



HAL
open science

Designing Digital Methods to monitor and inform Urban Policy.

Donato Ricci, Gabriele Colombo, Axel Meunier, Agata Brilli

► **To cite this version:**

Donato Ricci, Gabriele Colombo, Axel Meunier, Agata Brilli. Designing Digital Methods to monitor and inform Urban Policy.. International Conference on Public Policy (ICPP3), Jun 2017, Singapore, Singapore. hal-01903809v2

HAL Id: hal-01903809

<https://sciencespo.hal.science/hal-01903809v2>

Submitted on 18 Apr 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



**3rd International Conference
on Public Policy (ICPP3)**
June 28-30, 2017 – Singapore

Panel T10P6 Session 1
Digital Methods for Public Policy

***Designing Digital Methods to monitor and inform Urban Policy.
The case of Paris and its Urban Nature initiative.***

Ricci, Donato - médialab|SciencesPo - donato.ricci@sciencespo.fr

Colombo, Gabriele - DensityDesign Lab, Politecnico di Milano - gabriele1.colombo@polimi.it

Meunier, Axel - médialab|SciencesPo - axel.meunier@sciencespo.fr

Brilli, Agata - DensityDesign Lab, Politecnico di Milano - agata.brilli@gmail.com

29/06/2017

Abstract

The reconciliation of nature and the urban space is worldwide considered among the *smart* solutions to a growing range of issues created by urban growth. But there is no agreement on the imaginaries and technical practices that should be included into the new urban nature.

To address the specific case of the city Paris and its big re-naturation project, to observe, monitor and, eventually, produce elements of reflections for future urban policies, in the NATURPRADI project has been conducted a Digital Methods campaign. It is aimed at mapping the symbolic and material elements of the urban nature debate by asking specific research questions: Which images, discourses and practices narrate urban nature? by whom and what are they sustained?

After having detailed the methodological aspect of the research, we critically discuss how the result of the Digital Methods campaign could constitute a strategy to address simultaneously citizens and institutions alike, and provide them with tools to navigate through the issue and imagine future public policies.

Keywords

Digital Methods, Data Visualisation, Public participation, Urban Nature, Visual methods, Participatory Design, Research Design.

Beyond the urban-nature divide: urban nature and public policy

By using the term nature, often, a green world is imagined against a grey one, the wild depicted against the built and organised environment. Indeed, the term “urban nature”, for long time, has been an oxymoron. Take for example the medieval cities, a wall was clearly delineated two spaces: the inside, populated by humans and the outside by animals, forest and plagues. Throughout the centuries this clear cut division faded: trees have been planted along the streets; specimens of flora and fauna collected and exhibited in museums, zoos and gardens. Finally, the relentless global urbanisation¹, has definitely blended together the antonymic divide between nature and culture, modernity and ecology (Cronon 1991; Soper 1995; Latour 2004; Morton 2007) as well the historical incompatibility between the city and the nature (Heynen, Kaika, and Swyngedouw 2006; Lévy and Hajek 2016). Nature, is not anymore something out there. It is something entangled in global, and rescaled, biological, chemical, geological, social and technological processes, binding together humans and non-humans, urban and non-urban spaces (Bell, Wekerle, and Keil 1996; Swyngedouw 1996). This shift calls for a change in the procedures through which cities are governed and sustained. Urban nature is becoming a matter of politics of everyday life in cities, a question of democracy, governance (Keil 2005; Angelo and Wachsmuth 2015) and, ultimately, as part of the public realm, subject to the need of multiple, and possibly, pluralist negotiations.

The urban nature issue

Urban nature issue, while representing a vast field of socio-technical experimentations, has been broadcast and branded with *green* imaginaries (Gandy 2006). On the one hand, municipalities, all over the world, are endorsing revegetation and *greening* programs by preserving spontaneous vegetation and, mostly, improving the quantity of managed areas as parks and gardens, vegetated rooftops and walls. Nature is seen as an aesthetic strategy to create the perception of a city that integrates (itself in) nature to secure better health conditions (Hartig and Kahn 2016). But, beyond these objectives, green urban design has also been used as a “mask” for a capitalist urbanization resulting the social inequalities of “green

¹ Following United Nations projections (UNDESA 2012; Kirby 2012) by 2050 around 66% of the human population will live in urban area. The sprawl of urbanisation is triggering unprecedented and irreversible impacts on the biosphere (Seto et al. 2011) ranging from biodiversity loss (Williams et al. 2009) and habitat fragmentation (Collins et al. 2000), to major climate modifications. As Swyngedouw (2014) states, planetary urbanisation is the geographical form of the Anthropocene (Waters et al. 2016).

gentrification” (see Checker 2011; Gould and Lewis 2016). On the other, nature is seen as an engineered process and as a technical solution, for example to the “heat island” effect (Kuttler 2008). Also these engineered forms of urbanity are strongly entailed to the production of green, ecological, and sustainable imaginaries as the case of the smart cities shows (Viitanen and Kingston 2014), that leveraging on green narratives, often markets corporate and technocratic visions (Rose 2017).

In both imaginaries — fostering the general discourses about green urbanism — nature still resides *outside* in an idealised, ready to be consumed, state. Beyond climate mitigation, technical solutions and aesthetic objectives, within urban nature we can acknowledge a main paradox of the contemporary society. On a bigger scale, the interaction between humans and the environment has become so intense as to require its own epoch, the Anthropocene. On the smaller one, the relationship is limited to a few encounters resting on individual consumer choice and market logic (Krueger and Gibbs 2007). Furthermore, urban management, mostly in its technocratic smart-city vision, is characterised by a progressive de-politicization (Keil 2003), envisioning systems to manage in a consensual and non-agonistic way issues and problems. New digital technologies — grouped under the term of “participation 2.0” (Claudel and Ratti 2016) — have progressively redefined what was used to be identified as “public”, in its Deweyan sense (Dewey 1927; Marres 2005), and give birth to a “networked public” (Varnelis 2008). They give the impression of facilitating public participation but, still, they left urban nature disconnected from diffused public engagement (Kaika and Swyngedouw 2011), hiding its social technical and political dimension. In these imaginaries, the city and nature become black-boxes in which the public can rarely form itself and act.

These mainstream narratives, obfuscates other instances, dynamics and possible forms of public participation. In the urban context, there is a muffled collection of contested natures (Macnaghten and Urry 1998), fabricated by technological and environmental objects and socio-cultural processes (Gandy 2002), urging for public participation and engagement. For example, the migration of non-indigenous species into urban settlement due to temperature changes (Douglas et al. 2010) should trigger a vast reconsideration of the concepts of wilderness and biodiversity (Uggla 2010; Hinchliffe et al. 2005). It is the case of the visions about a productive and resourceful urban nature. The “new Agrarianism” (Freyfogle 2001; Paull 2013) vision clashes with the deluge of “local”, “green”, “organic”, “biodynamic” items of grocery stores, or with the “above ground” practices of the urban hydroponics techniques. All these visions, products and techniques are the results of different and specific environmental objects, social processes and material networks: the soil of the city, the pollutants possibly captured in it, fertilizers, livestock, composting techniques, trucks, refrigerators, packaging, artificial lights, thermostats, chemicals. These networks, bounding micro-localities to global markets (Jacobs 1961; Harvey and Braun 1996; Heynen, Kaika, and Swyngedouw 2006), are misleadingly represented as fixed, stable, ordered and homogeneous (Graham and Thrift 2007) and often remain opaque and invisible.

Issue mapping for public policy

The greenest Paris

As many cities in the world, the city of Paris has recently started a big renaturation process. In this context, a heterogeneous wave of bio-technological, sustainable and circular economy experiments, along with urban farming projects, is rising. Soon, a digital platform, called “*Végétalisons Paris*”, will try to enable citizens to promote their greening initiatives, share best practices, and develop a community of urban gardeners and *biophilic*² supporters. These initiatives, are historically rooted in a process started since the middle of the seventeenth century (Lawrence 2008), through the construction of tree-planted boulevards; continued with the French Revolution — when public city parks and tree plantations have been promoted to give to the lower class access to public spaces —; and expanded with the Haussmanian urbanisation —

² The term biophilia has been popularised through the work of Edward O. Wilson (1984) and it refers to an innate tendency that humans have to connect to nature and other form of living entities. The term is here adopted to gather under the same umbrella all the different, and sometime contrasting, practices, visions and object related to a new understanding of the relationship with nature especially in relation to the urban environment.

by the opening of the Buttes Chaumont and the Montsouris parks —. In the '70s, the first quantitative objectives about urban nature have been set, defining the inhabitant-to-green area ratio — $10\text{m}^2/\text{inhabitant}$ in the centre of the city and $25\text{m}^2/\text{inhabitant}$ on the outskirts (Legenne 2009) —, triggering in the '80s a second wave of garden creation in Paris (APUR 2010). In the last decade, through the “*Budget Participatif*” initiative, Parisians have been asked to propose projects for their *arrondissement*, starting a bottom-up public policy process. These new policies continued with the project “*Du vert près de chez moi*” — operation deployed through a smartphone application — that asked citizens which places they wished to re-vegetate; they have been expanded in the frame of the “*Permis de végétaliser*” — a regulatory grant to temporarily occupy public spaces for greening activities, in which a special attention has been taken by a micro natural territory the tree pits —; and broadened by the opening of the biodiversity observatory — registering the flora and the fauna living in the urban area —. In the same framework the “*Main Verte*” program promoted a vast civic engagement to foster biodiversity project, resulting, in 2016, to the declaration of “biodiversity” as honorary citizen of the city. Even more recently, the *Mairie de Paris* set a series of new quantitative goals to achieve by 2020. The charter “*Objectif 100 hectares*”, federating national, multinational companies and local public actors, is meant to increment, installing mostly green roofs and walls, the city overall vegetated surface of 100 hectares. One third of these new surfaces should be devoted to urban agriculture and sustained by the “*Parisculteurs*” call for project. By the very same date, other goals have been set: to plant 20.000 trees in the public and private space, and the opening to the public of 30 hectares of green spaces.

NATURPRADI

The present paper is the result of the first 9 months of the NATURPRADI³ project. While the research project intends to support the above described efforts of the municipality, it is aimed, at the same time, to dig into them and into their effects. It tries to expose the different social, political and technological issues associated to urban nature; its actors, and the controversies caused by alignment and misalignment of interests. It is a mapping endeavour: observing and describing the transformation of the city-nature relationship so to help citizens and institutions to craft new public policies. While a growing corpus of researches is exploring for example the wider socio-technical relationship between renaturation projects, wild flora and the renegotiation of public space (Pellegrini and Baudry 2014) or the socio-technical network behind the micro territory of pit trees (Pellegrini and Patricia 2012); the neo-liberal processes of green gentrification (Newman 2011) or the shift from preserving the nature to managerial approaches to biodiversity (Blandin 2009), none of them provided a reconstruction of the various issues raised by the urban nature in the Parisian context, how they are co-articulated and how they entangled or disentangled themselves through the time.

The NATURPRADI project seeks to explore how the future mosaic of urban nature in Paris, often publicised using quantitative indexes — like the numbers of trees planted or the size of new area for green and biodiverse areas —, by observing how less visible material organisms, objects, places, practices and technologies are mobilised, re-appropriate and discussed in the public arena.

Digital Methods for studying the publics and their objects

To achieve this objective, the NATURPRADI project — especially in the module led by the SciencesPo|médialab — is deploying a pragmatist and issue-oriented (Latour 2005; Marres 2007) Digital Methods campaign (Rogers 2013a). The campaign draws upon the notion of public, formulated across the famous Lippmann-Dewey debate. In the resulting pragmatist definition, the public is not an *a priori* constituted set of

³ NATURPRADI – Urban Nature in Digital Practice(s) – is a 3-year research project funded by ADEME (French Environment and Energy Management Agency) as part of MODEVAL-URBA 2015 call for project. It started in September 2016 and is led by the LAVUE Architecture and Anthropology laboratory, which partnered with the City of Paris - Office of Green Spaces, the Museum of Natural History - Eco-anthropology and Ethno-biology laboratory, the Paris Urbanism Agency, and Sciences Po's|médialab.

people, rather it is a local and specific arrangement of individuals. They are tied by their commitments in addressing a situation and their concerns for its future consequences. The public is dependent on the context which calls it into being: the *issue*. But issues are not able to assemble the public on their own. Herein lies the problem: before acting, in order to achieve a desired result, the public must be assembled, “constructed” (Dewey 1927). The public, to come into being, has to produce “attachments” (Gomart and Hennion 1999). Attachments are relationships bonding the public to external resources. Attachments are expressed through the commitment of individuals to nurture these links and through a strong and reciprocal dependency upon them⁴.

