



Delft University of Technology

Towards Design Fiction for Human-Centered Energy Transitions Imagining Infrastructures and Worldbuilding

van Leeuwen, G.E.; Singh, A.

Publication date
2024

Document Version
Final published version

Published in
PAD Pages on Arts & Design

Citation (APA)

van Leeuwen, G. E., & Singh, A. (2024). Towards Design Fiction for Human-Centered Energy Transitions: Imagining Infrastructures and Worldbuilding. *PAD Pages on Arts & Design*, 17(26), 47-65.

Important note

To cite this publication, please use the final published version (if applicable).
Please check the document version above.

Copyright

Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

Takedown policy

Please contact us and provide details if you believe this document breaches copyrights.
We will remove access to the work immediately and investigate your claim.

26



HUMANIZING ENERGY



PAD. Pages on Arts and Design

International, peer-reviewed,
open access journal
founded by Vanni Pasca in 2005

Editor-in-Chief**Marinella Ferrara**

Politecnico di Milano, Italy

Advisory Board**Tevfik Balcioglu**

Arkin University, Kyrenia, Turkey

Murat Bengisu

Izmir University of Economics, Turkey

Isabel Campi

Design History Foundation, Barcelona, Spain

Eduardo Corte Real

UNIDCOM/IADE, Lisbon, Portugal

Antonio da Cruz Rodrigues

Universidade Lusófona, Lisbon, Portugal

Soumiya Mikou

Moroccan Design Association, Casablanca, Morocco

Ely Rozenberg

RUFA, Rome University Fine Art, Italy

Mireia Frexia Serra

Gracmon, Universitat de Barcelona, Spain

Andreas Sicklinger

Alma Mater Studiorum Università di Bologna, Italy

Fedja Vukić

University of Zagreb, Croatia

Managing Editor**Chiara Lecce**

Politecnico di Milano, Italy

Editorial Assistants**Giorgia Bonaventura**

Politecnico di Milano, Italy

Laura Carugati

Politecnico di Milano, Italy

Editorial Board**Giuseppe Amoroso**

Politecnico di Milano, Italy

Helena Barbosa

University of Aveiro, Portugal

Michela Bassanelli

Politecnico di Milano, Italy

Letizia Bollini

Libera Università di Bolzano, Italy

Stefania Camplone

Università degli Studi di Chieti-Pescara, Italy

Roberto De Paolis

REPRISE - MUR independent scientific expert, Italy

Cinzia Ferrara

Università degli Studi di Palermo, Italy

Francesco E. Guida

Politecnico di Milano, Italy

Ashley Hall

Royal College of Art, London, England

Elif Kocabiyik

Izmir University of Economics, Turkey

Lia Krucken

Creative Change, Brazil and Germany

Carla Langella

Università degli Studi di Napoli Federico II, Italy

Chiara Lecce

Politecnico di Milano, Italy

Giuseppe Lotti

Università degli Studi di Firenze, Italy

Tomas Macsotay

Pompeu Fabra University, Spain

Alfonso Morone

Università degli Studi di Napoli Federico II, Italy

Raquel Pelta

Universidad de Barcelona, Spain

Daniele Savasta

Izmir University of Economics, Turkey

Rosanna Veneziano

Università degli Studi della Campania Luigi Vanvitelli, Italy

Li Zhang

Beijing Information Science and Technology University, China

Publishing Consultant**Vincenzo Castellana**, Architect, Italy**Art Direction****Francesco E. Guida****Web Site****Pietro Forino**, www.pietroforino.com**Correspondents****Amina Aguezmay** (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**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.**047****Imagining Infrastructures and Worldbuilding**

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 Mastrodonardo & 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

by Valentina Auricchio, Marta Corubolo, Stefana Broadbent, Beatriz Bonilla Berrocal & Chenfan Zhang

