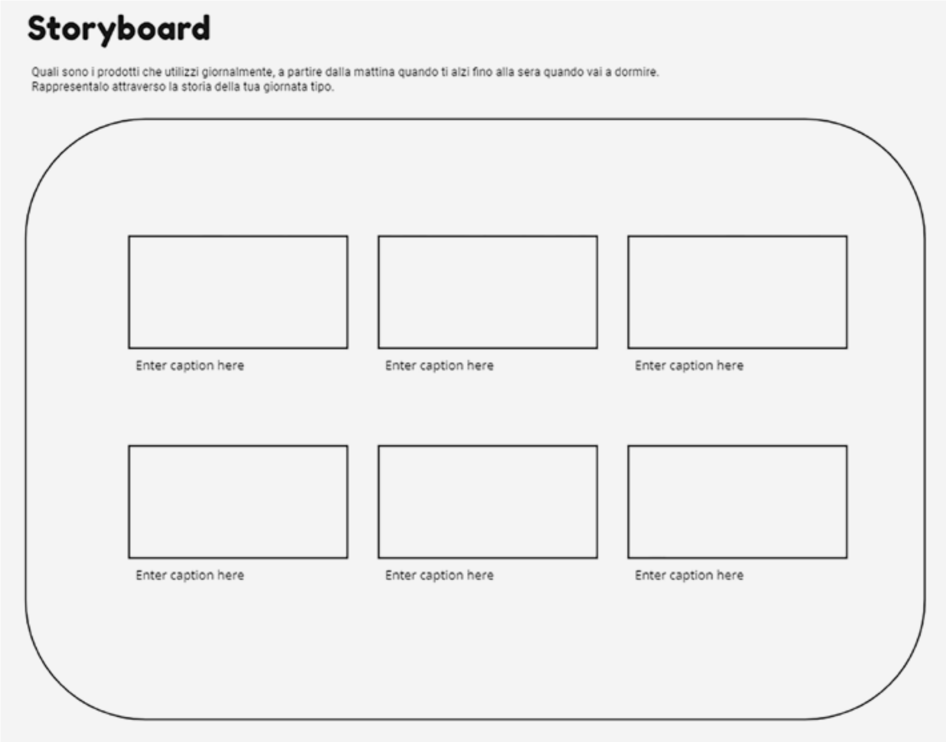


Figure 5. Service Design Lab, Workshop of domestic ecosystem, Example of storyboard used during the first activity, 2024.

They then used storyboards to translate a typical day's consumption patterns into visual narratives. Uploading these vignettes to a shared jamboard allowed collaborative representation of household consumption phases in their daily routines (Fig. 5).

Building on a lecture about ecosystem mapping (Tassi, 2019), students mapped all sources of household consumption into five categories: water, electricity, food, transportation, and waste generation. This helped them identify all elements of consumption within the domestic ecosystem (Fig. 6).

