5. Curating data for urban biodiversity: three catalogues on local issues in Milan

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Preserving urban biodiversity is a widely recognized goal, with cities implementing initiatives to achieve it. However, when examining policies and local efforts, conflicts often arise among citizens, municipalities, and private stakeholders. Debates on urban biodiversity leave digital traces on social media, forums, and newspapers.

This text illustrates the potential of online data to inform planning and participation in urban biodiversity projects. In contrast to established formats for data analysis, such as dashboards, we explore catalogues as tools to curate, analyze, and display data from online sources. Through case studies focused on biodiversity policies in Milan, this chapter demonstrates how curated datasets displayed in printed catalogues can be used to map debates surrounding urban nature. As catalysts for public engagement, catalogues prioritize individual data points, promote the slow fruition of data, and give space to marginalized voices.

5.1 Mapping urban biodiversity with the web

Faced with unprecedented transformations, our society is redefining its relationship with the natural world: in the age of the Anthropocene, extractive capitalism, and the climate crisis, humanity must reconsider its influence on the Earth. Among the most evident human effects on the planet, biodiversity loss has escalated to the magnitude of a mass extinction (Cowie *et al*., 2022; Kolbert, 2014), and the protection of nature has jumped to the top of the global agenda. The European Commission (2020) has embraced a long-term plan to reverse the degradation of ecosystems with the EU Biodiversity Strategy for 2030, and the United Nations (2023) have placed the fight against biodiversity loss at the core of its sustainable development goals.

While there is widespread agreement regarding the importance of restoring natural biodiversity, in practice, it remains a complex issue. In the urban context, the generic desire for more nature clashes with the unique characteristics of different areas, the diverse needs of citizens, and economic interests, often sparking intense negotiations over public space.

Given the challenges of reconciling nature and city needs, designing inclusive and effective solutions for urban biodiversity requires considering a multitude of actors, positions, and interests. To ensure inclusivity and incorporate diverse viewpoints, municipal administrations often resort to participatory design processes, engaging community members in collaborative processes of meaning-making and design. While the aim is to provide everyone with a voice in the planning process, conventional forms of public engagement have struggled to attract a diverse range of participants, often prioritizing those at the top of the social hierarchy and marginalizing underrepresented voices (Lowndes *et al*., 2001; Witkowski *et al*., 2021; Thorsen, 2023). In this context, the need arises to reformulate concepts and methods of public engagement and stakeholder mapping, devising approaches that actively consider the multiple voices of those potentially impacted by urban-nature design initiatives.

In addition to offline discussion venues, such as public hearings or conferences, different actors present their arguments, advocate for causes, or express their positions on online forums, blogs, and

social media platforms (sharing images, memes, videos, comments, hashtags, or mentions). As a result, the internet has become a pivotal space for capturing the multitude of actors, voices, and perspectives intricately connected to urban biodiversity issues.

Taking a cue from analytical frameworks from media studies and digital sociology, including controversy mapping (Venturini and Munk, 2022), digital methods (Rogers, 2013), and issue mapping (Marres, 2015), we outline methods for collecting, analyzing, and presenting online data on the debate around urban biodiversity in printed catalogues. These catalogues display user-generated content, giving space to individual data items, foregrounding marginalized voices, and facilitating public engagement around projects and policies aimed at preserving urban biodiversity.

First, we examine consolidated practices of engaging with data in the urban context, specifically focussing on data-driven dashboards. Second, we introduce the concept of *curating data* as an alternative approach to using online materials to inform urban projects. Third, we exemplify this approach through three catalogues serving as case studies. These catalogues collect and analyze data concerning local issues related to urban biodiversity in Milan. Finally, we discuss how the curating data approach and the catalogue format can support policy-making, design actions, and participatory activities around urban biodiversity.