249

III. TOOLS: ENERGY TECHNOLOGIES & DIGITAL AWARENESS

Solar Biota. Co-Living with Solar Ecologies

by Suzanna Törnroth

282

From the *Cloud* to the Ground. A Data-Driven Research to Build Informative Heritage on the Internet's Energy Footprint

by Fabiola Papini, Francesca Valsecchi & Michele Mauri

307

Towards Energy Sustainability in the Digital Realm. A Compass of Strategies between Natural and Artificial Intelligence

by Michele De Chirico, Raffaella Fagnoni, Carmelo Leonardi, Ami Licaj, Giuseppe Lotti, Manfredi Sottani & Annapaola Vacanti

329

Understanding the Energy Transition by Analyzing the IT Revolution.

An Infrastructural Reading to Direct Design Approaches toward Energy Sustainability

by Davide Crippa & Massimiliano Cason Villa

354

III. BIOGRAPHIES

About the Authors

375

VALUES

ENERGY CULTURES & BEHAVIOURAL
CHANGE

Towards Design Fiction for Human-Centered Energy Transitions

Imagining Infrastructures and Worldbuilding

Gijs van Leeuwen

Delft University of Technology

Orcid id 0000-0002-5374-2302

Abhigyan Singh

Delft University of Technology

Orcid id 0000-0003-4984-9067

Keywords

Design Fiction, Energy Transitions, Worldbuilding, Infrastructure, Design Anthropology.

Abstract

This article proposes to support human-centered energy transitions through design fiction. Design fiction is conceptualized as a form of worldbuilding in the sense that design fiction not only represents alternative realities but also intervenes in the processes of their emergence. For the context of energy transitions, this article proposes to approach worldbuilding through an understanding of and engagement with energy infrastructures.

The distributed agencies and lengthy time horizons that characterize infrastructural development pose interesting challenges for designers and can be subverted by leveraging the poetic and aesthetic qualities of infrastructure through design fiction.

The article discusses such aspects of energy infrastructures and expected developments in the transition to renewable energy. The approach is illustrated using seven emerging energy worlds, and future steps are identified to develop these into proper design fiction further. Overall, our approach draws together technological, political, and economic trends in the energy sector and provides pointers for designers and artists to intervene and co-shape energy transitions.

1. Introduction

Energy transitions are multidimensional and distributed processes that unfold over multiple decades. This creates challenges for designers who intend to intervene, as a local, human-centered focus is quickly overshadowed by systemic and infrastructural issues (Van Leeuwen & Singh, 2023). Furthermore, energy systems and infrastructures emerge through the distributed agency of many actors, including engineers, policy-makers, and administrators, which raises questions about the impact a single designer can make. To address these challenges, this article proposes using *design fiction* to support shifts in values, mindsets, and practices across the distributed networks that shape energy transitions. Through this use of design fiction, the agency and autonomy of all who co-shape energy transitions are acknowledged and respected, as opposed to intervention through political or technological means.

The approach is fleshed out using the concept of *worldbuilding*, which we interpret in two different senses. First, worldbuilding serves to construct representations of alternative and emerging realities. Through worldbuilding, designers and artists can draw the interrelations between emerging technologies, political-economic structures, sociocultural values, and novel forms of community organization, all of which are important aspects of the transition from fossil to renewable energy. Second, by invoking worldbuilding, we recognize and utilize the performativity of design fiction, as it has the capacity to *intervene* in emerging energy transitions. By stimulating the imagination and critical reflection, design fiction can shape sociocultural values and meanings of energy tran-

sitions, thereby intervening in the coming about of alternative realities and emerging worlds.

This article proposes to take energy infrastructures as an entry point to characterize how such worldbuilding might occur in the context of energy transitions. Infrastructures draw together technological innovations, political regimes, economic paradigms, and cultural meanings, thus providing a natural underpinning for building an integral vision of alternative futures. Furthermore, infrastructural developments are at the core of the transition to renewable energy. This paper draws from various scholarly perspectives on energy infrastructures, which serves to understand how design fiction can represent various energy transition realities and intervene in emerging infrastructural developments.