Tracing which urban nature objects are under debate in the public arena, by which actors are produced and to which other are attached to — forming unstable constellation of publics — is ultimately the research question and the driver of the project. For such tracing activity digital media and digital platforms are particularly adapted (Marres and Rogers 2005; Marres and Gerlitz 2016). By collecting digital-native content, the NATURPRADI project exploits digital platforms to extensively document the social dynamics surrounding the urban nature debate. While the city is the space where nature, culture, society and technology redefine each other, the web offers places to detect, visualise and interpret the dynamism and heterogeneity of this processes. Within digital platforms, smart city imaginaries are present alongside grassroots visions; amateurs and experts brush shoulders through online media, sharing a common space of information production and dissemination; start-ups propose new technologies through the same digitized and easily accessed infrastructure across which journalists report their news and research labs publicize their advancements.

A curatorial approach for data collection

Although the discussion around urban nature can be witnessed in a multitude of digital channel and media — i.e. *Facebook*, for promoting events, or *Whatsapp* for organising the same events or to get part into AMAP (*Association pour le maintien d'une agriculture paysanne*, the French Community-supported agriculture associations) —, Twitter has been chosen as principal environment of data collection for the project. This platform is one of most broadly used platforms in France by a variety of actors and able to connect in an open way a variety of users getting spontaneously organised in discussion topic by using hashtags.

Twitter, presenting the concrete opportunity for “empirical sociocultural research” (Burgess and Bruns 2015), has become, over the years and despite its transformation⁵, an object of study and a data source for research scopes⁶ (Rogers 2013b). Several methods and technique have been developed in order to cope with its specificity, biases and its embedded politics (Gillespie 2010; VanDijck 2013), technically, rhetorically and culturally expressed (Gillespie 2014). Nevertheless, Twitter data collection remains challenging and every decision induces non negligible limitations.

As many other Twitter based research, the *Streaming API*⁷ has been adopted for the NATURPRADI Digital Methods campaign. These API offers the possibility to retrieve only live data, not allowing for getting

⁴ The central role given to material resources is in explicit contrast with traditional political studies where material entities are typically neglected. Only recently have they regained attention and started being considered as important empirical elements in the formation of publics.

⁵ Since its opening, in 2006, Twitter has been subject to business models changes leading to consecutive shifts in its purpose, contents, formats, communication affordances of its interface and technical infrastructure. The latest Twitter instance is driven by a model relying on advertising, corporate partnerships and on reselling the data produced by its users. For an analysis of the controversies linked to the use of Twitter for social researches see (Burgess and Puschmann 2014)

⁶ Here we are discussing mostly researches concerned not with a “big data approach”, but those triggered by a research protocol driven by a specific research question or theory, so less concerned with the size of the collected dataset and more with its relevance to the extent of issue under study (Röhle and Rieder 2012; Marres and Weltevrede 2013; Schroeder 2014).

⁷ In computer sciences and programming field API (Application Programming Interface) is a set of protocol used for building applications and exchange remotely data between them.

past tweets. Furthermore, it imposes some bandwidth limitations coming into effect when the requested tweets exceed a certain threshold, in our case the 1% of the all traffic flowing in the platform⁸.

A limitation affecting Twitter based researches is linked to its representativeness (see Blank 2016). Although Twitter is widely used all across the world, its adoption rate changes accordingly to different social *milieux* and the way it is used may differ significantly from country to country. In the NATURPRADI project there is no assumption about the possible exact extension of the observed digital population to the general one. Furthermore, in NATURPRADI a traditional ethnographic module, is planned to be carried out by the other members of the consortium. Their results will be used to mitigate the bias linked to the social media population and eventually grounding the finding of the Digital Methods campaign.

The last aspects of the Twitter platform to be taken into consideration is linked to the approach for harvesting the corpus and the duration of the observation. The latter aspect has been easier to solve rather than the first one. It has been chosen to collect one year of data, since July 2016 until July 2017⁹, in order to acknowledge the expected fluctuation in the tweets flow due to seasonality, and to monitor the impact of the various actions taken by the municipality.

Among the different approaches for Twitter corpora building (see Mayr and Weller 2017) it has been chosen one based on keywords. As a first step, a list of keywords — *agriculture urbaine, jardinage, nature, biodiversité, végétalisation* —, representing the object of study of the project, has been compiled by the member of the project. To expand it, adding new relevant keywords, the *Wikipedia* pages of each word in the list has been used to explore¹⁰ other pages present in the “see also” section. This operation, produced a first network of concept. The network has been analysed and discussed, judging the pertinence of the new discovered keyword, even more important, their use in the current language. Nodes representing expression and keywords, too technical have been discarded or reformulated so to meet a balanced point between scientific vocabulary and the common language. This operation resulted in a second list and, another network, by using the same technique, has been produced (IMG. 1-2). The very same concertation procedure among the project member has been adopted and a list of 158 keywords (IMG. 3) has been used to capture the tweets mentioning them¹¹.

It has to be remarked that although this procedure has granted satisfying results, it is impossible to achieve a kind of “completeness” about the tweets referring to a specific issue. Users can always use different wording, or certain pertinent tweets may have been not capture because they didn’t mention any keyword of the list. As partial mitigation of this bias, once a tweet part of a conversation has been captured the entire discussion to which it belongs has been retrieved.

To assure a territorial specificity to our corpus we queried only for French word. In addition to this, all the keywords are queried by adding the word “Paris”. This method, after some testing, has been more successful rather than a geo-based search since the quantity of retrieved tweets showed to be significantly greater.

⁸ It has been estimated by the NATURPRADI research team that this would have been extremely improbable. This assumption has been confirmed valid, not having received any notification by the Twitter system. For a further discussion of these limitations and the implication for social research see (Gerlitz and Rieder 2013)

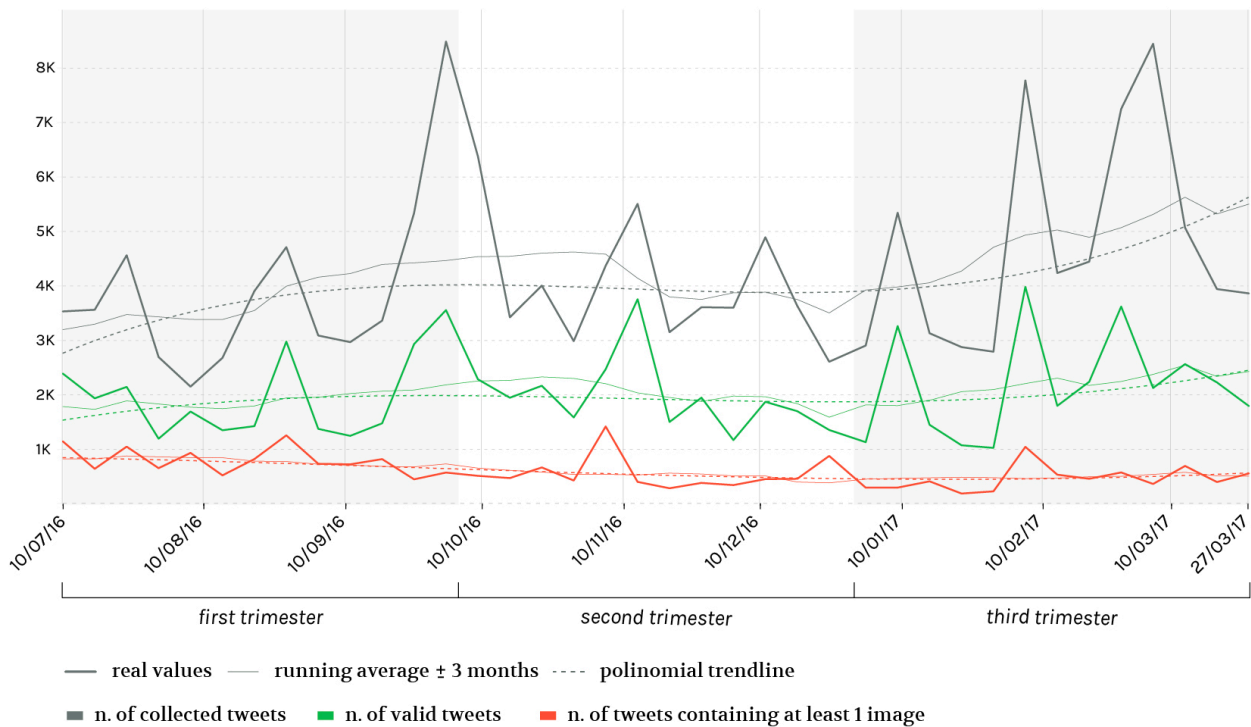
⁹ At the time of the publication of this paper, 9 months of data have been collected and analysed. This paper, thus, is to be considered as an intermediary report of the Digital Methods campaign. The feedback we are going to receive will improve the methodology used, highlight its strengths and weaknesses, eventually leading to their further amelioration.

¹⁰ This *crawling* operation has been performed using a custom open source tool developed by the médialab|SciencesPo and by the DensityDesign Lab at the Politecnico di Milano. The source code is available here <https://github.com/densitydesign/strumentalia-seealsology>.

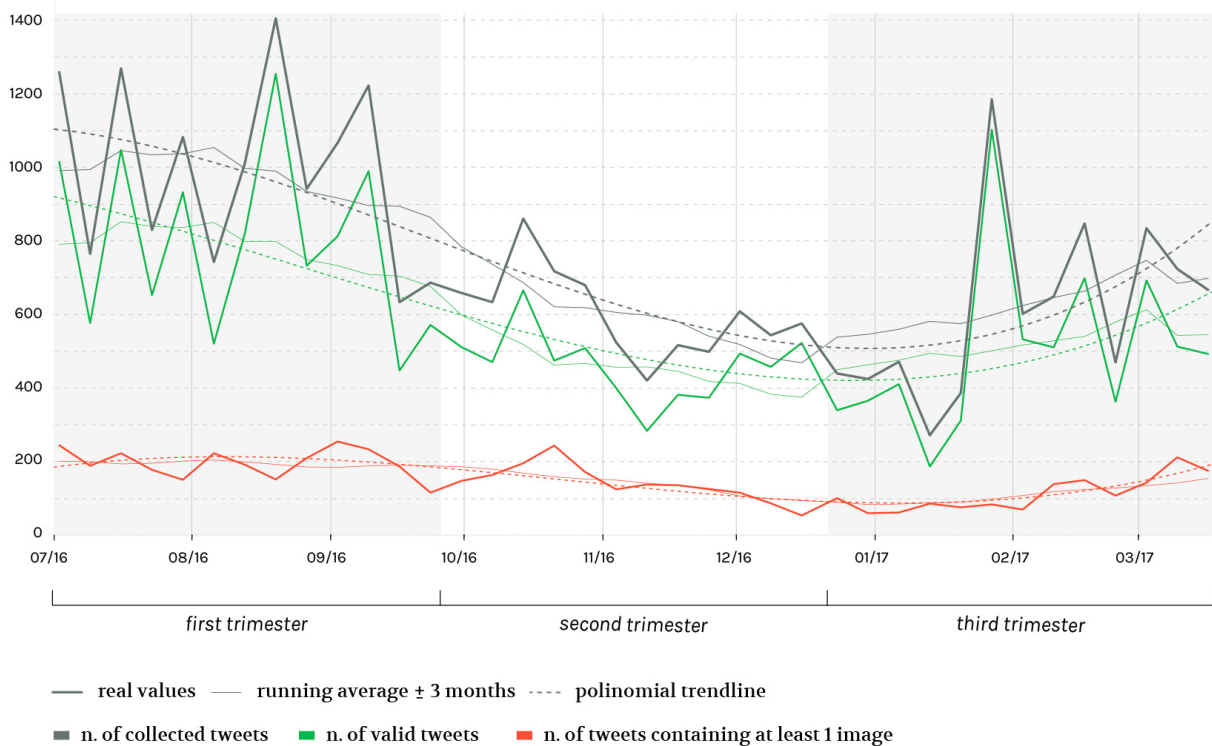
¹¹ To capture and store the tweets a specific infrastructure developed at the médialab has been adopted. The open source software for collecting the data is available here: <https://github.com/medialab/gazouilloire>.