5.2 Visualizing urban data: dashboards and catalogues

As an alternative to other forms of information monitoring, such as dashboards, the approaches and formats we present here prioritize granularity and disaggregation. Indeed, when using user-generated data to monitor the discussion around a (urban) issue, dashboards are ubiquitous. Dashboards track developments and performances through neatly displayed and interactive representations of data to facilitate their understanding for various audiences. Dashboards are widely used in different fields (Sarikaya *et al*., 2019), including urban biodiversity, commonly visualizing indicators such as wind, air quality,

traffic, or tree maintenance (Riffat *et al*., 2023). They are designed to be clear, fast, and digested representations of data from different sources combined with filtering systems, drill-downs, and indicators visualized as arrows, traffic lights, and percentages, offering a glance-able overview. Dashboards help monitor and understand complex issues and are often a platform for participatory actions, especially in city development (Pluto-Kossakowska *et al*., 2022).

While dashboards provide functional affordances to monitor complex issues, they also present challenges. Among others, the high level of aggregation could favour «mechanistic, unsophisticat-ed decision-making regimes», and «less aggregation» (Sarikaya *et al*., 2019) could be required in some contexts. Furthermore, the neat representations of data in dashboards convey an apparent objectivity that centres the interests and views of its authors without consider-ing marginal or subversive voices (Sarikaya *et al*., 2019, p. 688).

In contrast to traditional dashboards, we propose a different way of handling data: curating it carefully. Curating data involves «select-ing, organizing, and looking after the items» (Stevenson and Lindberg, 2011) stressing the qualitative and subjective nature of the activity. Instead of lumping everything together, we create catalogues that display each item separately. This approach encourages engage-ment with individual data items and invites users to spend more time exploring them.

Curating data and catalogues as sites of curation

Curating data refers to the intentional act of selecting and organ-izing individual items. This concept is borrowed from museology: when curating items in their collection, a museum curator selects the finest items, arranges them according to a unified theme, and then «engages the public in a conversation around the collection» (Fraser, 2019, p. 2). The concept of curation can be extended to data practices: Curating data (as opposed to collecting data) emphasizes the interpretive gesture and framing of the author (Benjamin, 2021) and frames the activity as a non-neutral practice where biases and personal upbringings are impactful, against the narration of objectiv-ity and data (Calvert, 2023). Expanding on these ideas, we argue that *curating* involves dedicating time to data, prioritizing manual collec-

tion methods over automated ones, and conducting this process with *care* (Puig de La Bellacasa, 2017).

We connect the concept of curating data with the catalogue format, a standard structure found in exhibitions, museums, and industrial design. In these domains, curators meticulously oversee artworks and items, which are then presented in catalogues, showcasing the complete collection. Etymologically, the *catalogue* reflects the concept of order, similar to how lists bring unity to diverse items (Eco, 2019, p. 113). When items such as text fragments, images, and web page screenshots are grouped together, they are seen as a single unit due to their shared context (Eco, 2019, p. 116). Catalogues can be found in disparate contexts: in exhibitions, they represent the artworks in a collection, along with their metadata such as the author, when they were produced, and other additional information. Applied to digital-born data, catalogues can also be designed as expressive artefacts to comment on social issues (Lavigne and Brain, 2020), political events (Quealy, 2021) and place-making processes (Colombo and Gray, 2023).

Building on these examples, we contrast the catalogue to the dashboard for exploring urban data. Catalogues shift the focus towards selecting, ordering, and organizing a dataset without simplifying it into aggregated data visualizations like dashboards do. We propose a specific catalogue structure articulated in three parts: an introduction, a visual summary employing conventional data visualization methods, and a detailed listing of items featured in the dataset. Catalogues are then printed in a format that users can browse physically.

5.3 Actors, statements and language: three catalogues for urban biodiversity

We detail the curating data approach through three analytical angles: actors, statements and language. Through the web, one studies the actors in a debate, their positions, and the language they use to advocate for their position. In what follows, we use three case studies in Milan to illustrate how curating data can inform the understanding of urban biodiversity. The cases investigate three emblematic

issues that impacted Milan on different scales: the pruning of a single wisteria tree in Piazza Baiamonti evolved into a media-fuelled clash involving the municipality, local organizations, and public figures; the spontaneous woods of Via Falck represent a disputed area among the organization who sold it, the investors who bought it, and the people who inhabit it; Forestami, a reforestation project aiming to plant millions of new trees across the entire city, has sparked debates regarding the effectiveness of such endeavours.