Finally, we illustrate our approach by sketching seven *emerging energy worlds* and identifying future steps to turn these into complete design fictions. Overall, this approach to design fiction serves to shift mindsets and value judgments among the distributed actors that co-shape energy transitions.

2. Design Fiction as a Form of Worldbuilding

An early, important work on design fiction is the 2009 essay *Design Fiction* by Julian Bleecker. In his account, design fiction inhabits a middle ground between science fiction and science fact, combining creative speculation with a grounded understanding of real possibilities. He further characterizes this using the term diegetic prototypes, which denotes how speculative technologies, products, or services are experi-

enced by subjects in their idiosyncratic manner. Since then, design fiction has been adopted by the design research community and explored from various perspectives, including user personas and scenarios, narratology and literary theory, and speculative and critical design (Baumer et al., 2020).

This article proposes to understand design fiction through the concept of worldbuilding. We draw from the work of Coulton et al. (2017), who argue that design fiction is a form of worldbuilding rather than a form of storytelling or narrative. They retain the diegetic perspective – i.e., a first-person, subjective view “from within”. However, instead of focusing on characters and plotlines, Coulton et al. (2017) emphasize how design fiction can reveal the elements of an imaginary world, as well as the meanings and interrelations of such diverse aspects. This way, design fiction imagines how technoscientific prototypes interact with individual human understandings, situated cultural meanings, and greater societal structures and systems. Design fiction can represent alternative worlds and realities by understanding worldbuilding in this manner.

There is an important second sense in which worldbuilding can be understood, as design fiction can also enact and perform worldbuilding in the social context where it is deployed. This perspective builds on authors like Markussen et al. (2020), who propose that design fiction should be understood through its potential to create social transformation rather than its ontological foundations. Another proponent of this approach is Zaidi (2019), who suggests that designers can support the transformation of cultural meanings and societal

structures through worldbuilding practices. Various applications of design fiction show how such transformations can concretely manifest. For example, Wu et al. (2019) use design fiction to stimulate ethical awareness and reflection among professionals, and Blythe et al. (2016) show how design fiction subverts solutionist thinking. Furthermore, the field of design anthropology may provide useful pointers, as it combines an understanding of emergent, alternative worlds with interventionist and performative action (Smith & Otto, 2016; Halse & Boffi, 2016; Singh, 2019). Building on such perspectives, this article proposes to use design fiction to support co-shapers of energy transitions in their judgments, reflections, practices, and actions. It does so by pointing toward alternative realities and possibilities, illustrating the diverse ways sociocultural meanings and values can manifest.

3. Energy Infrastructures as a Starting Point for Worldbuilding

This section argues that infrastructures form an interesting point of departure for worldbuilding due to their interconnected, heterogeneous, and pervasive nature. By discussing various important dimensions of energy infrastructures, including their political, economic, and aesthetic dimensions, a conceptual toolbox is constructed to conduct worldbuilding in the context of energy transitions.

First, we argue that an understanding of infrastructures creates an integral picture of a world that ties together technology, societal structures, cultural values and meanings, and individual, subjective perspectives. Infrastructures can

be considered the backbone of modern civilization, as they create the interconnective tissue for the flow of people, materials, and ideas (Larkin, 2013). More than a material network of interconnected technological components, infrastructural ecosystems consist of entangled technologies, administering organizations, financial techniques, and regulatory structures (Hughes, 1983). As such, infrastructures create the enabling background conditions for society to function.

In particular, energy infrastructures are closely tied to political and economic systems. In his 2011 work, *Carbon Democracy: Political Power in the Age of Oil*, Timothy Mitchell analyzed how the materiality of coal- and oil-based infrastructures co-shaped with the political paradigms of their time. While labor-intensive coal logistics enabled worker strikes and hence socialist politics, oil pipelines and extraction wells centralized control with Western governments and corporations. Dominic Boyer (2019) provided a more present-day perspective, who coined the term *energopower* to show how wind energy development in Mexico co-developed with diverse political and institutional processes, including the interests of local indigenous groups.