agriculture - agricultures - agriculture biointensive - agriculture verticale - agroforesterie - agrosylviculture - alimentation proximité - #AMAP - aquaponie - arboriculture - arbre - arbre alignement - arbres alignements - arbre urbain - arbre_remarquable - arbres - arbres urbains - arbres_remarquables - arbuste - arbustes - architecture écologique - aromatique - aromatiques - association_végétale - bande_enherbée - biodiversité - biodiversité bâtiment - biodiversité jardin - biodynamique - biointensive - botanique - botaniques - cartographie végétation - chantier nature - compost - composts - compostage - compostages - conservation nature - corridor biologique - corridors biologiques - "coulée verte" - "coulées vertes" - développement - durable - éco-habitat - ecoagriculture - écocitoyenneté - écoconstruction - écologie urbaine - écologique - écologiques - écoquartier - écoquartiers - espace vert - espaces verts - ferme verticale - fermes verticales - fleurie - fleuries - flore des murs - floriculture - forêt - forêt urbaine - fragmentation écologique - fruitier - fruitière - fruitiers - génie écologique - génie_écologique - gestion différenciée - graminée ornementale - "guerrilla gardening" - horticulure - horticulure urbaine - îlot - îlot chaleur - îlots chaleur - incroyables comestibles - infrastructure verte - jardin - jardins - jardin communautaire - jardins communautaires - jardin ouvrier - Jardin-forêt - jardinage - jardinage collectif - "jardin familial" - "jardins familiaux" - "jardin public" - "jardins publics" - "jardin sauvage" - "jardins sauvages" - jardinage urbain - jardins ouvriers - matrice écopaysagère - micro-agriculture - micro-ferme - micro-fermes - mur végétal - mur végétalisé - murs végétalisés - murs végétaux - naturalité - nature - observatoire paysage - patrimoine naturel - paysage urbain - paysages urbains - permaculture - plan climat-énergie territorial - plante - plante grimpante - "plante utile" - plantes - plantes grimpantes - polyculture - potager - potagère - potagères - potagers - prairie - prairies - prévégétalisation - "produit local" - "produits locaux" - alimentation proximité - renaturation - "réseau écologique" - "réseaux écologiques" - résilience écologique - soutenable - soutenables - stratégie biodiversité - sylviculture - système d'information sur la nature et les paysages - terrasse végétalisée - terrasses végétalisées - toit-terrasse - toits-terrasses - toiture - toitures - trame verte - trame_verte - trames vertes - végétale - végétales - végétalisation - végétalise - végétalises - végétalisée - végétalisées - végétation - verger - vivrière - grenelle environnement - effet serre

IMG. 3 The final list of keywords and expression used to retrieve the tweets. All of them have been used in combination with the word "Paris".



IMG. 4 Line graph of the weekly collected tweets and the relative proportion of valid ones (related to Paris and to urban nature) along with those containing pictures. Over nine months 161.208 tweets have been harvested, 77.683 of them retained for analysis of which 22.997 contained at least one image.



IMG. 5 Line graph of the weekly collected images. Over nine months 22.414 Twitter images have been collected along with 5.689 Instagram one shared over the same platform for a total of 28.103 images.

To assure that the final corpus would not be biased by tweets not related to Paris or to the urban nature, a further curatorial procedure has been applied. Through a custom and open-source software¹², every tweet has been read by the research team and evaluated in terms of its pertinence. This approach, distinguishes the NATURPRADI project from many other big data ones. Furthermore, the close reading of the tweets enabled us to have a constant overview of the state of the discussion, gaining a deep understanding of the dynamics of the issue> This aspect resulted to be extremely useful in the analysis and interpretation of the data.

All the tweets constituting the corpus have been further processed to extract the relevant information contained in them. The most important information stored are: a) the user and its profile; b) date and time; c) number of like and retweet; d) hashtag and mention of other users; e) link to web URL; f) attached images that have been downloaded and stored.

A further data enrichment has been done by extracting archiving the *Instagram* images shared in the tweets; and by processing the text of the tweets with an entity-extraction software¹³. While in specific events, like humanitarian crisis or elections, hashtags are able to coordinate the interactions of the “*ad hoc* public” interested and involved in them (Bruns and Burgess 2011) this could not be considered the case for urban nature. Retrieving and understanding a wider set of expressions used, besides the wording expressed through hashtags, has been necessary to build a more nuanced collection of names, places and objects related to urban nature in Paris. The hashtags present in the tweets and the entities extracted from texts are considered here on the same level and called objects.

¹² The source code is available here: <https://github.com/medialab/catwalk>.

¹³ The entity extraction allowed to retrieve in the tweets mention of places, people and other relevant objects checking and matching the words of the tweets against the DBpedia service. The service used for this is Dandelion: <https://dandelion.eu/>. The hashtag and extracted entities have been cleaned using the clustering algorithms available on Google Refine and the Talisman library <https://github.com/Yomguithereal/talisman>.

A similar supervised and curatorial approach combined with automated techniques, has been used for retrieving images and tag their contents¹⁴. It has to be remarked that we have been able to get only the images posted directly in a tweet or linked through Instagram. Due to technological limitation it has been impossible to retrieve the images that Twitter presents, automatically, when in a tweet is present a link. This is a main limitation of our approach. Due to this reasons it does not pretend to have analysed all the images related to urban nature in Paris. Our method, in between “cultural analytics” and “photo-documentation” (Rose 2016), pay a closer attention to those images that have been actively attached to the messages by their users as a form of commitment.

This curatorial approach we developed has granted us to, both, inject our personal expertise, and the one of the members of the consortium, in controlling the flow of information passing through Twitter, and to have a close understanding of its evolution and context.

Quantify otherwise to otherwise qualify: diagramming discourses, narrative and images

Urban nature, as many controversial issues, emerges from social, biological, political and technological interplays in which a rhetorical dimension and a symbolic one are coupled together. To understand these two dimensions and their interactions, requires a series of mixed analysis and visualisation approaches able to document and expose visually how the different discourses entail material subjects and socio-technical configurations.

The Twitter corpus has been analysed and visualized triangulating different *spaces*:

- **The discursive space:** to understand the liveliness of the issue, (i.e. amount of information produced over time) and actors’ interaction and change in composition and attachments (analysis of the user-objects network over time);
- **The latent agonistic space:** to capture the latent yet agonistic aspects of the issue a selection of hand-picked tweets has been compiled and ordered so to form “micronarratives”. With a qualitative effort is possible to pay attention to weak signals otherwise quantitatively obfuscated.
- **The visual space:** to document the pictures sharing patterns. Pictures are analysed according to their content, the actor that produced them and their temporality;

The discursive space: a tripartite mosaic

Baselines

The first set of visualisations, based on a monthly count of @users and objects mentions in the corpus, shows the dominant voices and the most mobilised objects in the debate. These visualisations, although simple, are able to highlight particular events or parallel issues drifting into the debate.

It is fairly easy to observe (IMG.6) how the current state of the issue is dominated by institutional and institutional related accounts, both in terms of quantity and of persistence over time. The list of the top accounts welcomes the official accounts of the Paris municipality (@Paris) and the mayor of the city (@Anne_Hidalgo). Their tweets and mentions is of one order of scale bigger than the others. This is a first signal that the discursive arena is driven by a political will, along with a publicity agenda: all the micro and macro activities launched by the municipality are widely advertised and consequently discussed by the Twitter users. Other politicians and political institutions are active: the deputy mayor in charge of green spaces (@PKOMITES); the French ministry of agriculture (@Min_Agriculture); the new president of the COP21 and former Minister of Ecology Ségolène Royal (@RoyalSegolene); the account of one of Paris

¹⁴ The detailed description of these operation is provided along with the analysis conducted in the next paragraphs.

arrondissement (@Mairie12Paris) along with @Baratti_Elbaz; @Celia_Blauel. It has to be remarked the progressive engagement of the new “*Végétalisons Paris*” (@vegetalisons) platform account, activated in November 2016. Following the political agenda and engaged in the discussion are some of the most preeminent French news outlet (@LeParisien_75; @Limportant_fr; @le_Parisien; @afpfr; @Le_Figaro; @M6; @20minutes; @FrancebleuParis; @BFMTV; @lemondefr).

Constantly active are two other accounts linked to iconic institutions of Paris, the National Museum of Natural History (@le_museum), active in research as well divulgative activities in the field of biodiversity and natural protection; and the Luxembourg garden (@jardinluco), the park incarnating the aesthetic of the traditional French parks. Especially visible are a series of other accounts linked to this peculiar *nuance* of urban nature, promoting leisure activities in parks and gardens (@parisvisites; @holaparis; @Secret-Francia_) or tweeting mostly vintage images of these spaces (@alcarbon68; @valmad76; @ArtLify; @SweetViolettes; @AgrapidiL; @AhmdSL).

Partially counterbalancing this nostalgic description of urban nature, some urban lifestyle accounts (@parisladouce; @ParisZigZag; @QueFaireAParis) diffuse information about events and activities linked to permaculture, zero-waste initiatives, biological and “*Local*” *food miles* products. In a much more technical way, the same contents are produced by specialised actors, associations, activists and outlet of fairs events (@sima_paris; @Blogaujardin; @c40cities; @Salondelagri; @alaindelavie; @Biodiver_Cite).

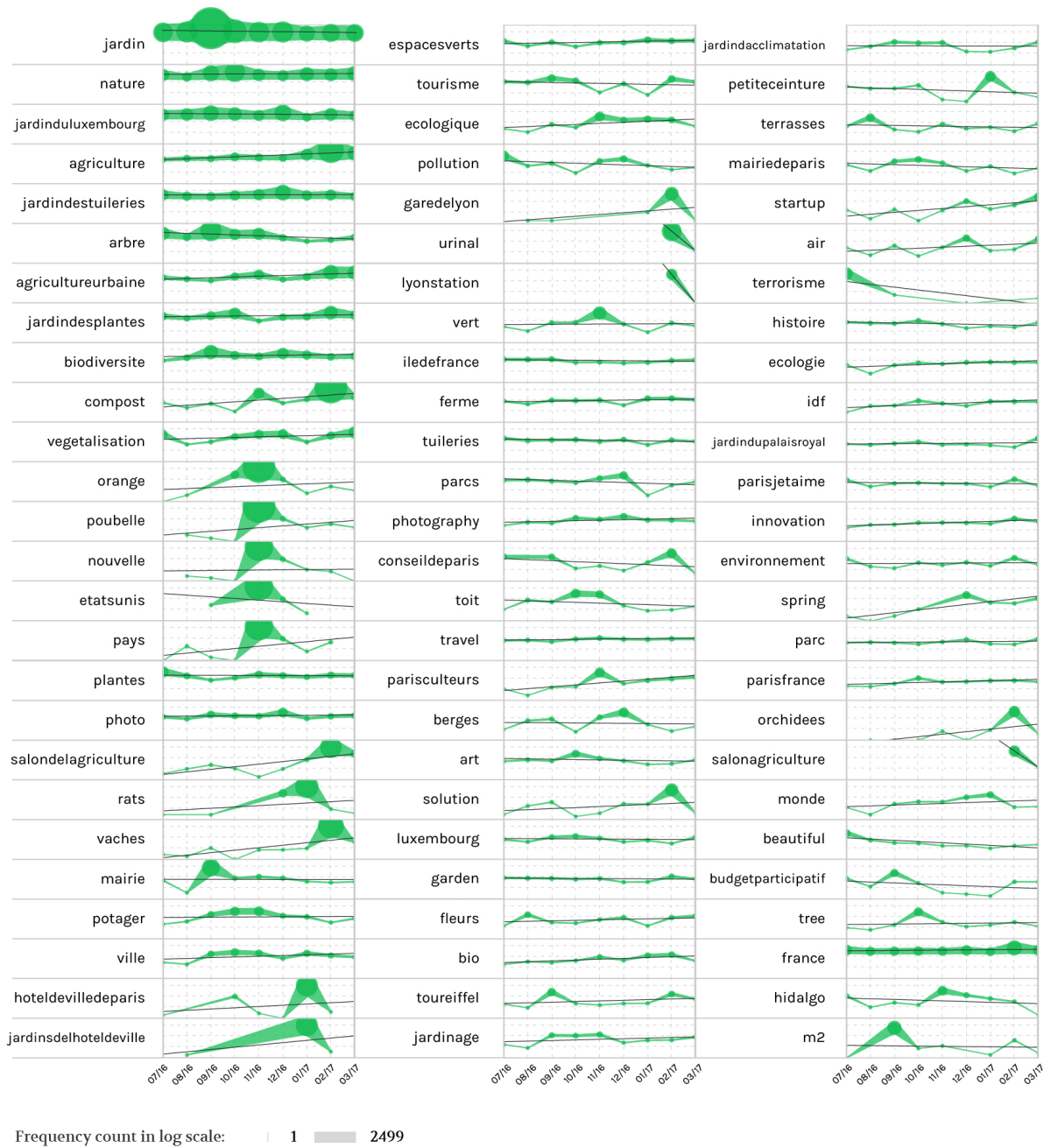
All the previous mentioned accounts showed a stable participation to the discussion while some other visible ones participate in concomitance of specific events and occasion ranging from top models strolling in the Tuileries Garden (@knjdaily) to the adoption of the new compost bin — weirdly resembling to Donald Trump, as for the user @smallest_stars —. Rather being noise, these ephemeral elements, are the signal of the vast heterogeneity of topic composing the urban nature issue.