The woods of Via Falck: actors and language

In the San Leonardo neighbourhood, located northwest of Milan, there is an approximately six-hectare area hosting a spontaneous forest with abundant plant and animal biodiversity. In 2022, the land-owner decided to transfer the building rights in the area to private investors. The proposed real estate project includes student housing, commercial spaces, social housing, and tall towers that could accom-modate up to 1500 new residents. However, it would entail the drastic transformation of the area and the felling of numerous trees.

The discussion surrounding the area was examined through the Google News portal, where all articles on the subject were gathered. All actors mentioned were identified by analyzing the text of online news articles. In this process, actors are defined following Latour's definition, which suggests that even objects, and more broadly, non-human entities, play active roles in articulating issues and relationships (2007). Embracing a comprehensive understanding of what constitutes an actor in this debate highlights the diverse voices potentially interested and involved in the project: private companies and organizations, political figures, and activists, as well as plants, place names, materials, animals, and buildings. The catalogue *A Plea, a Tree, and the Pope* includes news articles, identified actors, and the sentences in which they are quoted.

The catalogue illustrates the actors engaged in the area and their relationships, as identified through their co-mentions within the same articles. The analysis reveals a distinct separation between discourse about the real-estate endeavour and that concerning the natural environment. In a network visualization displaying actors' references in the articles and linking those mentioned together, plants and
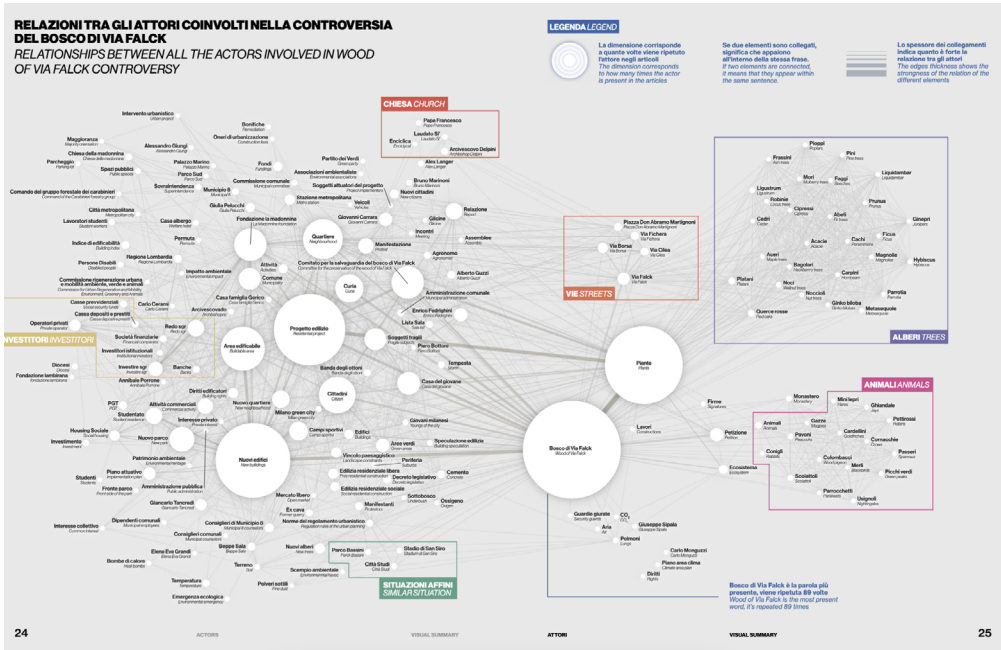
RELAZIONI TRA GLI ATTORI COINVOLTI NELLA CONTROVERSIA DEL BOSCO DI VIA FALCK
RELATIONSHIPS BETWEEN ALL THE ACTORS INVOLVED IN WOOD OF VIA FALCK CONTROVERSY

QUANTITIES DATASET

In the present dataset, the quantities are arranged in descending order of frequency, starting from the maximum number of repetitions and proceeding toward the minimum.