Whilst this is only a brief indication of the significance of these works, they show the necessity for worldbuilding practices in the energy context to take matters of power and politics seriously and how infrastructural properties shape these. In the second, interventionist sense of worldbuilding, infrastructures pose interesting challenges for designers. Thomas Hughes' 1983 book *Networks of Power* shows these in two important ways. Firstly, the electrical grid is shown as a fun-

damentally distributed system where no single actor controls its development. While individual entrepreneurs like Edison played an important role, competing systems and models emerged in diverse regulatory regimes and geographical contexts, stabilizing beyond the control of any individual actor. Designerly intervention in infrastructural development must somehow account for this distributed agency. Furthermore, Hughes described how various phases of infrastructural development unfolded over decades. The long development time of infrastructures means there is a fundamental uncertainty about how early interventions will develop over time.

To deal with these challenges, we propose that designers can participate in infrastructural change by supporting informed reflection, decision-making, and judgement for people who are a part of infrastructural ecosystems. Design fiction can support this by leveraging the *aesthetic* dimension of energy infrastructures. This aspect is identified by Brian Larkin (2013), who argues how the materiality of infrastructure – e.g., the concrete of a road or the iron of industrial machinery – produces a certain aesthetic sensibility in the beholder, which shapes the subjective meanings associated with the infrastructure. He also argues that infrastructures have a *poetic* quality, as they are often associated with promises and visions of societal progress. Since infrastructures are so extensive and heterogeneous, Larkin argues that the definition of an infrastructure is a political act. This would make exploring energy infrastructures through design fiction a political project in its own right, as would how designers give shape and form to the aesthetics of infrastructures. This article holds that leverag-

ing the aesthetic and poetic qualities of infrastructures within design fiction is a promising avenue for designers to pursue and co-shape infrastructural developments. This is opposed to traditional forms of product design, which occupy a limited space downstream of an infrastructural ecosystem and are subject to dominant economic and political paradigms.

4. Infrastructural Innovation in the Transition to Renewable Energy

Having established the relevant aspects of energy infrastructures for worldbuilding, this section discusses the infrastructural overhaul required for the renewable energy transition, touching on technological, political, and social dimensions. The current electrical grid is organized in a hierarchical, centralized manner, as it transports electricity from a few centralized power plants to many end-consumers. Renewable energy requires a fundamentally different, more decentralized architecture. Solar and wind energy are geographically dispersed, and new sources of flexibility are required to compensate for the uncontrollability of the weather. Under the smart grid paradigm, digital technologies are expected to play a larger role in data collection, predicting future energy flows, and controlling the grid (Skjølsvold et al., 2015). Furthermore, new end-user-facing technologies are also emerging, such as electric vehicles, smart home energy systems (Geelen et al., 2013), and digital energy platforms (Boekelo & Kloppenburg, 2023).

Existing research provides several pointers for understanding these developments' political, economic, and aesthetic qualities. A common expectation is that bottom-up actors like

prosumers and energy communities gain power by practicing *energy citizenship* and *energy democracy* (Wahlund & Palm, 2022). Households and communities can become more autonomous by utilizing locally sourced renewables and energy storage, such as batteries. Hence, the renewable energy transition may not only lead to a more distributed infrastructural architecture but also a more decentralized political system (Funcke & Bauknecht, 2016). At the same time, the increasing reliance on smart technology may centralize control in the hands of a select few actors, as has been the case in other sectors. Since smart technology is associated with technocratic and solutionist forms of governance, its use in energy systems may have a depoliticizing or even *antipolitical* effect (Sadowski & Levenda, 2020). An example of this could be *demand response* practices, which are techniques for grid operators to steer behavior using price signals to secure the grid's stability (Calver & Simcock, 2021).