The IMG.7 shows in the same way the most mobilised objects of the last 9 months. It is, again, easy to cluster them accordingly different topics, from urban agriculture (agriculture; agricultureurbaine; compost) to the main Parisian parks (jardinduluxembourg; jardindestuileries) and the associated leisure activities (photo; tourisme; photography; travel); from the new objects of new Parisian urban nature (biodiversite; compost; toit; ferme; pariculteurs) to specific element linked to punctual events (the new urinal able to produce compost and that excited some main international news headlines like @nytimes, @guardian, @fastcoexist, @bbcworld).



Frequency count in log scale: | 1 ■ 1608

IMG. 6 List of the most active and mentioned user over time. They are ordered by the total tweets produced and mention received.



IMG. 7 List of the most mentioned object overtime. They are ordered by the total amount of mentions over the 9 months,

Network analysis

A network analysis has been performed to disclose the full complexity of the discursive space. It shows how different users are attached to each other and to specific objects, indicating the formation of *ad hoc* publics. In this way, a more comprehensive depiction of the Parisian urban nature mosaic has become possible. For every trimester a specific network¹⁵ has been produced, permitting comparisons and diachronic analyses. On every visualization an interpretative diagrammatic layer has been added to highlight the grouping of users and objects on the basis of their distinctive way of being linked together forming isolated clusters or serving as central core for the overall network. In other words, this diagrammatic layer, while assuring the possibility of reading the network properties on a *local* level — i.e. the specific position of a node and its relevance — and on a *global*, *gestalt*, one — i.e. relative nodes positions and size —, it allows to focus on a *meso* structural level in which network nodes are joined together in tightly knit groups, between which there are only looser connections. The diagrammatic layer, selects the most relevant information while simplifying other, for then amplify their visual relevance permitting their classification, and, thus, building the overall sense to the network¹⁶ (IMG. 7-9).

In every network, at a first glance it could be seen a denser core. In this core, and in a stable fashion over the trimesters, are present the most active and mentioned accounts: @Paris, @Anne_Hidalgo and @PKOMITES, to which joins in the latest trimester @vegetalisons. Is around this political and institutional accounts that the entire discursive mosaic is organised and evolves through time. It confirms that, in Paris, the urban nature issues are leaded and drove mainly by a political agenda whether this one expresses a top-down or a bottom-up approach. Other accounts, proposing other practices linked to associative (i.e @cjp75006; @LaRe_cyclerie), research (i.e. @citizenfarm, @agroparistech), start-ups (i.e@aeromate_paris) and even leisure and recreational (i.e. @alcarbon68) ones, are much more peripheral.

This core organises the overall mosaic, as a pivot dispatching users and objects, into three main discursive surfaces. They have been called surfaces as echo of the tradition in architectural and landscape discussions (White 2010) and for the tension that, in those disciplines, the term is able to trigger especially in relation to policy decisions (take as Parisian example the decision by the municipality to increase the surface of available green of 100 hectares, or the renewed attention to vertical vegetated surfaces). As for *material* surfaces, in built and unbuilt environments, the ones we have identified are “productive surfaces”. They are considered as a *terrain* able to “yield something”, something tangible, in our case for sure not energy or dietaries nor heat or wastes, but discussions, visions, opportunities economies, programs, typologies and public articulations. They operate independently from scale in a logic holding different heterogeneous entities. We have tried to defined them, by remobilizing the actors that inhabit them — their @users and their objects — as follow:

- a) *Technological agrarian urbanism*: on this surface are active the new propositions aimed at improving urbanisation in relation to its natural and environmental assets.

They encompass short production circuits, reduction in carbon emission (climat, energie), ecological (ecologie) sustainability along with revamped traditional techniques. Here is welcome innovation, in all its forms, from the use of big data for improving energy and food productivity (alimentation), to the new skyscrapers and tower where to install trees or the shipping containers for growing vegetables and strawberries (fraises). This is surface where the research experiments of @ag-

¹⁵ To produce the networks, the elements contained in a single tweet — mentions to other users and objects (the combination of hashtags and extracted entities) has been transformed in a *clique* — a small fully connected and weighted network —. The combination of these *cliques* for a specific trimester produced the final networks under analysis. The nodes of the network have been filtered leaving the ones with an occurrences count greater than 4. The edges by a weight greater than 4 as well. The visual network analysis is based on a spatialization achieved through the ForceAtlas2 algorithm (Jacomy et al. 2014).

¹⁶ This process is mainly mutated from cartographic practices and thoroughly discussed in (Quaggiotto 2008), and it has been applied to all the visualisation produced. While computational network analysis techniques achieve such a detection by algorithmic and statistical procedures, we adopted a quali-quantitative approach. On top of the results of a community detection algorithm we performed a qualitative re-contextualisation of user and objects, possible to obtain thank to our close reading of every tweets.

roparistech and @lapaillasse take place. It has expanded and become denser over the time, starting to feature banks (i.e. @credit_agricole) and for-profit associations (i.e. @fermedigitale, @invivogroup). Its expansion is also due to the @sima_paris and @salondelagri events. During these events have been reported the only protests on this surface prompted by the vegan movement and caused by the participation of politicians to them (francoishollande), perturbing a quite pacified assembly under the name of technology and management.

On this surface start-ups, made in Paris and representing la French Tech (i.e. @agreenstartup), sheeps (moutons, brebis), robots and open data are trying to lead to a reconceptualization of the city based on a mixture of efficacy and tradition, on a blend of economic utilitarian (economie) and ecological principles: the smart city.

- b) *Unsettle biophilic tension*: on this surface we can find all sort of actors, users and objects, hosting the most controversial attachment to urban nature.

Smart city is one of the overlaps between the previous surface and this core one. It connects two different approaches to urban nature, one based on broad structures, the other, on more small scale actions. In the former we have technologies, in this latter a context. The smart city shows all the ecosystemic services¹⁷ that urban nature may provide along with its utilitarian benefits: reduction of pollution in the air, reduction of the heat island (canicule); revegetation of liminal spaces (metro). Politicians, more or less famous and acting on various scales (@royalsegolene, @fvauglin, @cgirard), institutions (@mairiedu4e, @mairiedu20, @aparisclimat) supported by some of the main national news outlets (@lemondefr, @le_parisien) contributed to make this cluster drift to and be fully co-opted by the very centre of this surface.

A similar role is obviously played by urban agriculture (agricultureurbaine). Among the different instances that this practices may assume — spanning from community garden to urban farmlands and high-tech vertical agriculture, still present in the space but scattered in the overall network —, here is present one attached to a specific understanding of the parisian realm (terroir), and its heritage (maraichere), where amap, farms (ferme), social economy (economiesolidaire), and locavore movements are connected to a really variegated set of users: startups (@citizenfarm), agronomists (@UrbAgriculture), amateurs (@zithub) and municipal initiatives (@fermeparis).

Over the time a specific cluster stemmed from the urban agriculture one. It is specifically related to permaculture, hydroponics (aquaponie) and aeroponics techniques. While carrying their promises to reduce the water consumption and to bypass the problems of urban soil pollution and compaction, the controversial infrastructure needed by these techniques — i.e. energy, fertilisers, humidity controllers — is scarcely visible in the network, but the presence of many conferences about the issues might be a signal of an unstable acceptance.

The rest of this surface holds a bewildering multitude of objects, sometimes coming from the other surfaces, attracted and gravitating around the three main actors of the Parisian urban nature @paris, @anne_hidalgo, @pkomites. Their role in the network is for sure influenced by mechanism like “preferential attachment” or by usual contestation behaviours that we can find on line. Nevertheless, their political agenda mobilised, absorbed and repurposed all sort of new natural objects under a relentless publicity grounded in the permisdevegetaliser, the budgetparticipatif, the vegetalisons and the parisculteurs initiatives. These initiatives are trying to appease contrasts, opposition and frictions that still are populating this surface. They emerge in specific moments: the protests for ecosystemic disservices caused by trees (polluted leaves, feuille); the growing presence of rats in the city; the overall policy in favour a specific social class (bobos); some urbanistic intervention (serresdauteuil) on the public space (espacepublic); the wild un-conventional new aesthetic of the pit trees (pied, arbres) or the attachment to natural object of controversial meaning and symbolisation (arbres, terrorism).

¹⁷ For a review of the typology of ecosystemic services and disservices see (Rankovic, Pacteau, and Abbadie 2012).

- c) *Natural green backdrop*: on this surface, often a vertical one, objects are used to compose an ordered and aestheticized landscape.

It is the “in-the-city” “out-there”. It is here that tourists end up when travel, where people indulge while in pause on a working day or get fit by running. While the iconic, harmonious, and stable Parisian parks (jardinduluxembourg, jardindestuilleries, boisdevincennes, boisdeboulogne) are the places where enjoy the sun and the beauty of seasons (spring, printemps, summer, etc, automne, winter, hiver) and their colors; the jardindesplantes is the place where to be fascinated by the exotic beauty of orchidees, magnolia and cerisierjaponais or wild beasts (ours). These highly-maintained places still serve as baseline for aesthetic normality, evaluating human-nature relationship thus for a kind of urban-nature ethic. Far from the urban wild of the petiteceinture, in these places a green background offers its beauty, consumed through the vintage blackandwhite picture of robertdoisneau, captured with a selfie or while capturing a pokemon.

IMG. 8-10 In the following pages the trimestral tweets user-object networks.



DEVELOPPEMENT DURABLE

eau

b

AGRICULTURE

faïences
moyens
alimentation
cop21
bio

trames

naturesauvage
ecologie

SMART CITY

energie
startup

pollution

privévegetalise

canicule

bobes

ovins

AGRICULTURE URBAINE

terroir
fertile
fermeurbaine
marichere
fermeurbaine

ferme

permaculture
aquapole
jardinpartages
@agroparis13

NEW OBJECTS TERTIARISME

urbanisme
potager
vegetalisation
berges
@bergs
@hugoboulet
@bergs
@hugoboulet
@bergs
@hugoboulet