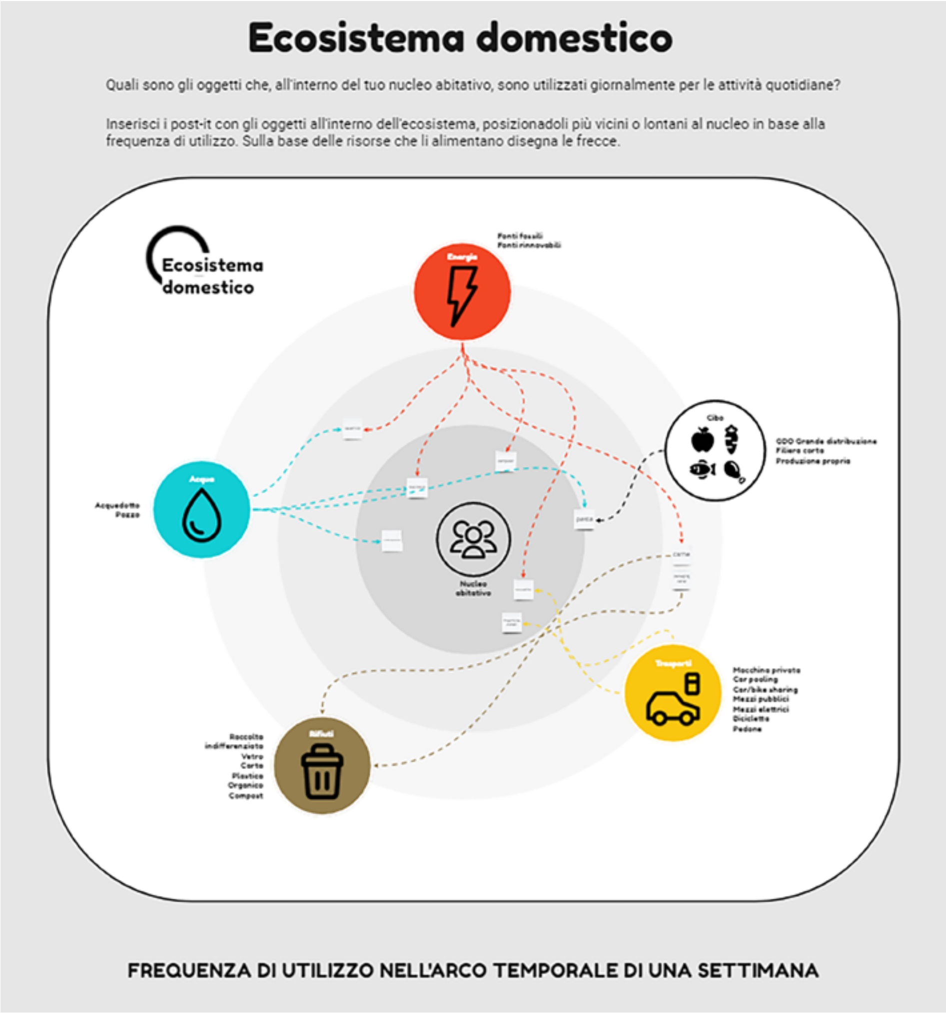


Figure 6. Service Design Lab, Workshop of domestic ecosystem, Example of Ecosystem map used during the second activity, 2024.

After a week, students reviewed their ecosystem maps with feedback from teachers and began creating an "interpretive abacus" to quantify each device's consumption. They conducted online research to find average consumption data for each device and entered these results into the abacus (Fig. 7).