Nel presente dataset, le quantità sono disposte in ordine decrescente di frequenza, partendo dal numero massimo di ripetizioni e procedendo verso quello minimo.

14	FLOORS OF NEW BUILDINGS	PIANI DEI NUOVI EDIFICATI
219	TREES AT RISK NOW	ALBERI ATTUALMENTE A RISCHIO
50-80	TREES AGE	ANNI DEGLI ALBERI
600	TOTAL EXISTING TREES	ALBERI TOTALI ESISTENTI
616	TOTAL EXISTING TREES	ALBERI TOTALI ESISTENTI
350	TREES AT RISK AT THE BEGINNING	ALBERI A RISCHIO INIZIALMENTE
1500	NEW INHABITANTS	NUOVI ABITANTI
63000 m²	TOTAL AREA TO BE BUILT	AREA TOTALE DA EDIFICARE

Figure 1.
Two extracts from *A Plea, a Tree, and the Pope*. Above, the visual summary accompanying the list of actors Below, an example of quantifications mentioned in news articles. Source: https://agc-exhibition.densitydesign.org/projects/a-wood-182-actors.

animals are entirely isolated from the main debate, forming a distinct cluster (see Figure 1). This configuration highlights a clear opposition between two perspectives: the discussion involving flora and fauna is detached from the construction project discussion. The distinction is further detailed in the list of actors, displayed alongside the articles from which they were extracted, showing how each word was framed in the original context.

Another aspect pertains to language. By flicking through the catalogue, it becomes apparent how the communicative code of measurement and quantification is widely employed in newspaper articles addressing the future of the area. Endangered plants, new buildings, company shares, and square metres – every facet of the debate is meticulously conveyed through measurements and quantities used to advocate various positions. This specific use of language might lead to a disconnect from how local residents perceive urban areas in terms of biodiversity, prioritizing statistics and indicators over affective relations.

Forestami: statements

Forestami, initiated in 2018 and promoted by the Metropolitan City of Milan in collaboration with local entities and private companies, aims to plant 3 million trees by 2030 to counteract climate change. Thanks to cooperation with private companies and an effective communication campaign, it has gained visibility, sparking both positive and critical opinions, particularly regarding the maintenance and survival of the trees.

Through the analysis of the comment space, dubbed *the bottom half of the web* (Reagle, 2015), the analysis explored the multitude of opinions – or, to use a term borrowed from controversy mapping (Venturini, 2010), *statements* – that actors express regarding the urban reforestation project. The debate was analyzed using comments from Instagram, Facebook, and X (formerly Twitter). Each comment was summarized into a statement that captured its tone and intention and subsequently categorized by theme. The analysis, compiled in the catalogue *Remember to water the trees*, highlights the various positions of users, from the most enthusiastic to the most critical. The predominant theme from the analysis revolves around the re-

sponsibility associated with urban green spaces: Is greenery considered a common good that citizens take care of or a service that institutions must guarantee? Another emerging theme concerns the (lack of) maintenance of trees, which users highlight in their criticisms of the Forestami project. The most common critique is that Forestami is seen as *greenwashing* by online communities (Figure 2), solely focussed on achieving reforestation goals, without adequately considering the long-term care and maintenance of the planted trees. Insights like these enable municipalities to identify perceptions concerning public initiatives for urban biodiversity and tailor communication strategies to address them effectively.

The wisteria of Piazza Baiamonti: actors and statements

In Piazza Baiamonti, situated in the Porta Garibaldi district, plans are underway to construct the National Resistance Museum. The project would involve cutting down existing trees, including an 80-year-old wisteria, four lime trees, and a horse chestnut. The wisteria, in particular, holds sentimental value for the local community and visitors to the area, who have voiced criticisms regarding the construction methods and the pruning and removal of the trees. Notably, the debate has garnered involvement from both nationally and locally recognized figures, leading to a rich and heated online debate.