oisieux

facades
@gamine_hidalgo
@gamine_hidalgo
@gamine_hidalgo

foret

veloc
pietons

nudistes

fermepedagogique

fontainebleau



botanique

petite ceinture

boisfontaine
vegetal

TOURISME

voyage
@montparnasse
@montparnasse
@montparnasse



PHOTOGRAPHY

tree
nature
beauitful
sun
flowers

TULIERIES/LUXEMBOURG

paris
@paris
@paris
@paris

GRANDS JARDINS

Jardinpublic
jardin des plantes
@gardenofparis
@gardenofparis



c

2EME TRIMESTRE
octobre - decembre 2016

a

tower
FOOD
vegetables

localfood
start up
shippingcontainers
urbanfarming

bigdata

@insaislisse
openresearch

agroalimentaire

open source
numerique
emploi

eco quartiers
grandparis

agricultures
innovation
@min_agriculture

alimentation sols
vegetal vegan cop22

AGRICULTURE

agroecologie
@agoristech

opendata
cartographie
DEVELOPPEMENT DURABLE

agroroesterie

cop21

toiture
@cop21

amap

AGRICULTURE URBAINE

permaculture

ecolo

SMART CITY

loisavre

natureeville

permaculture

@veganbois

bois

@anne_hidalgo

feuilles

@importantfr

@scopshs

maison

permaculture

houblon

toitsepatis

toitsepatis

toitsepatis

toitsepatis

toitsepatis

toitsepatis

toitsepatis

toitsepatis

greenroofs

brebis eleavage
ovins
moutons
loup

serreeduteuil
@hightech

pollution
natureeville

permaculture

modiverste

SMART CITY

loisavre

permaculture

houblon

toitsepatis

toitsepatis

toitsepatis

toitsepatis

toitsepatis

toitsepatis

toitsepatis

toitsepatis

sustainability

pestes

alimentsaires

espaceverdierjardinpotager

@fermeaparis

champignons

NEW OBJECTS

voitures

@le_figaro

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

jeardin

alimentsaires

b

jardinspartages
habitatparticipatif

c

LAISSEZ-FAIRE

Aaah c'est eux !! Les **jardiniers clandestins** ! 🐿️🌿#guerillagardening #On les a trouvés chef! ☺️
Incredible: un jardin sauvage en plein coeur de Paris #biodiversité Reclaimed by Nature #Paris #beautiful
C'est à dire? La mairie de Paris réprime la plantation-de-fleurs- sans permis pour ce faire? o_ô
Morning jog Wild Flowers Happiness #travel #paris # flowers #instratravel #nature
Wild Beast in Bois de Vincennes. Nature sauvage dans Paris au bois de Vincennes
Les écologistes proposent de créer un espace vert dédié au **naturalisme** à Paris
Cessons de faire revenir des espèces en France. A chaque fois c'est pour les **tolerer** encore@mot@après. Regardez avec les loups
« Dernière chance pour la biodiversité » — Quand **Paris s'ensauvage**
Vivement le permis de sortir dans la rue ... suivra naturellement le permis de respirer. #OhWait
Paris est sale
Un hibou moyen-duc repéré au Jardin Abbé-Pierre Grands Moulins #paris13 Cette espèce avait disparu de Paris au XIXe siècle!
#Hidalgo élu « Diplômé verte de l'année » pour son action climatique et écologique 🌿🌿 Je pensais que c'était pour la propreté de #Paris ce qui serait bien ce serait un Paris propre, sans poubelles débordantes de tous côtés et sans rats ds les jardins publics
A **wolf pack** is forming on the outskirts of #Paris #nature
Paris : alerte aux rats dans les parcs et jardins
Paris part à la chasse aux rats et ferme des squares
Des Sept. 2014, @vincenotger754 signalait la multiplication de rats dans les jardins de Paris. 4e: #SantéPublique
ALERTE invasion de RATS — dans nos rues près de Gare de L'Est !!! C'est scandaleux @paris 🐀🐀🐀🐀🐀🐀🐀🐀🐀🐀

POLITIQUE DE BOBOS

#Paris #Pollution- **Politique gâtée** de Hidalgo ! Seul les bobos pour applaudir ce type de politique !
La bobo attitude des parisiens...! -----
La **symbolique niaise** bobo -gt La Ville de Paris plante ~28 arbres contre le terrafisme » à la Cité U #NiceAttentat
ça consomme combien un arbre connecté? ça coûte combien? Anne tu es la reine des BOBOS.
Et bientôt **#Paris sera un village de campagne** , avec ses forêts, ses pâturages et ses bobos
#Paris n'est pas qu'un jardin public pr bobos inactifs ms la capitale de ce qui était la France ... Vous la sabotez et la **détruisez** .
La mairie offre un arbre aux Parisiens ayant un jardin "d'au moins 10 m2". Félicitations aux 23 **millionnaires** qui vont en profiter
Quand les bobos parigos s'approprient la Bretagne pour leur ville degueulasse #Paris
Intoxiquer & empoisonner des animaux pour faire plaisir à ses électeurs bobos. #AnnieDingo invente l'écologie.
le **microcosme #bobo #écolo** contre #NDDI qui découvre via G+ qu'il y a des arbres dans sa ville
Araignées fourmis guêpes limaces et frelons bios garantis, les bobos adorent.
Propagande de bobos entre soi qui n'ont aucune idée de la force d'adaptation de la nature sans eux
Je viens de passer sur @M6, les bobos découvrent le compost. Nous on appelle ça le fumier, mais bon on est pas écologes a @Paris

DESTRUCTION DE LA NATURE

le greenwashing cosmétique continue pendant que **la Mairie de Paris bétonne** au détriment des espaces verts
A Paris quand on coupe un arbre on ne replante pas. On le laisse se "révégétaliser" !
La végétalisation de Paris : les 150 arbres de la porte Maillot abattus
Paris s'étouffe et manque cruellement de parc publique. La carte d'espaces verts est faussée!
@JF_Legarret présente un voeu relatif au développement des espaces verts à #Paris #ConseilParis
Les **ruines du Jardin d'agronomie tropicale** peuvent mourir tranquille. Projet non retenu dans le #BudgetParticipatif
Another piece of #Green, #Nature and #Freedom that will disappear soon from #Paris. **#RIP little #jardincommunautaire** ! #photovomber
Après Grand Train, dans le 18e, un projet immobilier fait débat dans le quartier: logements ou espaces verts ?
Les derniers **espaces verts et livres** de #Paris seront livrés au béton et à l'urbanisation: scandale A. #Hidalgo
Stop à la destruction d'espaces Verts #Paris: Signez et RT merci !
Square clos Feuquières et st...
Et au passage un espace vert de moins ! Svp signez la pétition pour sauver les arbres du secteur Léo Lagrange... Merci!
Hier c'était le jardin de la Goutte d'Or, aujourd'hui le TEP de Ménilmontant et demain le stade Léo Lagrange amputé et bordé de barres avec vue sur les tours de Bercy Charenton. La nature disparaît à la vitesse grand V à Paris malgré les **promesses** de petits toits végétalisés !
la blague le projet environnement ! Avec le grand paris on rase les parcs, on coupe les arbres #pollution #BudgetIDF

NATURE E CULTURE

Evacuation des **migrants** qui occupaient les Jardins d'Éole, à Paris C'est la **#canicule** , tous à l'ombre !!! Du haut des plus vieux #arbres de Paris quatre siècles nous contemplent.
#MaSolutionCanicule Attention, c'est un peu radical. Préserver un minimum d'arbres en ville. Il fait 4° de moins dans les deux bois de Paris
Orly : ler **aéroport** à rejoindre une asso pour la biodiversité
Fermés du futur: Big Data et agriculture de précision
Le Dalai-lama à Paris: "Nous sommes partis de la nature et nous devons la respecter"
We are so excited! **Cellular Agriculture** leader @NewHarvesOrg is coming and installing its #openresearch lab at La Paillasse in Paris!! 🌱 faire pousser plantes aro & fleurs comestibles ac des #capsules #pretapousser c'est possible #innovation
Un parc national urbain : Celui de Paris consacrerait ainsi la **biodiversité urbaine** et citoyenne, concept qu'il faut modeler soigneusement.
Une propal de plus: simplifions les mots de la biodiversité de @Paris et intégrons la notion de **biodiversité citoyenne**
Auteur d'un potager, rencontre des cultures du monde dans un centre d'accueil de migrants, bel article de Télérama
#végétaliser ville #brasseur #permaculture L'air parisien est pollué. **Houblon altéré** . La bière sera t-elle propre à la consommation? #santé
Et quid des **produits polluants et dangereux** : pesticides, insecticides, engrais, raticides, etc qui vont avec? (en réponse à: Plantez des arbres dans les jardins et les cours des immeubles, nous vous les offrons, Paris devient plus verte. 🌱)
Paris : 40000 tonnes de feuilles trop polluées pour être compostées
#régions
Les **#berges** de-Paris seront un grand parc rempli d'espaces de convivialité et d'utilité sociale 🌳🌳🌳🌳🌳🌳🌳🌳🌳🌳
#Hidalgo pourrit la vie des franciliens et des parisiens en fermant les #Berges et ose leur parler de **pétanque** !
Où l'on apprend dans Le Monde que la Mairie de Paris pense l'agriculture urbaine comme un **dispositif anti migrants**

IMG. 11 Example of the reconstruction of the hand-picked tweets composing the four micronarratives.

The latent agonistic space

While proceeding in the qualitative section of the pertinent tweets, a small sub corpus has been collected to keep track of those providing an alternative or remarkable entry into the issue. Instead of treating them as *noise*, they assumed the status of weak, still valuable, part of the overall Parisian urban nature mosaic. They have been visually order by time and by topic, so to form a text, a *micronarrative* (IMG. 11).

The first micronarrative conjures up a *laissez-faire* attitude towards nature. This attitude is perceived as positive in some of the tweets that advocate for more freedom in urban activities and interventions than those controlled by the city of Paris. At the same time, it is related a certain degree of wilderness reconquering the city, in the form of spontaneous plant growth, nudism or the presence of wild animals. These latter are the trigger for complaining about the apparent messiness and dirtiness that a *laissez-faire* attitude would, in turn, induce.

The second one is concerned with the beneficiaries of the new urban nature policy of the city. It is evident a resentment against a policy that seems to be designed for a specific social class: the *bobos*¹⁸. So the revegetation movement is seen as exclusive, idealist, unfair and overall a marketing device to please the electoral base of the mayor.

The third narrative suggests that nature is actually being destroyed in Paris, contrarily to what the main narrative affirms. It uses examples by grassroots activists that fight against the felling of trees, the destruction of shared gardens or green spaces in the city, replaced by urban renewal projects. This narrative has some connections with the first one and the second one, since it criticizes choices made by city of Paris to favour particular ways of producing nature at the expense of others.

Finally, the forth micro narrative associates urban nature with other urban issues, contrarily to the main narrative that tend to autonomies revegetation efforts under the term *végétalisation*. In particular, transportation issues, arrival of migrants, pollution or climate change are being articulated and weighted against the importance of the revegetation policy.

The visual space

Baselines

The first entry point into the visual space is provided by the analysis of most retweeted images. Images are placed in a Cartesian space with the horizontal axis representing time and the vertical axis representing the number of retweets. The visualization allows to observe what type of urban nature generate more engagement over time. It is a baseline providing a sort of visual score of the Parisian nature, where each image constitutes, visually, a micro facet of the main mosaic.

Considering images retweeted from 250 to 30 times (IMG.12), a large part of the visual space is composed of a nostalgic and aestheticizing interpretation of urban nature: black and white photos of Parisian parks, old paintings, symmetrical shots and tree-lined perspectives, they are the visual depiction of the discursive surface that we call *natural green backdrop*. In order to go over this first coating, a second visualisation considers images retweeted between 29 and 15 times (IMG.13). Its presents a more diverse, less aestheticizing and more actively produced environment, depicting the overlap of the *technological agrarian urbanism* and the *unsettle biophilic tension* surfaces. Here it is possible to find at the same time *pieds d'arbres*, rooftop garden inaugurations, green walls, growing vegetables, green initiatives promotional material.

The top images analysis offers a first, rather general overview of the imaginary produced on Twitter. To better qualify what is specifically associated to different terms, a second visual method has been adopted.

¹⁸ In France, the term has become widely used negatively to design a political enemy characterized by a mix of trendsetting and alternative lifestyle, concerned for ecology but with economic power and living in well-to-do parts of the metropolis.



IMG. 12 Plot of the images retweeted at least 30 times.



IMG. 13 Plot of the images retweeted at least 15 times.

Moodboards

The moodboard method allows to visually qualify ambiguous objects, by disclosing of which images a specific term is composed. We selected the tweets mentioning in their text a specific object, in the first visualisation is *nature*. Then the eventual images contained in the tweet itself have been harvested. By using a content recognition algorithm¹⁹, a set of keywords has been generated and attached to each image. A weighted bipartite network has been built using images and tags. The weight of the edges corresponds to the confidence interval that the algorithm gives for the association image-tag. The method has been applied by grouping images into trimester, so to disclose the evolution over time. (IMG.14)

A first look confirms the presence of a continuum opposing a rather traditional conception of nature to human activity: most of the images depict landscapes without human presence, while clusters containing people is rather small. When humans are included, they mainly use natural features as a background.

The aesthetic of urban nature could be appreciated along a polarised spectrum (Ross 2003) on the one hand the macroscopic level of vast panoramas, on the other, the microscopic of small and particular elements. The method allows to observe at which scale urban nature is more often represented. From top to bottom, images progressively move from a macro view (sunsets, horizons, skies), moving to medium-scale elements (trees, rivers and gardens) up to a micro view (flowers, insects, leaves). The first extreme of this gradient is the one with more images, reinforcing the argument that nature is appreciated mainly through wide-angular views.

Comparing the visualization of two trimesters (IMG. 15), it is possible to notice the rise and fall of season specific elements, such as flower in spring leaving spaces to foliage footage in fall. Furthermore, the visual space observed through the *nature*, suggests mainly an aestheticizing, to-be-consumed conception of nature. The act of building of reintroducing nature in the urban setting with their associated practices are marginally represented.

To dig into the practices of urban nature, the same method has been applied to other object, namely agriculture and *végétaliser*.

