Urbanite

Supporting the decision-making in urban transformation with the use of disruptive technologies

Deliverable D2.6

Impact analysis and recommendations

Authors:	Max Kortlander, Marit Hoefsloot
Responsible Partner:	Waag Futurelab
Status-Version:	Version 1 – Final
Date:	29.06.2023
Distribution level (CO, PU):	Public Deliverable

Project Number:	GA 870338
Project Title:	Urbanite

Title of Deliverable:	Impact analysis and recommendations
Due Date of Delivery to the EC:	30/06/2023

Workpackage responsible for the Deliverable:	WP2 - Social impact of disruptive technologies
Editor(s):	Waag
Contributor(s):	FVH, AMST, TECNALIA, C. Messina, MLC
Reviewer(s):	FVH, AMST, TECNALIA
Approved by:	All Partners
Recommended/mandatory readers:	WP6

Abstract:	This report gathers the experiences attained in all the tasks carried out in WP2 to convert them into recommendations and lessons learned for any public administration aiming at using similar disruptive technologies.
Keyword List:	Recommendations, Public Administration Disruptive Technologies, Social Policy Labs, Civil Society Engagement
Licensing information:	This document is licensed under Creative Commons Attribution-ShareAlike 3.0 Unported (CC BY-SA 3.0) https://creativecommons.org/licenses/by-sa/3.0/
Disclaimer	This document reflects only the author's views and neither Agency nor the Commission are responsible for any use that may be made of the information contained therein

Document Description

Document Revision History

Version	Date	Modifications Introduced	
		Modification Reason	Modified by
v0.1	07/12/2022	First draft version	Waag
v0.2	19/12/2022	Comments and suggestions received by consortium partners	Forum Virium Helsinki, City of Amsterdam, Tecnalia
v0.3	21/12/2022	Edits made based on the comments and suggestions by partners	Waag
v0.4	10/05/2023	Document revised	Waag
v0.5	22/06/2023	Final feedback provided	Tecnalia
v0.6	29/06/2023	Final feedback revision and delivery final version	Waag
v1	30/06/2023	Final version submitted to EC	Tecnalia

Table of Contents

Table of Contents 4
Terms and abbreviations 5
Executive Summary 6
1 Introduction 7
2 Challenges and recommendations 7
2.1 Challenges (Necessary Steps) 7
2.2 Recommendations (Design Process Priorities) 9
Clear internal organisation of the public administration 9
Participatory development 10
Identification of a shared mission 10
Modular and iterative development 11
Open (standards / source / process) 11
Education 12
Explainability 13
Model trustworthiness 13
2.3 Social Impact (Informed Human Decision-making and Trust) 14
Informed Human Decision-making 14
Trust 14
3 Conclusion 15
References 16
Appendix The local contexts of the pilot cities 17
Amsterdam 17
Bilbao 18
Helsinki 18
Messina 19
Social impact in the context of pilot cities 21

Terms and abbreviations

EC	European Commission
GDPR	General Data Protection Regulation
Social Policy Labs (SoPoLabs)	Co-creation sessions with local policymakers, civil servants, and other stakeholders from civil society aimed to identify social challenges associated with the use of disruptive technologies in the provision of services by public administrations.
Use cases	Used to refer to the pilot cities; Amsterdam, Bilbao, Helsinki, and Messina

Executive Summary

Which factors influence the adoption and integration of disruptive technologies (e.g., artificial intelligence, machine learning, simulation and prediction models, mapping, data analysis) in public decision-making processes? Urbanite approaches this question through the lens of municipal efforts to develop local mobility data ecosystems that integrate various datasets and disruptive technologies. Our findings are relevant for all decision-makers (e.g., policymakers and civil servants) working with data and disruptive technology in a public role.

To gather the lessons and recommendations based on the Urbanite experiences, Waag conducted a co-creation workshop and internal interviews with the Urbanite partners and invited them to reflect on their experiences, the challenges they faced, and the lessons they learned from the process. The local contexts of pilot cities are summarised in Appendix 1.