To analyze the debate surrounding this project, we focus on the alignment between statements and actors. Here, we operationalize the notion of 'alignment' through language, in the sense that «when multiple actors use the same language, or when publics do so, they align» (Rogers, 2018). Which actors use the same language regarding the project and share a similar position? What alliances are formed through shared positions? The discussion has been examined through 130 videos from various platforms, including Facebook, Instagram, Google Video, TikTok, and YouTube. The primary positions expressed in each video have been identified, categorized into macro-themes, and attributed to the individuals who articulated them (Figure 3).

The analysis maps alignments and misalignments among actors based on their shared issues and language. For instance, there is an apparent disconnect between the issues and languages brought

Figure 2.
Sample of a section from *Remember to water the trees*. Above, the original posts from which the comments were collected. Below, a portion of the comments belonging to the *greenwashing* thematic group. Source: https://agc-exhibition.densitydesign.org/projects/remember-to-water-the-trees.

forward by politicians and those by citizen groups. Politicians and city representatives tend to focus on the municipality's policies or lack thereof, while associations and citizens are more concerned with preserving urban nature, particularly the wisteria. The analysis also uncovers unexpected alliances resulting from shared language. For instance, right-wing politicians criticize the municipality (of an opposing colour) for sacrificing nature for urban development, aligning themselves with associations advocating for the preservation of urban nature. Doing so, they appropriate themes typically associated with left-leaning citizen organizations, resulting in an unforeseen coalition.

5.4 Catalogues of data as tools for public engagement around urban biodiversity

Urban biodiversity, particularly at a local level, often triggers conflicting perspectives on its preservation and restoration. Current practices of monitoring online debates through dashboards prioritize aggregated and digested views of large volumes of data. Drawing inspiration from curatorial practices in art, we suggest using catalogues as an alternative format for gathering, representing, and examining online data about urban biodiversity policies.

Catalogues require researchers and designers to reflect deeply on their role as *data curators*, stressing the qualitative and subjective nature of the process (D'Ignazio and Klein, 2020).
As a visual format, the catalogue stands in opposition to the tendency towards reduction seen in conventional data visualization approaches (Manovich, 2011), exploiting the generative power of *assembly* (Parry, 2023) to showcase diversity by unflattening data items.

The catalogue diverges from standard data visualization techniques that prioritize simplification through aggregation methods such as summing, averaging, or counting, aimed at simplifying *data for easier consumption* (Pelzel, 2021). The catalogue directs attention to individual data points, foregrounding less prominent voices within the dataset. For example, one can follow users that are less active and post less, or comments that generate fewer likes or views.

Top-left page:

Gruppo/*Cluster*	Dichiarazione/*Statement*
CEMENTIFICAZIONE E USO DEL SUOLO CEMENTIFICATION & LAND USE	**Preservare il verde contro la cementificazione** Preserve green against cementing project

Persone/*People*	Estratti/*Quotes*
Non specificato, Comitato Baiamonti Not specified, Baiamonti Committee FBK07	È uno spazio della città dove voglio costruire una piramide [...]. Noi diciamo invece che vogliamo del verde a disposizione della collettività. Ogni fazzoletto di verde è prezioso, in una città al centro della pianura padana, che è una dei luoghi più inquinati del mondo. It is a space in the city where I want to build a pyramid [...]. Instead, we say that we want green space available to the community. Every patch of green is precious, in a city in the middle of the Po Valley, which is one of the most polluted places in the world.
Carlo Monguzzi, Rappresentanti politici Political Representatives YTB01	Ma come si fa a buttare via questo spazio verde quando attraversata la strada a 50 metri c'è un'enorme spianata di cemento grande tre volte questo prato? But how can you throw away this green space when 50 metres across the road there is a huge concrete esplanade three times the size of this lawn?
Non specificato, Cittadini Not specified, Citizens FBK04	Siamo qui per riaprire quest'area, che vogliamo rimanga un giardino e che rimanga pubblico, contro la cementificazione che la giunta sta portando avanti. We are here to reopen this area, which we want to remain a garden and remain public, against the cementing that the junta is carrying out.