Similar arguments can be made about novel modes of energy exchange. A common expectation is that households will evolve from consumers of energy to *prosumers* of energy who engage in peer-to-peer (P2P) energy trading on local energy markets. While this is often hailed as a positive and empowering development, it is not difficult to recognize the framing of the *homo economicus* in these perspectives, where end-users of energy are seen as rational individuals who are optimizing for self-interests (Singh, 2019; Singh et al., 2017). This approach may be distinguished from perspectives on energy communities, where access to energy resources is shared collectively (Bauwens et al., 2022), the energy justice framework which prioritizes a just

distribution of costs and benefits (Hanke et al., 2021), and alternative forms of energy exchange which prioritize social relations (Singh et al., 2018). While these discussions briefly show what contested aspects of renewable energy infrastructures are emerging, they indicate potential directions designers and artists may explore in their worldbuilding efforts.

5. Seven Emerging Energy Worlds

The above sections discuss what could be the conceptual building blocks for designers and artists to explore the significance of energy transitions through worldbuilding. This section presents early versions of what we take to be *emerging energy worlds*. These worlds are constructed using concepts discussed above and from empirical research conducted in a local energy transition project in Amsterdam South-East. Through ethnographic fieldwork and co-creation sessions, the authors explored tensions between diverse stakeholders, the potential for community involvement, and the design of infrastructural innovations. This research is not further elaborated within this paper, but for more details, readers can refer to Van Leeuwen & Singh (2023) and Van Leeuwen & Singh (2024).

The worlds described here are not exhaustive of all possibilities but indicative of directions that might be pursued in future work. For the present article, these worlds are described at a high level – they are not complete design fiction but provide directions for further development. If sections provide the grounding realities of ‘science fact,’ the section proposes avenues for creative speculation. Several steps should be taken to further develop these directions into concrete design fic-

tion. For each emerging energy world, suggestions are made about what these steps could look like.

The first step is to consider the *transformative purpose* of the design fiction, i.e., the shifts in mindsets, values, or practices this design fiction should support. The second step is determining the *social context* in which it will be deployed, regarded, and explored. Design fiction may be strategically mobilized within projects, networks, or organizations that make up the process of infrastructural development. The third step is to define the *aesthetic form* the design fiction will take, including the subjective perspective from which the energy world is perceived. This is crucial for creating immersion and imagination beyond present-day constraints and realities.

5.1. A Crumbling Grid

What would the world look like if the electrical grid failed to provide a stable electricity supply and the power went out for days or weeks? Supply chains, digital communications, digital payments, and other systems we have taken for granted could fail and become inaccessible. As a result, authorities might implement emergency measures to reduce and control energy consumption to safeguard the grid's stability.

- **Transformative purpose:** to make people aware of the crucial reliance of our society on the electrical grid and how it enables our daily practices.
- **Social context of intervention:** with end-users of energy, i.e., citizens who are not particularly aware or conscious of how the grid is functioning.

- **Aesthetic form:** a day-in-the-life of end-users of energy to explore how daily life is impacted by a lack of stable electricity supply.

5.2. Techno-Capitalist Monopoly

What if large technology corporations assume complete control over the energy system and own the energy supply and grid infrastructure? Such actors could use advanced technologies like artificial intelligence to predict and control energy flows in the grid, which would be completely invisible to outsiders. Volatility in energy markets could increase corporate profits at the expense of household energy expenditures.

- **Transformative purpose:** to make people aware of the consequences of excessive use and reliance on smart technology and free market mechanisms.
- **Social context of intervention:** with technologists, innovators, and economists in the energy sector, to explore the consequences if a technology-centric, market-based approach is taken too far.
- **Aesthetic form:** a speculative smart energy product-service system or a “job-of-the-future” description for a smart energy technologist working at a large technology corporation.

5.3. Autonomous Energy Community

What if local communities isolated themselves from the rest of the system, aiming to become as independent as possible? Such tight-knit communities might jointly share access to energy resources without a notion of individual ownership. Technical skills in infrastructural maintenance would be

highly valued, and social relations could be characterized by in-kind exchanges.