We identified several necessary steps for building an integrated mobility data ecosystem comprised of data and disruptive technologies, which each carry their own specific challenges. These necessary steps are:

- Identify the need for data and use / development of disruptive technologies
- Define the mission and vision
- Gain awareness of existing data
- Access existing data
- Ensure quality, cleanness, completeness, and accuracy of data
- Meet interoperability standards
- Establish a governance framework

Challenges in each of the above steps must be met before technical development of a larger data ecosystem can proceed. In addition to the challenges faced in these steps, there are also challenges in meeting other requirements such as ethical concerns around the development and use of technology in public decision-making. These requirements include:

- Human decision-makers (e.g., policymakers and civil servants) must understand and scrutinise the implications and limitations of technological outputs (e.g., data visualisations, models, and predictions).
- The use of data and disruptive technologies must be compatible with relevant laws and public values (e.g., regarding privacy and transparency).
- Technological outputs must be relevant for and usable by decision-makers.
- Technological outputs must be explainable to the extent that the steps of reasoning, sources, and considerations that lead to a recommendation or prediction must be able to be reproduced and validated by humans.
- Use of the technology must merit and earn trust by citizens, decision-makers, and other stakeholders.

Our recommendations for local policymakers are presented in the form of design process priorities. These design process priorities include:

- Clear internal organisation of the public administration
- Participatory development
- Identification of a shared mission
- Modular and iterative development
- Open (standards / source / process)
- Explainability
- Model trustworthiness
- Education

The intended social impact of these recommendations is to help people work with data and disruptive technologies in a way that improves human decision-making and is worthy of public trust.

1 Introduction

Municipal policymakers need to make educated decisions to shape the future of mobility in cities; there is a persistent assumption that these decisions can be facilitated by a data-driven platform.

The use of disruptive technologies (e.g., artificial intelligence, machine learning, simulation and prediction models, mapping, data analysis) in policy-making raises significant questions when applied in democratic societies that value human rights – and especially when applied by public institutions. These questions involve decision-making (*How is AI and other disruptive technologies [e.g., machine learning, simulations] utilised in a decision-making process?*); human oversight (*How is human oversight ensured?*); accountability (*Who is responsible for technological outputs, and how can processes involving disruptive technologies be made open?*); access & exclusion (*Who has access to use disruptive technologies, and what data do large models include?*), technology and development processes *(Who is included in development and how are models trained?)*; and trust (*How can AI and disruptive technologies be incorporated into democratic policy in a way that is worthy of public trust?*).

Urbanite partners organised participatory Social Policy Labs (SoPoLabs) in four pilot cities (Amsterdam, Bilbao, Helsinki, and Messina) to gain insight into the application of disruptive technologies to develop ecosystems of shared mobility data (mobility data commons). Sessions included local policymakers, civil servants, and other stakeholders from civil society. This revealed several challenges and opportunities related to the (lack of) trust of the public servants and end-users in the use of data and disruptive technologies.

The challenges in these steps and requirements provide the context for subsequent recommendations around the leading question of this deliverable: Which factors influence the adoption and integration of disruptive technologies (e.g., artificial intelligence, machine learning, simulation and prediction models, mapping, data analysis) in decision-making processes? Urbanite approaches this question through the lens of municipal efforts to develop local mobility data ecosystems that integrate various datasets and disruptive technologies. Our findings are relevant for all decision-makers (e.g., policymakers and civil servants) working with data and disruptive technology in a public role.

2 Challenges and recommendations

Urbanite partners recounted and evaluated their experiences leading up to, during and after the three SoPolabs through a series of interviews with Waag about challenges faced and lessons learned. The challenges and subsequent recommendations are relevant for any policymaker or decision-maker making use of disruptive technologies, especially policymakers and decision-makers involved in mobility at the municipal level.

2.1 Challenges (Necessary Steps)

The development of a local (mobility) data ecosystem is a complex process, in which challenges appear at each crucial step. These challenging yet crucial steps are:

- **Identify the need for data and use / development of disruptive technologies** – It is crucial that real needs of policymakers drive any technical development. The needs and problem that a technical solution intends to solve must be clearly defined at the

outset. Some civil servants may be apprehensive to use new technologies because of the time investment, because they are already familiar with existing technology and processes, because of a lack of expertise in developing and implementing disruptive technologies, and because of a lack of trust that disruptive technologies and new ways of working with data will be helpful.

- **Define the mission and vision** – Based on the needs and desires of the relevant policymakers, establish the mission of the initiative, and review the partners' and public administrations' policy and strategy around data use and management.