W–Hysteria [74]

Top-right page:

Gruppo/*Cluster*	Dichiarazione/*Statement*
COINVOLGIMENTO DEI CITTADINI CITIZENS INVOLVMENT	**Parere di 50.000 cittadini ignorato** 50.000 citizens' opinions ignored

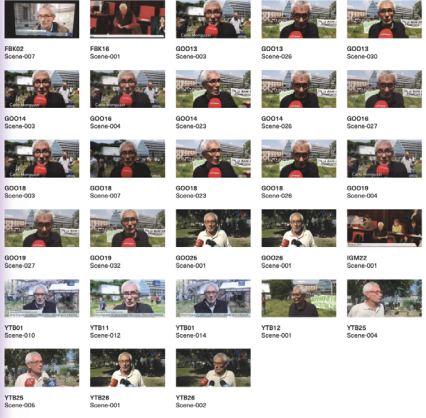| Persone/*People*	Estratti/*Quotes*
Non specificato, Cittadini Not specified, Citizens FBK29 IGM20	Alla fine li hanno tagliati. Nonostante le 54.000 firme di cittadini che chiedevano di salvarli, nonostante una votazione all'unanimità del consiglio comunale, nonostante il sopralluogo della commissione congiunta verde e Cultura. In the end they cut them down. Despite the 54,000 signatures of citizens calling for them to be saved, despite a unanimous vote by the city council, despite an inspection by the joint green and culture commission.
	Alla fine li hanno tagliati. Nonostante le 54.000 firme di cittadini che chiedevano di salvarli, nonostante una votazione all'unanimità del consiglio comunale, nonostante il sopralluogo della commissione congiunta verde e Cultura. In the end they cut them down. Despite the 54,000 signatures of citizens calling for them to be saved, despite a unanimous vote by the city council, despite an inspection by the joint green and culture commission.
Silvia Sardone, Rappresentanti politici Political Representatives YTB07	Ecco, si sono mobilitati tantissimi milanesi, circa 40.000, le firme raccolte per tutelare questo patrimonio verde, importante in una città ricca di asfalto come Milano. Here, so many Milanese have mobilised, around 40,000, the signatures collected to protect this green heritage, which is important in a city full of asphalt like Milan.
Giovanni Storti, VIP GOO13 GOO14 GOO15 GOO16 GOO18 GOO19	Forse bisogna ascoltare i cittadini. Perhaps the citizens should be listened to.
	Forse bisogna ascoltare i cittadini. Perhaps the citizens should be listened to.
	Forse bisogna ascoltare i cittadini. Perhaps the citizens should be listened to.
	Forse bisogna ascoltare i cittadini. Perhaps the citizens should be listened to.

Estratti [75] Dataset

Bottom-left page:

Gruppo/*Cluster*	Persona/*Person*	Partito/*Party*
RAPPRESENTANTI POLITICI POLITICAL REPRESENTATIVES	Alessandro Cattaneo	Forza Italia

FBK19 Scene-030 / IGM10 Scene-030 / IGM10 Scene-001 / IGM10 Scene-027 / IGM11 Scene-001

RAPPRESENTANTI POLITICI POLITICAL REPRESENTATIVES	Carlo Monguzzi	Europa Verde

FBK02 Scene-007 / FBK16 Scene-001 / GOO13 Scene-003 / GOO13 Scene-026 / GOO13 Scene-030
GOO14 Scene-003 / GOO16 Scene-004 / GOO14 Scene-023 / GOO14 Scene-026 / GOO16 Scene-027
GOO18 Scene-003 / GOO18 Scene-007 / GOO18 Scene-023 / GOO18 Scene-026 / GOO19 Scene-004
GOO19 Scene-027 / GOO19 Scene-032 / GOO26 Scene-001 / GOO26 Scene-001 / IGM22 Scene-001
YTB01 Scene-010 / YTB11 Scene-012 / YTB01 Scene-014 / YTB12 Scene-001 / YTB25 Scene-004
YTB25 Scene-006 / YTB26 Scene-001 / YTB26 Scene-002