Urban agriculture can be roughly divided into three main types: community and family garden; the remnants of industrial farming incorporated in the urban territory, and a new high-tech agriculture, often linked to the smart city. In the agriculture moodboard, images cluster as if they are attracted by 3 poles: depictions, people, infrastructure. Within this *meso* layout it is possible to observe what type of urban agriculture is imagined, in particular how much the new high-tech imaginary occupies the visual space. Parisian urban agriculture seems to be linked to a conception of made of rooftop gardens and micro-farming. Images referring to a high-tech imagery, such as vertical tower, are marginal in the visualization. Even in the moodboard of the trimester January-March (IMG 16), where the number of images increases considerably, therefore rendering a multifaceted space, agricultural infrastructures are still connected to a low tech imaginary. One of the few images introducing a high-tech aesthetic is repeated in numerous instances, suggesting that, even if still marginal, when that new aesthetic is introduced, it resonates very quickly.

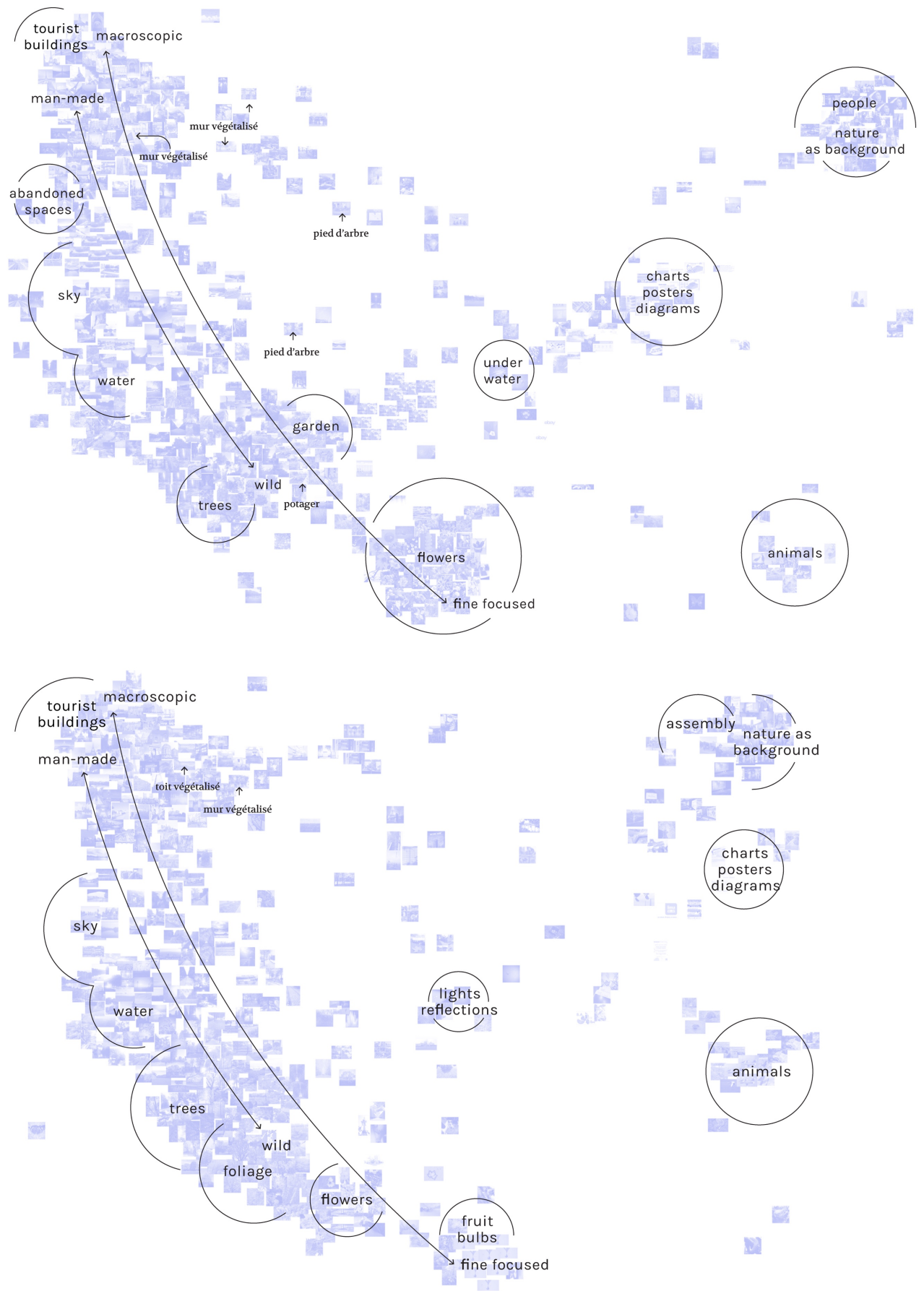
The same method applied to images tweeted with the objects *végétaliser*, *vegetalisation* and *vegetalisons* renders as well an aesthetic lacking any sign of sophisticated technology. It mainly presents (IMG. 17) small revegetation initiatives over renders of city green mega projects, do-it-your-own wood structures over light metal buildings covered in flourishing vegetation.

The method also allows to identify which recurrent objects are composing the revegetation visual space: the pit trees and the green wall seem to be the objects around which the visual discourse is constructed. The differences in which these two elements are depicted calls for a closer look.

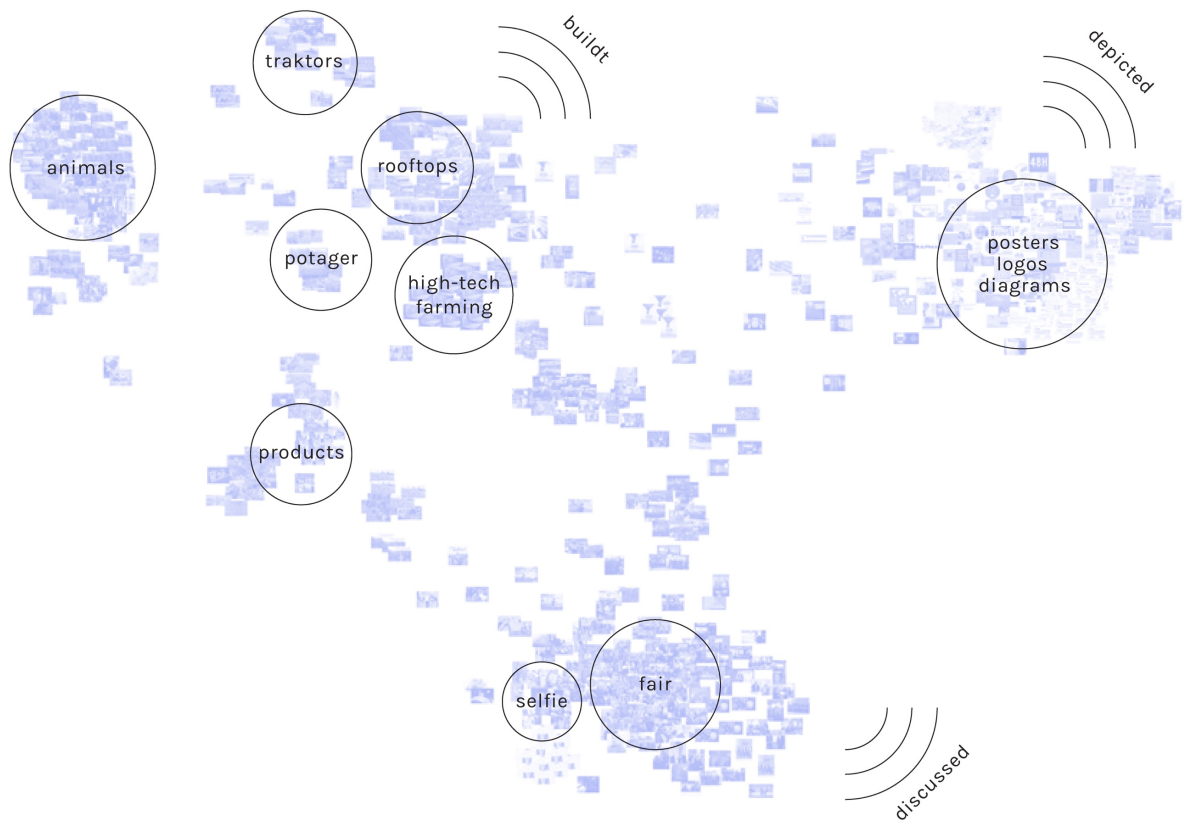
¹⁹ For this task, it has been used the Image Tagging API provided by IMAGGA (<https://docs.imagga.com/#auto-tagging>). The model used by this service is trained on generic images, therefore it was considered suitable for the NATURPRADI dataset, composed of very different type of images (photos, drawings, posters, screenshots).



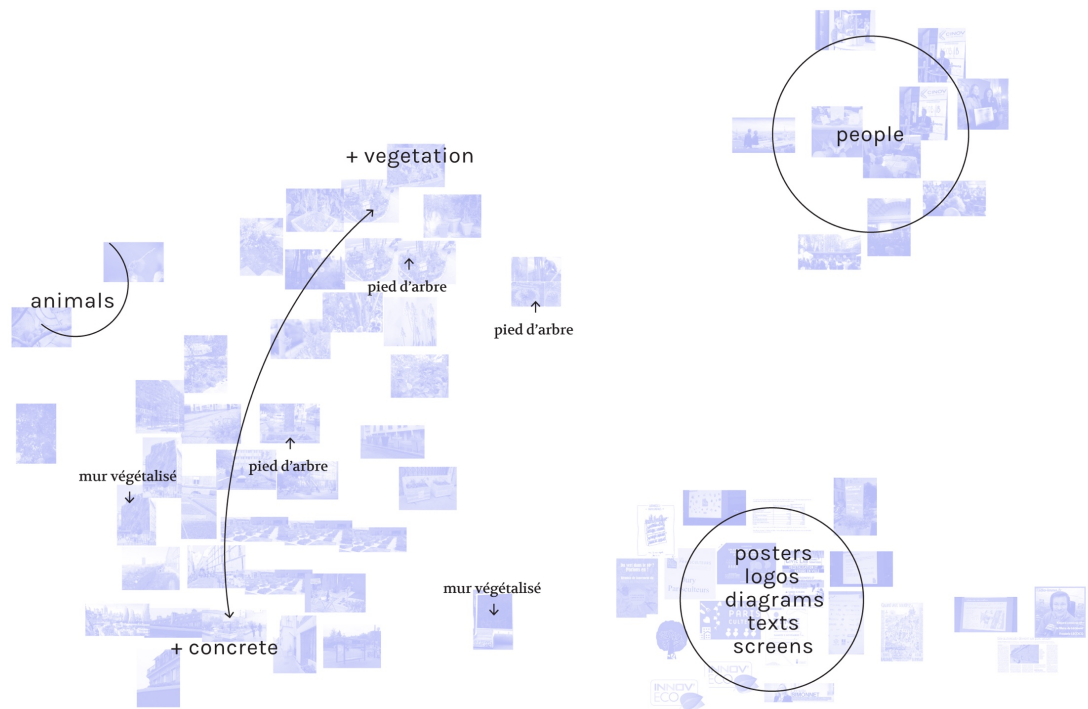
IMG. 14 Network of the images contained in tweets mentioning the word "nature" for the first trimester of observation.



IMG. 15 Interpretative diagrams of the first two trimester of observation. The diagrams are based on the networks of pictures contained in tweets mentioning the word “nature”.



IMG. 16 Interpretative diagrams of the third trimester of observation. The diagram is based on the networks of pictures contained in tweets mentioning the word “agriculture”.



IMG. 17 Interpretative diagram of the second trimester of observation. The diagram is based on the networks of pictures contained in tweets mentioning the words “végétaliser”, “vegetalisation” and “vegetalisons”.