- **Gain awareness of existing data** – Once the mission and vision established, development teams need to identify existing relevant data.

  Awareness of existing data is a challenge within municipalities for a variety of reasons (e.g., data silos, or a lack of interdepartmental communication) which are often organisational and bureaucratic in nature, rather than technical. Lack of awareness can lead to duplicated efforts and more data collection than is necessary.

  Communication between municipal departments is essential to know which data is available in each department and investigate the available opportunities for sharing that data for other purposes that may arise with the integration of new technologies. Municipality should facilitate interdepartmental data exchange, and consider setting up a data management position/team/department within the public administration to facilitate knowledge and data exchange between various (internal) departments and (external) stakeholders.

- **Access existing data** – Once a team is aware of existing data, that data is often difficult to access.

  There are many potential challenges to accessing existing data. Relevant proprietary data may be closed, costly, or gathered by private parties in a manner inconsistent with public values (e.g., gathered via dark patterns or surveillance capitalism). Public data sets may also be difficult or impossible to access, for example due to interdepartmental access restrictions.

  Challenges in accessing data are not always technical. Civil servants may be hesitant to use data due to the potential consequences of wrongfully sharing data (e.g., violating GDPR). Apprehensive civil servants may choose not to share the data at all, even in cases that are legally and ethically sound. Similarly, open data sets may not be accessible in practice if civil servants do not know when or how to handle them.

- **Ensure quality, cleanness, completeness, and accuracy of data** – Once data is accessed, there are various potential reasons why it may be unusable: data may be of a poor quality, unorganised, incomplete, or inaccurate.

  Development teams may face difficulty in identifying technical problems which (later) arise due to missing or otherwise problematic data. Problems with data at this stage in the process can lead to subsequent problems in development (e.g., when designing for interoperability and usability).

- **Meet interoperability standards** – Various high quality data sources must also be interoperable in order to contribute to a larger data ecosystem.

  The lack of widely and consistently used open standards for various datasets (e.g., even within municipalities and municipal departments) is a major challenge for city-level data

ecosystems and data commons. Data sets are often organised to suit an isolated use, domain, or context, and not optimised for collaborative use alongside other data sets.

Despite these challenges, certain open standards are emerging which have been used in Urbanite.

- **Establish a governance framework** – After establishing the mission and vision of the initiative and the data needs, requirements and policies, it is crucial to define the governance structure, the governing body, and the roles and responsibilities that will facilitate its implementation. To do so, identify applicable regulations and constraints to data sharing, its exploitation and underlying methods. Keep in mind the rights of the individuals and organisations who generate and consume the data during its whole lifecycle, and apply specific guidelines, methods and tools to ensure its compliance.

Challenges in each of the above steps must be met before technical development of a larger data ecosystem can proceed. **Further requirements also pose crucial challenges** during development and use of data and disruptive technologies. These challenging requirements include:

- Human decision-makers must understand and scrutinise the implications and limitations of technological outputs (e.g., data visualisations, models, and predictions).
- The use of data and disruptive technologies must be compatible with relevant laws and public values (e.g., regarding privacy and transparency).
- Technological outputs must be relevant for and usable by decision-makers.
- Technological outputs must be explainable to the extent that the steps of reasoning, sources, and considerations that lead to a recommendation or prediction must be able to be reproduced and validated by humans.
- Use of the technology must merit and earn trust by citizens, decision-makers, and other stakeholders.

There are many complex challenges which arise from necessary steps in planning, developing, and using data and disruptive technologies in the context of decision-making and the development of data ecosystems. Such challenges can be overcome; a public design process with the right priorities can lead to the development and use of technology which both aids in human decision-making and earns societal trust.

2.2 Recommendations (Design Process Priorities)

Public design processes to develop local mobility data ecosystems should prioritise:

- Clear internal organisation of the public administration
- Participatory development
- Identification of a shared mission
- Modular and iterative development
- Open (standards / source / process)
- Explainability
- Model trustworthiness
- Education

Clear internal organisation of the public administration

As mentioned in the previous section, a common challenge is that different departments of public administrations have various data access and management practices. Moreover, it is often not entirely clear which departments have access to what kind of data and under which

circumstances it can be safely shared. It is essential to know which relevant data is available in each department and investigate the opportunities for sharing and collaborating with that data for other purposes, while still complying to the relevant data policies. To this end, clear internal organisation and communication between municipal departments is indispensable.