- **Transformative purpose:** to support reflection on an approach to energy systems that prioritizes social relations and values rather than technology and efficiency.
- **Social context of intervention:** with citizens looking to start an energy community, as well as professionals who develop tools, products, and services for energy communities, or who work with energy communities.
- **Aesthetic form:** a day-in-the-life of members of the autonomous energy community, using visuals that represent local community life.

5.4. Smart Energy Household

What if households embraced smart technology, combining household solar energy, batteries, and algorithms to optimize their own consumption? Automated systems could trade this energy on local energy markets to maximize profit and minimize costs. Through apps and other product-service systems, households are engaged through gamification and energy competitions to change their behavior.

- **Transformative purpose:** to explore peoples' preparedness to adopt new home energy systems and services and to support a more user-centric design of such products.
- **Social context of intervention:** in design and innovation processes where professionals are working on new smart energy systems and services, as well as with potential future adopters of these technologies.

- **Aesthetic form:** a day-in-the-life, or other representation, of how end-users of these speculative technologies adapt their daily routines to a home smart energy system.

5.5. National Energy Commons

What if national governments assumed top-down, technocratic control over the energy supply? Expert knowledge and scientific instruments could be mobilized to meet national goals for reducing the energy system's CO2 emissions. Energy budgets could be imposed on end-users, and national campaigns could be organized to educate people about energy use and recruit people for energy-related jobs.

- **Transformative purpose:** to stimulate reflection on the controversial decisions that might emerge around energy governance and the degree to which political control should be centralized.
- **Social context of intervention:** with policymakers, energy policy researchers, and anyone else interested in energy system governance.
- **Aesthetic form:** explore decision-maker's perspective in energy governance and the tensions and dilemmas they encounter.

5.6. Smart Energy Hub

What if businesses and commercial actors worked together to better maintain the stability of the local electricity grid? Businesses could strike special contracts with the grid operator to share access to the grid and use smart technology to jointly optimize the use of solar energy, battery and heat storage, and flexible consumption.

- **Transformative purpose:** to support businesses and other commercial actors in collaborating and exploring joint energy transition solutions.
- **Social context of intervention:** with business representatives who are open to exploring collective energy solutions.
- **Aesthetic form:** a speculative contract or interface that represents how energy resources among different actors are interconnected and interoperate, which shows the social agreements that are in place for local energy governance.

5.7. Local Energy Institution

What if the energy system were governed democratically, with local institutions for political decision-making? Such institutions could govern a particular grid section and impose their own form of energy taxes and regulations. They would make political decisions about how scarce energy resources are distributed, exchanged, and organized.

- **Transformative purpose:** to explore what kind of political decisions and reasonings factor into local energy system governance and what a democratic institution in this regard could look like.
- **Social context of intervention:** with policymakers, citizens, researchers, or other professionals interested in exploring alternative forms of local energy system governance.
- **Aesthetic form:** represents the perspective of local leaders or politicians who are tasked with making decisions about local energy system governance.

6. Towards Design Fiction for Human-Centered Energy Transitions

Transitions and infrastructural developments unfold over decades, and, likely, many future developments in technology, governance, and economy cannot be foreseen. Furthermore, the extensive scale and distribution of agency in systemic transitions is such that local, human-centered interventions are limited in scope. This article provides pointers for how design fiction can serve to intervene at a local level while not losing sight of greater systemic trends.

While this article aims to make steps toward developing design fiction that supports the emergence of human-centered energy transitions, these efforts are far from complete. From the descriptions provided in Section 5, several important steps still need to be taken to develop design fiction, as we have defined in this article. Design fiction should go beyond textual descriptions and consist of visual and material prototypes. Such prototypes should illustrate diverse aspects, including the social, political, and technological, at various scales, including local, national, and global, and through diverse perspectives, including end-users, professionals, or decision-makers. While we intend to explore these in future work, we encourage other designers, artists, and researchers to do the same.