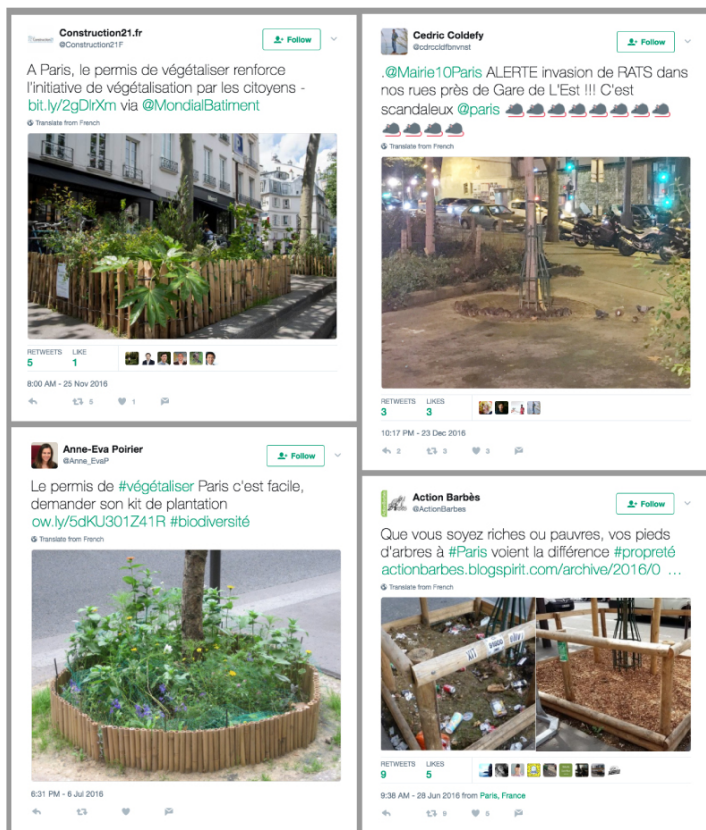
Object-network

In order to observe the role of two central objects within the visual space — mur végétalisé and pied d'arbre — an additional method has been designed. The central question is: which issues do these objects host? Which concerns and sub-issues those objects are able to catalysing? To operationalise these questions, the relation between the images and the text of the tweets in which they are contained is explored.

Since the visual variants of the two objects do not allow to use any form of automatic content recognition, each image depicting a green wall or a pit tree has been selected manually and then, the hashtags and the entities present in the tweet have been retrieved. It has been produced a bipartite network containing the images and their associated textual entities. Images are visualized with a lower opacity, and textual entities are visualized on top of them and resized according to their frequency.

In the mur végétalisé visualization (IMG. 19), two main issues can be identified by looking at both images and text. On the left, green walls are architectural elements identified by their location and framed as spaces in the city where nature slowly reconquers the human built environment. On the right of the map, the green wall is a high-tech novelty, a smart device put in place to counter air pollution.

The “pied d'arbre” visualization (IMG. 20) shows a more disperse space, expression of the various issues that this single object is able to mobilize. First, the pied d'arbre is strictly connected to the permisdevegetaliser, the re-vegetation flagship initiative of the municipality. This particular object brought into the debate a plethora of sub issues and in order to explore them, it is possible to retrieve the actual tweets, using the network visualization as an index. Looking closer at single tweets (IMG. 18), the pied d'arbre becomes a place for celebrating biodiversity, but also an occasion for setting what in the biodiversity scheme for Paris is accepted and what is not; it is used as visual symbol for celebrating bottom-up vegetation processes as well as a way to expose inequalities in the city.



IMG. 18 Hand-picked selection of tweets containing a “pied d'arbre”.

From quantification to delineation, to composition

Through the Digital Methods campaign, its peculiar data collection protocol, the triangulation of different analyses and visualisations it has been possible to produce a cohesive restitution of the fragmented mosaic of the Parisian urban nature issue and its evolution over 9 months. Observing both the discursive and the symbolic instances of the debate flowing over Twitter, it has been possible to appreciate the effects of the re-naturation policy of the municipality along with the associated constellation of publics and objects. Populating 3 overlapping surfaces, still gravitating around the same political and institutional pivot, these publics and objects are negotiating toward what ends nature should be *brought back* and *preserved* or *designed in* to the urban realm.

On the one hand, a managerial, hi-tech global vision — that finds in national and international information outlets as well in political support a quick and intense amplification — is exerting a growing pressure to be accepted in the everyday life of the city. On the other, the cultural heritage of the city, its iconic identity — that finds a resistant rooting in the allure of its parks — anchors the city in an aestheticized wide-angular dreamy vision of the urban nature. It is not by chance that the users revolving and participating to the construction of these two visions are often expressing themselves in other languages than French, being them international companies and start-ups, research centres or tourists. Far from setting an artificial distinction and separation of the different ways of being in the city and attaching to them any sort of different privilege, the active inhabitants of the actual and future Parisian urban nature are in the middle of these two forces. Through the constant alignment and dis-alignment with political and institutional entities they are going to decide upon which practices, both public and private, are going to constitute the normal vision of the urban nature. It has been shown how a plethora of objects, ranging from the rats to the recuperation of the techniques linked to the *marâchère* horticulture, is under debate, some of these will probably be filtered out either by “top-down” or “bottom-up” processes. What is of interest here is how these objects will make evolve at the same time the public and the political actions. Will the normalised adoption of the *pieds d’arbre* extended widely to city, letting a more profound questioning of the dominant aesthetic of the urban nature, or will it be still confined in outside of the touristic ventral areas where the Haussmannian pit tree grid will still be the clean invisible link to the city cultural heritage? At first this kind of questions — that can be easily extended at almost any other objects that has been found in our observation — may appear mundane, but it opens up to the re-definition of the “public space” re-articulating, at a different level, single citizens, tourists, social classes, transportation means, hygienic needs, unbidden animals and plants. This kind of questions are able to elicit the interactions between humans, the environment and the city, and to capture their intensity. They enable to reconsider urban nature as the persistent result of the interaction between humans and nonhumans actors, by making visible the relationship that ties individual and collective practices to environmental resources.

While delineating, although in an overlapped and fuzzy way, the surfaces of the Parisian urban nature has been the primary objective of the NATURPRADI project, sustaining their internal re-composition is still an open challenge, especially in terms of public policies. These ones should be concerned more in the processes of movement and entanglement rather than in tracing boundaries. We emphasize that having exposed the heterogeneous assembly that in a multiscale logic aggregate publics and objects is a first step to imagine new ways for the city, citizens, and other living beings to interact. It entails a process of *public imagination* defined as the possibility to produce with the public new, visual or material, representations of the issue, with the necessary aesthetic qualities and informed knowledge, in order to imagine how to act and intervene within them. In this way is possible to transcend the metaphoric qualities of the nature and their translation into goal and targets. Their risk is to operate, more or less efficiently, as organising, delocalised, principles acting upon inert objects and matters, thus excluding experiences, attachments and concerns. Without these aspects, goals and target, can be easily commodified becoming a form of accountancy, a tool and a stock for the “green business as usual”.

If nature has not to become a metric or a tool this will question profoundly both city institutions and citizens, because nature is not always present into an operational, cleaned-up, and green manifestation. Urban nature is not just about the modern idea of pleasantness, productivity or mitigation. It includes

invisible aspects that may be messy including struggles and conflicts inherent to their politics. In this sense there should be an abandon of the ideal of domesticating nature, pre-process it for the urban realm, rather than the embracing of a “dwelling perspective” (Ingold 2000) towards the built and unbuilt environment: “the forms people build, whether in the imagination or on the ground, arise within the current of their involved activity, in the specific relational contexts of their practical engagement with their surroundings”.

Co-interpretation with the public

Our approach leaves open one last question that we will try to address in its future development. If nature has to be produced through the combination of social, technological and material objects, what kind of participative practices are needed to open the question up so that concerned and affected citizens can help provide their own answers?

As previously suggested, digital methods are not big-data methods but research design processes that take into account both the data to be transformed as much as the publics concerned with the issue at hand. Therefore, we will actively seek to engage the public participation in our research. A format called data sprint that enables participatory research has been experimented at the SciencesPo|médialab (Munk, Meunier, and Venturini 2017). In the NATURPRADI project to continue this commitment in engaging the public into research endeavour we are attempting a format of public workshop that fits with the principle of visualisation (Ricci 2010) and diagrammatic interpretation we have implemented in the project.

We propose to invite actors involved in the production of urban nature — whether politician, association, researcher, public servant — for a half-day workshop to interpret our visualisation to produce new diagrams according to specific research questions. Apart from being a quick way to explore and analyse our dataset, the workshop is also a temporary space whose organisation is negotiated with the participants — whose points of view on the issue might be very different — around the maps. The meetings we have with potential participants enable us to start imagining questions for our visualisations, for example: Can we identify different modes of engagement with nature? Can we explore different imaginaries linked to green innovation and the future of urban nature? What type of maintenance (including costs) do the new objects entail? How do they fare with regard to biodiversity?

To extend the pragmatist approach of the project, the final dataset, visualisations, their analysis and their interpretation are shared with the public, producing a discussions spaces, trying stimulating engagement, develop with the public new material and intellectual technologies, new attachments to make the issues evolve. The Digital Methods campaign of the NATURPRADI project, operates, in this way as a public laboratory. By equipping actors involved in the issues (Venturini et al. 2015) and by opening up to them, in specific moments, the research, it incorporates their concerns in the enquiry.

Bibliography

- Angelo, Hillary, and David Wachsmuth. 2015. "Urbanizing Urban Political Ecology: A Critique of Methodological Cityism." *International Journal of Urban and Regional Research* 39 (1): 16–27. doi:10.1111/1468-2427.12105.
- APUR. 2010. "Situation et Perspectives de La Place de La Nature À Paris. Situation et Perspectives de La Place de La Nature À Paris." Paris.
- Bell, David V. J., Gerda R. Wekerle, and Roger Keil. 1996. *Local Places in the Age of the Global City*. Montréal: Black Rose Books.
- Blandin, Patrick. 2009. *De La Protection de La Nature Au Pilotage de La Biodiversité*. Versailles: Éditions Quae.
- Blank, Grant. 2016. "The Digital Divide Among Twitter Users and Its Implications for Social Research." *Social Science Computer Review*. SAGE Publications. doi:10.1177/0894439316671698.
- Bruns, Axel, and Jean E. Burgess. 2011. "The Use of Twitter Hashtags in the Formation of Ad Hoc Publics."
- Burgess, Jean, and Axel Bruns. 2015. "Easy Data, Hard Data : The Politics and Pragmatics of Twitter Research after the Computational Turn." In *Compromised Data : From Social Media to Big Data*, edited by Ganaele Langlois, Joanna Redden, and Greg Elmer. London: Bloomsbury Publishing.
- Burgess, Jean, and Cornelius Puschmann. 2014. "The Politics of Twitter Data." In *Twitter and Society*, edited by Katrin Weller, Axel Bruns, Jean Burgess, Merja Mahrt, and Cornelius Puschmann. New York: Peter Lang.
- Checker, Melissa. 2011. "Wiped Out by the 'Greenwave': Environmental Gentrification and the Paradoxical Politics of Urban Sustainability." *City & Society* 23 (2). Blackwell Publishing Inc: 210–29. doi:10.1111/j.1548-744X.2011.01063.x.
- Claudel, Matthew, and Carlo Ratti. 2016. "Dimensions of the Future City." In *Cities in the 21st Century*, edited by Oriol Nel·lo and Renata Mele, 162–78. New York: Routledge.
- Collins, James, Ann Kinzig, Nancy Grimm, William Fagan, Diane Hope, Jianguo Wu, and Elizabeth Borer. 2000. "A New Urban Ecology." *American Scientist* 88 (5): 416–25. doi:10.1511/2000.5.416.
- Cronon, William. 1991. *Nature's Metropolis : Chicago and the Great West*. New York: W.W. Norton.
- Dewey, John. 1927. *The Public and Its Problems*. Athens, OH: Swallow Press Books, Henry Holt & Company.
- Douglas, Ian, David Goode, Mike Houck, and Rusong Wang. 2010. "Urban Ecology." In *Handbook of Urban Ecology*, 3–7. London: Routledge.
- Freyfogle, Eric T. 2001. *The New Agrarianism: Land, Culture, and the Community of Life*. Washington: Island Press.
- Gandy, Matthew. 2002. *Concrete and Clay*. Cambridge, Mass.: The MIT Press.
- . 2006. "Urban Nature and the Ecological Imaginary." In *In the Nature of Cities: Urban Political Ecology and the Politics of Urban Metabolism*, edited by Nik Heynen, Maria Kaika, and Erik Swyngedouw, 63–75. New York: Routledge.
- Gerlitz, Caroline, and Bernard Rieder. 2013. "Mining One Percent of Twitter: Collections, Baselines, Sampling." *M/C Journal*.
- Gillespie, Tarleton. 2010. "The Politics of 'Platforms.'" *New Media & Society* 12 (3): 347–64. doi:10.1177/1461444809342738.
- . 2014. "The Relevance of Algorithms." In *Media Technologies: Essays on Communication, Materiality, and Society*, edited by Tarleton Gillespie, Pablo J. Boczkowski, and Kirsten A. Foot. Cambridge, Massachusetts: MIT Press.
- Gomart, Emilie, and Antoine Hennion. 1999. "A Sociology of Attachment: Music Amateurs, Drug Users." *The Sociological Review* 47 (S1). Blackwell Publishing Ltd: 220–47. doi:10.1111/j.1467-954X.1999.tb03490.x.
- Gould, Kenneth A., and Tammy L. Lewis. 2016. *Green Gentrification: Urban Sustainability and the Struggle for Environmental Justice*. New York: Routledge.
- Graham, S., and N. Thrift. 2007. "Out of Order: Understanding Repair and Maintenance." *Theory, Culture & Society* 24 (3). SAGE Publications: 1–25. doi:10.1177/0263276407075954.
- Hartig, Terry, and Peter H. Kahn. 2016. "Living in Cities, Naturally." *Science* 352 (6288).
- Harvey, David, and Bruce Braun. 1996. *Justice, Nature and the Geography of Difference*. Oxford: Blackwell.
- Heynen, Nik, Maria Kaika, and Erik Swyngedouw. 2006. "Urban Political Ecology. Politicizing the Production of Urban Natures." In *In the Nature of Cities: Urban Political Ecology and the Politics of Urban Metabolism*, edited by Nik Heynen, Maria Kaika, and Erik Swyngedouw, 1–19. New York: Routledge.
- Hinchliffe, S., M. B. Kearnes, M. Degen, and S. Whatmore. 2005. "Urban Wild Things: A Cosmopolitical