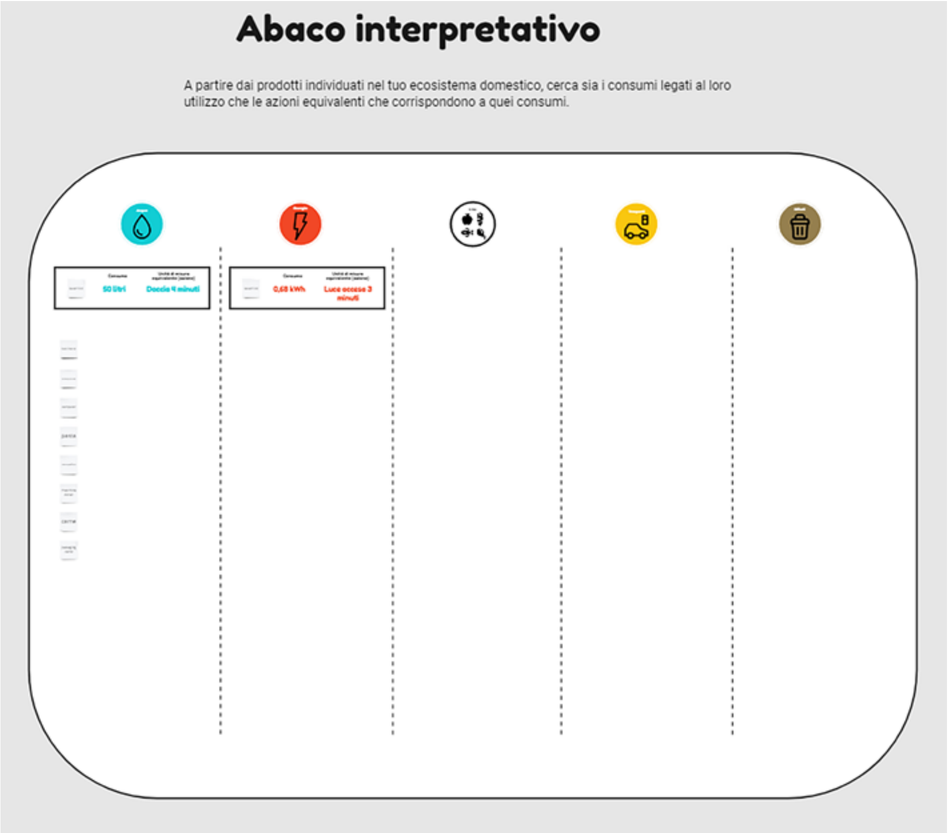


Figure 7. Service Design Lab, Workshop of domestic ecosystem, Example of Interpretative Abacus used during the third activity, 2024.

The next activity, "transform-ations," involved developing solutions to reduce or eliminate consumption problems identified in previous exercises. Students chose three products from their abacus and used a template on the jamboard to outline the object, the resource to be recovered, the resource recovery strategy, and potential solutions to modify family behavior (Fig. 8).
During the final presentation, students shared their "transform-ations" solutions. It was clear that through these activities, students gained a deeper understanding of household

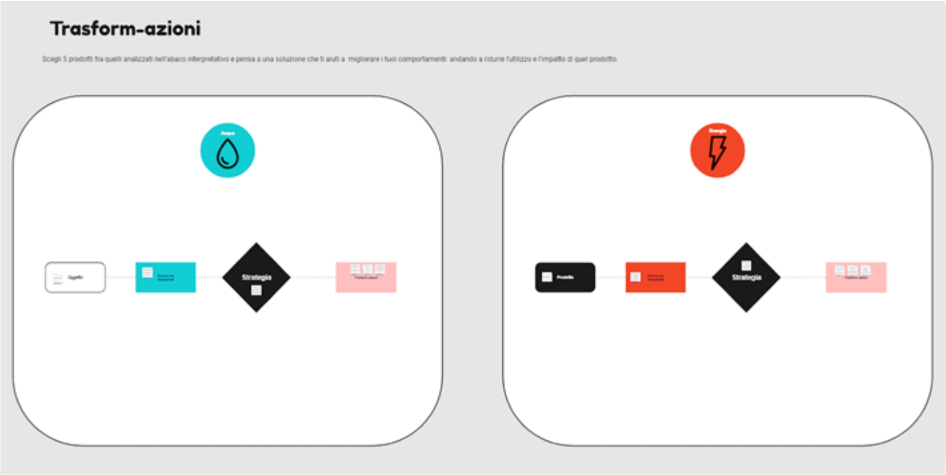


Figure 8. Service Design Lab, Workshop of domestic ecosystem,, Example of Trasform-azioni used during the fourth activity, 2024.

resource consumption and the impact of daily actions on energy use. They recognized the environmental impact of their choices and proposed innovative solutions to reduce consumption and promote sustainable practices.

The case studies that were just showcased are a compelling illustration of how such methodologies can increase environmental awareness and encourage sustainable behaviors. By engaging students in a series of practical activities, a deeper understanding of the impact of their daily habits on the environment was fostered.

5. Conclusions

"Design for Change" results as a compelling approach within the framework of fostering sustainable energy. By actively engaging users, facilitating virtuous behaviors, and nurturing a culture of shared responsibility, this innovative methodology holds immense promise in addressing the pressing challenges of our energy-intensive world. Co-creation is central to Transformation Design in service platform development. When project participants actively contribute to shaping the service, designers must move away from rigid, pre-determined sequences of actions. This allows for greater adaptability and flexibility to meet the evolving needs of the co-creators. When designers are faced with the need to disseminate and scale the promising solutions of creative communities, their contribution takes the form of "enabling solutions", or "a system of products, services, communication and everything else needed to improve the accessibility, effectiveness and replicability of a collaborative service" (Manzini, 2008: 38).