W–Hysteria [50]

Bottom-right page:

Gruppo/*Cluster*	Persona/*Person*	Ruolo/*Role*
RAPPRESENTANTI POLITICI POLITICAL REPRESENTATIVES	Elena Grandi	Assessora al Verde Green Assessor

GOO17 Scene-001 / YTB14 Scene-001

RAPPRESENTANTI POLITICI POLITICAL REPRESENTATIVES	Enrico Marcora	Fratelli d'Italia

YTB11 Scene-014

RAPPRESENTANTI POLITICI POLITICAL REPRESENTATIVES	Ettore Licheri	Movimento 5 stelle

FBK25 Scene-039 / FBK25 Scene-041

RAPPRESENTANTI POLITICI POLITICAL REPRESENTATIVES	Federico Benassati	Forza Italia

FBK09 Scene-001 / IGM08 Scene-001

Persone [51] Dataset

Figure 3.
Two-page spreads from *W(H)ysteria*. Above, two pages of the catalogue surfacing statements from videos. Below, the list of actors in all their appearances. Source: https://agc-exhibition.densitydesign.org/projects/the-glitchine-diorama.

Consequently, catalogues can serve as a tool to identify actors and opinions that might otherwise go unnoticed when using traditional aggregation methods, thereby enriching the mapping process with nuanced perspectives.

In this context, the curating data approach, along with the catalogue format that embodies it, aligns with feminist calls for data science to embrace diversity and amplify marginalized voices, often silenced «in the service of clarity, cleanliness, and control» (D'Ignazio and Klein, 2020). As a feminist method that privileges multiple perspectives, the catalogue format does not assume homogeneity and does not merely summarize, treating each data point as a distinct entity. This approach facilitates the exploration of «continuities and resonances» among elements (Ahmed, 2017). However, it is crucial to recognize that marginalized voices might not always want to be included in the analysis: Invisible actors who used hashtags or replied to highly public figures could appear in the dataset, and including them in catalogues without their consent could raise ethical issues.

Moreover, because they highlight marginalized perspectives, catalogues can guide participatory design efforts, assisting researchers, designers, and planners in involving overlooked stakeholders (in addition to established stakeholder mapping methods) and mobilizing new pockets of the public. Who should sit at the table of participation? Whose interests matter? How can planners and designers engage effectively with diverse actors?

Finally, as printed materials, catalogues offer opportunities for participatory workshops and public engagement activities, serving as *conversation prompts* (Manzini, 2015) to explore alternative perspectives on the issue at hand. For instance, in the project mapping reforestation in Milan, statements from citizens, ranging from observations of dead trees to expressions of scepticism about the initiative, could prompt discussions among stakeholders.

While dashboards have been used as tools for community engagement (Pluto-Kossakowska *et al*., 2022), catalogues provide a slower approach to data consumption, which can be advantageous in participatory settings, contrasting the quick insights of visualization summaries and indicators. In this regard, time plays a crucial role in engaging with catalogues: navigating a dataset by flipping pages

extends the duration required to comprehend and analyze the data, prompting observers to engage thoughtfully and attentively.

Cities, faced with unprecedented transformations, require inclusive and systemic actions that can mediate between conflicting interests. While data can be a valuable source to map and understand urban dynamics, with traditional approaches in data science and visualization, the risk is suppressing pluralism and marginal voices in the service of clarity and quickness of insight. Here, we have presented *curating data* as a slower way of working with online data that foregrounds marginal points of view. While the inclusive mapping of diverse positions is not enough to act in complex contexts that characterize urban nature, it is undoubtedly a starting point for informing more effective and careful design actions.

Acknowledgments

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