Design fiction can support nuanced perceptions, reflections, and actions among energy transition actors by sensitizing people to these diverse realities and possibilities.

References

- Baumer, E. P. S., Blythe, M., & Tanenbaum, T. J. (2020). Evaluating Design Fiction: The Right Tool for the Job. In R. Wakkary, & K. Andersen (Eds.), *Proceedings of the 2020 ACM Designing Interactive Systems Conference*, (1901–1913). ACM. <https://doi.org/10.1145/3357236.3395464>
- Bauwens, T., Schraven, D., Drawing, E., Radtke, J., Holstenkamp, L., Gotchev, B., & Yildiz, Ö. (2022). Conceptualizing Community in Energy Systems: A Systematic Review of 183 Definitions. *Renewable and Sustainable Energy Reviews*, 156, 111999. <https://doi.org/10.1016/j.rser.2021.111999>
- Bleecker, J. (2009). Design Fiction: A Short Essay on Design, Science, Fact, and Fiction. In S. Carta (Ed.), *Machine Learning and the City* (pp. 561–578). Wiley. <https://doi.org/10.1002/9781119815075.ch47>
- Blythe, M., Andersen, K., Clarke, R., & Wright, P. (2016). Anti-Solutionist Strategies: Seriously Silly Design Fiction. In J. Kaye, A. Druin, C. Lampe et al. (Eds.), *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (pp. 4968–4978). ACM. <https://doi.org/10.1145/2858036.2858482>
- Boekelo, M., & Kloppenburg, S. (2023). Energy Platforms and the Future of Energy Citizenship. *Energy Research & Social Science*, 102, 103165. <https://doi.org/10.1016/j.erss.2023.103165>
- Boyer, D. (2019). *Energopolitics: Wind and Power in the Anthropocene*. Duke University Press.
- Calver, P., & Simcock, N. (2021). Demand Response and Energy Justice: A Critical Overview of Ethical Risks and Opportunities Within Digital, Decentralised, and Decarbonised Futures. *Energy Policy*, 151, 112198. <https://doi.org/10.1016/j.enpol.2021.112198>
- Coulton, P., Lindley, J., Sturdee, M., & Stead, M. (2017). Design Fiction as World Building. In *Proceedings of the 3rd Biennial Research Through Design Conference* (pp. 163–179). <https://doi.org/10.6084/m9.figshare.4746964.v1>
- Funcke, S., & Bauknecht, D. (2016). Typology of Centralised and Decentralised Visions for Electricity Infrastructure. *Utilities Policy*, 40, 67–74. <https://doi.org/10.1016/j.jup.2016.03.005>
- Halse, J., & Boffi, L. (2016). Design Interventions as a Form of Inquiry. In R. C. Smith, K. T. Vangkilde, M. G. Kjaersgaard, T. Otto, J. Halse, & T. Binder (Eds.), *Design Anthropological Futures* (pp. 89–103). Bloomsbury.

Hanke, F., Guyet, R., & Feenstra, M. (2021). Do Renewable Energy Communities Deliver Energy Justice? Exploring Insights from 71 European Cases. *Energy Research & Social Science*, 80, 102244. <https://doi.org/10.1016/j.erss.2021.102244>

Hughes, T. (1988). *Networks of Power*. Johns Hopkins University Press.

Larkin, B. (2013). The Politics and Poetics of Infrastructure. *Annual Review of Anthropology*, 42(1), 327–343. <https://doi.org/10.1146/annurev-anthro-092412-155522>

Zaidi, L. (2019). Worldbuilding in Science Fiction, Foresight and Design. *Journal of Futures Studies*, 23(4), 15–26. [https://doi.org/10.6531/JFS.201906_23\(4\).0003](https://doi.org/10.6531/JFS.201906_23(4).0003)

Markussen, T., Knutz, E., & Lenskjold, T. (2020). Design Fiction as a Practice for Researching the Social. *Temes de Disseny*, 36, 16–39. <https://doi.org/10.46467/TdD36.2020.16-39>

Mitchell, T. (2011). *Carbon Democracy: Political Power in the Age of Oil*. Verso.