- Experiment." *Environment and Planning D: Society and Space* 23 (5). SAGE Publications: 643–58. doi:10.1068/d351t.
- Ingold, Tim. 2000. *The Perception of the Environment : Essays on Livelihood, Dwelling & Skill*. London: Routledge.
- Jacobs, Jane. 1961. *The Death and Life of Great American Cities. Readings in Planning Theory, Fourth Edition*. New York: Vintage.
- Jacomy, Mathieu, Tommaso Venturini, Sebastien Heymann, and Mathieu Bastian. 2014. "ForceAtlas2, a Continuous Graph Layout Algorithm for Handy Network Visualization Designed for the Gephi Software." *PLoS One* 9 (6): e98679. doi:10.1371/journal.pone.0098679.
- Kaika, Maria, and Erik Swyngedouw. 2011. "The Urbanization of Nature: Great Promises, Impasse, and New Beginnings." In *The New Blackwell Companion to the City*, edited by Gary Bridge and Sophie Watson, 96–107. Blackwell.
- Keil, Roger. 2003. "Urban Political Ecology." *Urban Geography* 24 (8). Taylor & Francis Group: 723–38. doi:10.2747/0272-3638.24.8.723.
- . 2005. "Progress Report—Urban Political Ecology." *Urban Geography* 26 (7). Taylor & Francis Group: 640–51. doi:10.2747/0272-3638.26.7.640.
- Kirby, Andrew. 2012. "Current Research on Cities and Its Contribution to Urban Studies." *Cities* 29 (Supplement 1): S3–8. doi:10.1016/j.cities.2011.12.004.
- Krueger, Rob., and David Gibbs. 2007. *The Sustainable Development Paradox : Urban Political Economy in the United States and Europe*. New York: Guilford Press.
- Kuttler, Wilhelm. 2008. "The Urban Climate – Basic and Applied Aspects." In *Urban Ecology*, edited by John M. Marzluff, Eric Shulenberger, Wilfried Endlicher, Marina Alberti, Gordon Bradley, Clare Ryan, Ute Simon, and Craig ZumBrunnen, 233–48. Boston, Mass.: Springer. doi:10.1007/978-0-387-73412-5.
- Latour, Bruno. 2004. *Politics of Nature*. Cambridge, Mass.: Harvard University Press.
- . 2005. *From Realpolitik to Dingpolitik – An Introduction to Making Things Public*. Edited by Bruno Latour and Peter Weibel. *Making Things Public—Atmospheres of Democracy*. Cambridge Mass.: The MIT Press.
- Latour, Bruno, and Emilie Hemant. 1998. *Paris Ville Invisible*. Paris: Les Empêcheurs de tourner en rond/La Découverte.
- Lawrence, Henry W. 2008. *City Trees : A Historical Geography from the Renaissance through the Nineteenth Century*. Charlottesville: University of Virginia Press.
- Legenne, Corinne. 2009. "La Desserte En Espaces Verts, Un Outil de Suivi de La Trame Verte D'agglomération." Paris.
- Lévy, Jean-Pierre, and Isabelle Hajek. 2016. "La Nature Urbaine, Une Utopie Paradoxe." *Futuribles*, no. 414: 61–72.
- Macnaghten, P, and J Urry. 1998. *Contested Natures*. London: Sage.
- Marres, Noortje. 2005. "Issues Spark a Public into Being: A Key but Often Forgotten Point of the Lippmann-Dewey Debate." In *Making Things Public: Atmospheres of Democracy*, edited by Bruno Latour and Peter Weibel. Cambridge, Mass.: The MIT Press.
- . 2007. "The Issues Deserve More Credit: Pragmatist Contributions to the Study of Public Involvement in Controversy." *Social Studies of Science* 37 (5). SAGE Publications: 759–80. doi:10.1177/0306312706077367.
- Marres, Noortje, and Carolin Gerlitz. 2016. "Interface Methods: Renegotiating Relations between Digital Social Research, STS and Sociology." *The Sociological Review* 64 (1): 21–46. doi:10.1111/1467-954X.12314.
- Marres, Noortje, and Richard Rogers. 2005. "Recipe for Tracing the Fate of Issues and Their Publics on the Web." In *Making Things Public: Atmospheres of Democracy*, edited by Bruno Latour and Peter Weibel. Cambridge Mass.: The MIT Press.
- Marres, Noortje, and Esther Weltevrede. 2013. "SCRAPING THE SOCIAL?" *Journal of Cultural Economy* 6 (3). Taylor & Francis Group: 313–35. doi:10.1080/17530350.2013.772070.
- Mayr, Philipp, and Katrin Weller. 2017. "Think before You Collect: Setting up a Data Collection Approach for Social Media Studies." In *The SAGE Handbook of Social Media Research Methods*, edited by Luke Sloan and Anabel Quan-Haase, 679. London.
- Morton, Timothy. 2007. *Ecology without Nature : Rethinking Environmental Aesthetics*. Cambridge Mass.: Harvard University Press.
- Munk, Anders Kristian, Axel Meunier, and Tommaso Venturini. 2017. "Data Sprints: A Collaborative Format in Digital Controversy Mapping." In *Digital STS Handbook*, edited by David Ribes and Janet Vertesi. Princeton University Press, 2017.

- Newman, Andrew. 2011. "Contested Ecologies: Environmental Activism and Urban Space in Immigrant Paris." *City & Society* 23 (2). Blackwell Publishing Inc: 192–209. doi:10.1111/j.1548-744X.2011.01062.x.
- Paull, John. 2013. "'Please Pick Me': How Incredible Edible Todmorden Is Repurposing the Commons for Open Source Food and Agricultural Biodiversity." In *Diversifying Foods and Diets*, edited by Jessica Fanzo, Danny Hunter, Teresa Borelli, and Federico Mattei, Routledge. London.
- Pellegrini, Patricia, and Sandrine Baudry. 2014. "Streets as New Places to Bring Together Both Humans and Plants: Examples from Paris and Montpellier (France)." *Social & Cultural Geography* 15 (8). Routledge: 871–900. doi:10.1080/14649365.2014.974067.
- Pellegrini, Patricia, and Patricia. 2012. "Pieds D'arbre, Trottoirs et Piétons : Vers Une Combinaison Durable ?" [Http://developpementdurable.revues.org](http://developpementdurable.revues.org), no. Vol. 3, n° 2. Réseau « Développement durable et territoires fragiles ». doi:10.4000/DEVELOPPEMENTDURABLE.9329.
- Quaggiotto, Marco. 2008. "Knowledge Cartographies: Tools for the Social Structures of Knowledge Spaces." In , edited by Pier Paolo Peruccio and Carla Cipolla. Turin: Allemandi.
- Rankovic, Aleksandar, Chantal Pacteau, and Luc Abbadie. 2012. "Services Écosystémiques et Adaptation Urbaine Interscalaire Au Changement Climatique : Un Essai D'articulation." *Doi.org*, no. Hors-série 12. OpenEdition. doi:10.4000/vertigo.11851.
- Ricci, Donato. 2010. "Seeing What They Are Saying: Diagrams for Socio-Technical Controversies." In *DRS2010 - Design & Complexity Proceedings*, edited by David Durling, Rabah Bousbaci, Lin-Lin Chen, Philippe Gauthier, Tiiu Poldma, Seymour Rowoth-Stokes, and Erik Stolterman. Montreal.
- Rogers, Richard. 2013a. *Digital Methods*. Cambridge Mass.: The MIT Press.
- . 2013b. "Debanalizing Twitter." In *Proceedings of the 5th Annual ACM Web Science Conference on - WebSci '13*, 356–65. New York, New York, USA: ACM Press. doi:10.1145/2464464.2464511.
- Röhle, Bernhard, and Theo Rieder. 2012. "Digital Methods: Five Challenges." In *Understanding Digital Humanities*, 67–84. London: Palgrave Macmillan UK. doi:10.1057/9780230371934_4.
- Rose, Gillian. 2016. *Visual Methodologies : An Introduction to Researching with Visual Materials*. 4th ed. London: SAGE Publications.
- . 2017. "Screening Smart Cities: Managing Data, Views And Vertigo." In *Compact Cinematics*, edited by Pepita Hesselberth and Maria Poulaky. London: Bloomsbury.
- Ross, Stephanie. 2003. *Contemporary Aesthetics. Contemporary Aesthetics*. Vol. 4. Contemporary Aesthetics.
- Schroeder, Ralph. 2014. "Big Data and the Brave New World of Social Media Research." *Big Data & Society* 1 (2). SAGE PublicationsSage UK: London, England: 205395171456319. doi:10.1177/2053951714563194.
- Seto, Karen C., Michail Fragkias, Burak Güneralp, and Michael K. Reilly. 2011. "A Meta-Analysis of Global Urban Land Expansion." Edited by Juan A. Añel. *PLoS ONE* 6 (8). Public Library of Science: e23777. doi:10.1371/journal.pone.0023777.
- Soper, K. 1995. *What Is Nature? Culture, Politics and the Non-Human*. Cambridge, Mass.: Blackwell.
- Swyngedouw, Erik. 1996. "The City as a Hybrid: On Nature, Society and Cyborg Urbanization." *Capitalism Nature Socialism* 7 (2). Taylor & Francis Group: 65–80. doi:10.1080/10455759609358679.
- . 2014. "The Violence of Sustainable Urbanity." *Harvard Design Magazine*, no. 37: 24–29.
- Uggla, Ylva. 2010. "The Values of Biological Diversity: A Travelogue." *Journal of Environmental Planning and Management* 53 (1). Routledge: 91–105. doi:10.1080/09640560903399806.
- UNDESA. 2012. "World Urbanization Prospects: The 2011 Revision." *Presenta-Tion at the Center for Strategic and* New York. doi:10.2307/2808041.
- VanDijck, José. 2013. *The Culture of Connectivity : A Critical History of Social Media*. Oxford: Oxford University Press.
- Varnelis, Kazys, ed. 2008. *Networked Publics*. Cambridge, Mass.: MIT Press.
- Venturini, Tommaso, Donato Ricci, Michele Mauri, Lucy Kimbell, and Axel Meunier. 2015. "Designing Controversies and Their Publics." *Design Issues* 31 (3). The MIT Press One Rogers Street, Cambridge, MA 02142-1209 USA journals-info@mit.edu : 74–87. doi:10.1162/DESI_a_00340.
- Viitanen, Jenni, and Richard Kingston. 2014. "Smart Cities and Green Growth: Outsourcing Democratic and Environmental Resilience to the Global Technology Sector." *Environment and Planning A* 46 (4). SAGE Publications: 803–19. doi:10.1068/a46242.
- Waters, Colin N., Jan Zalasiewicz, Colin Summerhayes, Anthony D. Barnosky, Clément Poirier, Agnieszka Gałuszka, Alejandro Cearreta, et al. 2016. "The Anthropocene Is Functionally and Stratigraphically Distinct from the Holocene." *Science* 351 (6269).

White, Mason. 2010. "The Productive Surface." *Places Journal*. doi:10.22269/101101.

Williams, Nicholas S G, Mark W. Schwartz, Peter A. Vesk, Michael A. McCarthy, Amy K. Hahs, Steven E. Clemants, Richard T. Corlett, et al. 2009. "A Conceptual Framework for Predicting the Effects of Urban Environments on Floras." *Journal of Ecology* 97 (1). Blackwell Publishing Ltd: 4–9. doi:10.1111/j.1365-2745.2008.01460.x.

Wilson, Edward O. 1984. *Biophilia*. Cambridge, Mass.: Harvard University Press.