What makes this approach strong is its focus on social psychology, behavioral sciences, and cutting-edge technologies. This synergy allows for the adoption of dynamics in response to the complex and ever-changing variables required by this ongoing transition. Beyond offering immediate solutions, "Design for Change" fosters groundbreaking advancements in how we manage and conceptualize energy resources. This approach ushers in a paradigm shift, where technological innovation and predictive scenarios work hand-in-hand to pave the way for a future with significantly reduced energy waste. By educating participants, the program engenders a critical awareness of the environmental and social consequences of daily routines. This goes beyond simply adopting energy-efficient practices, nurturing a long-term commitment to responsible behavior.

While past experiences offer valuable insights, a critical approach remains essential to avoid deterministic biases and uncritical adoption of *Key Enabling Technologies*. These innovations demand thorough investigation, comprehension, and integration to empower users with knowledge and awareness. This fosters a sense of designer accountability and stimulates critical design thinking, crucial for tackling the ever-growing complexity of achieving sustainability and other ecosystemic goals.

References

Ayan, O., & Turkay, B. (2020). IoT-Based Energy Efficiency in Smart Homes by Smart Lighting Solutions. In *2020 21st International Symposium on Electrical Apparatus & Technologies (SIELA)* (pp. 32–36). IEEE. https://ieeexplore.ieee.org/abstract/document/9167065#:~:text=10.1109/SIELA49118.2020.9167065

Badalucco, L., & Chiapponi, M. (2009). *Energia e design. Innovazioni di prodotto per la sostenibilità energetica*. Carocci.

Bhamra, T. A., & Mallen, C. (2017). Design for Sustainability: A Practical Guide for a Low-Carbon Future. Routledge.

Burgess, J., & Nye, M. (2008). Re-Materialising Energy Use through Transparent Monitoring Systems. *Energy Policy*, *36*(12), 4454–4459. https://doi.org/10.1016/j.enpol.2008.09.039

Ceschin, F., & Gaziulusoy, I. (2016). Evolution of Design for Sustainability: From Product Design to Design for System Innovations and Transitions. *Design Studies*, *47*, 118–163. https://doi.org/10.1016/j.destud.2016.09.002

Chiesa, G., Di Vita, D., Ghadirzadeh, A., Herrera, A.H.M., & Rodriguez, J.C.L. (2020). A Fuzzy-Logic IoT Lighting and Shading Control System for Smart Buildings. *Automation in Construction*, *120*, 103397. https://doi.org/10.1016/j.autcon.2020.103397

Cialdini, R. B. (2009). *Influence: The Psychology of Persuasion*. HarperCollins.

Climate ADAPT. (2024, May 17). *Campagne di sensibilizzazione per un cambiamento comportamentale*. Climate ADAPT. https://climate-adapt.eea.europa.eu/it/metadata/adaptation-options/awareness-campaigns-for-behavioural-change

Deterding, S., Sicart, M., Nacke, L., O'Hara, K., & Dixon, D. (2011). Gamification. Using Game-Design Elements in Non-Gaming Contexts. In D. Tan, B. Begole, & W.A. Kellogg (Eds.), *CHI'11 Extended Abstracts on Human Factors in Computing Systems* (pp. 2425–2428). ACM. https://doi.org/10.1145/1979742.1979575

Friedel, R. (1991). The Material of Invention: Materials and Design by Ezio Manzini. *Technology and Culture*, *32*(1), 133–135. https://doi.org/10.1353/tech.1991.0152

Gamma, K., Mai, R., Cometta, C., & Loock, M. (2021), Engaging Customers in Demand Response Programs: The Role of Reward and Punishment in Customer Adoption in Switzerland. *Energy Research and Social Science, 74*, 1–16. https://doi.org/10.1016/j.erss.2021.101927

Huseynli, B. (2024). Gamification in Energy Consumption: A Model for Consumers' Energy Saving. *International Journal of Energy Economics and Policy, 14*(1), 312–320. https://doi.org/10.32479/ijeep.14395

IEA. (2022). *World Energy Outlook 2022*. International Energy Agency.