Sadowski, J., & Levenda, A. M. (2020). The Anti-Politics of Smart Energy Regimes. *Political Geography*, 81, 102202. <https://doi.org/10.1016/j.pol-geo.2020.102202>

Singh, A., Strating, A. T., Romero Herrera, N. A., Mahato, D., Keyson, D. V., & van Dijk, H. W. (2018). Exploring Peer-to-Peer Returns in Off-Grid Renewable Energy Systems in Rural India: An Anthropological Perspective on Local Energy Sharing and Trading. *Energy Research & Social Science*, 46, 194–213. <https://doi.org/10.1016/j.erss.2018.07.021>

Singh, A. (2019). *Conceptualizing Inter-Household Energy Exchanges: An Anthropology-Through-Design Approach* [Doctoral Dissertation, TU Delft]. Library. <https://doi.org/10.4233/UUID:57BE7165-2726-4A1A-B076-C5ED3988E00B>

Singh, A., Strating, A. T., Herrera, N. R., van Dijk, H. W., & Keyson, D. V. (2017). Towards an Ethnography of Electrification in Rural India: Social Relations and Values in Household Energy Exchanges. *Energy Research & Social Science*, 30, 103–115. <https://doi.org/10.1016/j.erss.2017.06.031>

Skjølsvold, T. M., Ryghaug, M., & Berker, T. (2015). A Traveler's Guide to Smart Grids and the Social Sciences. *Energy Research & Social Science*, 9, 1–8. <https://doi.org/10.1016/j.erss.2015.08.017>

Smith, R. C., & Otto, T. (2016). Cultures of the Future: Emergence and Intervention in Design Anthropology. In R. C. Smith, K. T. Vangkilde, M. G. Kjaersgaard, T. Otto, J. Halse, & T. Binder (Eds.), *Design Anthropological Futures* (pp. 19–36). Bloomsbury.

van Leeuwen, G., & Singh, A. (2023). Local Frictions in the Energy Transition: Design Anthropology for the Emergence of Energy Communities. In M. Cuciurean-Zapan, & E. Hanover (Eds.), *2023 EPIC Proceedings* (pp. 277–294). Epic. <https://www.epicpeople.org/local-frictions-in-energy-transition-design-anthropology-for-energy-communities/>

van Leeuwen, G., & Singh, A. (2024). Design Anthropology for Ethics of Care and Emergence: Reflections From an Energy Transition Project. In C. Gray, E. Ciliotta Chehade, P. Hekkert, L. Forlano, P. Ciuccarelli, P. Lloyd (Eds.), *DRS2024: Boston*, (pp. 23–28). DRS. <https://doi.org/10.21606/drs.2024.797>

Wahlund, M., & Palm, J. (2022). The Role of Energy Democracy and Energy Citizenship for Participatory Energy Transitions: A Comprehensive Review. *Energy Research & Social Science*, 87, 102482. <https://doi.org/10.1016/j.erss.2021.102482>

Wu, Y., Lyckvi, S., & Roto, V. (2019). “What is Fair Shipping, Anyway?”: Using Design Fiction to Raise Ethical Awareness in an Industrial Context. In S. Brewster, & G. Fitzpatrick (Eds.), *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (pp. 1–13). ACM. <https://doi.org/10.1145/3290605.3300666>

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 University 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-Pesca, 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 Mastrodonardo

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.mastrodonardo@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 practitioner 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 degree of Product Service System Design. In 2022, she participated in an international mobility program at FH Salzburg 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, and 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



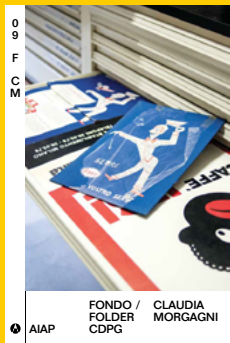
Progetto Grafico

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