IEA. (2023). *Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach*. IEA. https://www.iea.org/reports/net-zero-roadmap-a-global-pathway-to -keep-the-15-0c-goal-in-reach

IPCC. (2023). *Climate Change 2021 – The Physical Science Basis: Working Group I Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press. https://doi.org/10.1017/9781009157896

IRENA. (2023). Renewable Energy Statistics 2023. International Renewable Energy Agency. https://www.irena.org/Publications/2023/Jul/Renewable-energy-statistics-2023

Li, Z., Li, J., Li, X., Yang, Y., Xiao, J., & Xu, B. (2020). Design of Office Intelligent Lighting System Based on Arduino. *Procedia Computer Science, 166*, 134–138. https://doi.org/10.1016/j.procs.2020.02.035

Lockton, D., Harrison, D., & Stanton, N. A. (2010). The Design with Intent Method: A Design Tool for Influencing User Behaviour. *Applied Ergonomics, 41*(3), 382–392. https://doi.org/10.1016/j.apergo.2009.09.001

Manzini, E. (2015). Design, When Everybody Designs: An Introduction to Design for Social Innovation. MIT Press.

Michie, S., Van Stralen, M.M,, & West, R. (2011). The Behaviour Change Wheel: A New Method for Characterising and Designing Behaviour Change Interventions. *Implementation Science, 6*, 1–12. https://doi.org/10.1186/1748-5908-6-42

Nasrollahi, H., Lampropoulos, I., Werning, S., Belinskiy, A., Fijnheer, J. D., Veltkamp, R. C., & van Sark, W. (2023). Review of Serious Energy Games: Objectives, Approaches, Applications, Data Integration, and Performance Assessment. *Energies, 16*(19), 6948. https://doi.org/10.3390/en16196948

Niedderer, K., Clune, S., & Ludden, G. (Eds.). (2017). *Design for Behaviour Change: Theories and Practices of Designing for Change*. Routledge. https://doi.org/10.4324/9781315576602

Niedderer, K., Ludden, G., Clune, S., Lockton, D., MacKrill, J. B., Morris, A., ... & Hekkert, P. (2016). Design for Behaviour Change as a Driver for Sustainable Innovation: Challenges and Opportunities for Implementation in the Private and Public Sectors. *International Journal of Design*, *10*(2), 67–85. https://www.ijdesign.org/index.php/IJDesign/article/view/2260

Pahl, S., Goodhew, J., Boomsma, C., & Sheppard, S.R. (2016). The Role of Energy Visualization in Addressing Energy Use: Insights from the eViz Project. *Frontiers in Psychology*, *7*, 92. https://doi.org/10.3389/fpsyg.2016.00092

Stanford d.school. (2024). *Get Started with Design Thinking*. https://dschool.stanford.edu/resources/getting-started-with-design-thinking

Stoknes, P. E. (2015). *A cosa pensiamo quando cerchiamo di non pensare al riscaldamento globale?*. Mondadori.

Tassi, R. (2019). *Service designer: Il progettista alle prese con sistemi complessi*. FrancoAngeli.

Verganti, R. (2009). Design Driven Innovation: Changing the Rules of Competition by Radically Innovating what Things Mean. Harvard Business Press.

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

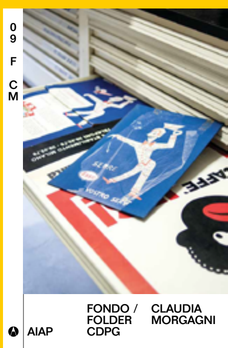
Devon Wemyss
PhD Science and Technology Policy Studies, she has been researching in the field of energy digitalisation and behaviour change at the ZHAW (Zurich University of Applied Sciences) for 10 years. Her main focus is on collaborative processes to activate climate-relevant behaviour change, particularly 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