It would help to set up of a data management team/department within the public administration to facilitate the data exchange and management among the departments of the public administration and external stakeholders. This team would own the data, can share this data with relevant internal and external parties and can support the problem owners with the data handling. This could help to avoid data silos within the organisation. Moreover, it is essential to identify someone per municipality who is the main contact person regarding data management and policies. This person will be in charge of communication between different public administrations.

As an external project partner working together with a public administration, it is good practice to take the time to get to know the public administration, its different departments, and the contact people per department. Understanding the structure of the public administration, will ease the collaborative process with the municipality. You can even consider making an organogram of the organization.

Participatory development

Including 'end-users' (decision-makers) throughout the entire design process is the only way to ensure the relevance of technical solutions.

Start the development and implementation of disruptive technologies by identifying the problem owner. The problem owner should be data literate and educated about the implications and limitations of disruptive technologies. The technology should solve their problem, and they should be able to use this technology.

There are different stakes and interests even within the public administrations. Participation and communication with all relevant governmental levels (local, regional, national) is necessary [1].

Participatory development should also include stakeholders from outside of the municipality, for example citizens, external experts and developers, researchers, and relevant private parties. Align the engagement process with stakeholders' needs, helping the stakeholders understand the benefits of participating in the project. Listen to the individual stakeholders and identify the benefit for them; why should this stakeholder join and what is in it for them?

With a topic such as urban mobility, there are many different stakeholders with differing – and sometimes conflicting – interests. Define clear goals and manage expectations, especially with regards to the participation of civil society.

Identification of a shared mission

In the context of public technology development projects – those which are publicly funded, developed for public institutions, and/or used by public institutions – technology and design processes must align with public values. European public technological projects can look to existing shared values as the starting point for their *foundation* (a set of goals, values, and assumptions that drives a development process [2]); such values may already be defined both legally (e.g., GDPR, ECHR) and in public statements (e.g., in EU approach to artificial intelligence [3]).

Establish a shared mission, take the time to get to know the internal and external stakeholders, and meet with them offline to build a trusting relationship. Talk to stakeholders about their

ambitions, needs and worries; this helps to understand what the partner needs to become a motivated participant and what you can do to ensure the benefit of the partner in the project.

While a shared mission is helpful in practical matters around collaborative technology development, more importantly it helps to ensure that the technology that furthers the mission of public institutions to protect public values including safety, privacy, and human agency.

Cultivate long-term perspectives such as third-horizon thinking in policymakers. Objectives such as designing technical tools that prioritise sustainable mobility over car traffic are important for public administrations such as Helsinki but are still rarely put into practice. To get civil servants to prioritise values such as sustainability, it is important to cultivate third-horizon thinking in policymakers. Often, policymakers are focused on the goals they can reach during their four-year term, but they should be incentivised to look beyond that timeframe and prioritise long-term goals.

Make the use case and the research question as confined as possible, making the case clear and manageable and allows the focus to stay on the development of the technical solution itself. Smaller, simplified use cases are also useful to determine the norms and values for larger use cases. Once the precedent has been set, the same norms and values can be applied to larger projects.

Modular and iterative development

It is difficult to gather required data and meet demanding requirements. Any ecosystem that brings various datasets together should be built in several steps to ensure that the requirements are covered before developing new functions of a platform (e.g., modelling).

Modules should be able to function and serve a unique function on their own, but also be compatible and complimentary to a larger data ecosystem. Modular development should thus adhere to commonly accepted open standards to ensure compatibility and interoperability with a larger data ecosystem. Public administrations can then pick and choose the modular technical solutions that best fit their local context and challenges.

Modular development is supported by working iteratively and in sprints with smaller data sets. This helps clarify the project's direction and allows room for development to manoeuvre and change course. Prototypes developed during the sprints can be expanded upon later with larger data sets.

Visualisations and mock-ups are useful in mid-term feedback sessions, keeping conversation tangible and enabling participants to give valuable feedback without the technical solution needing to be completed. They can be a useful tool to bring developers together with end users and other stakeholders.

Modular development in this way helps to ensure that development is based on real needs in the city, and not just based on what is technically possible.

Investigate how the problem owner solves or approaches the issue without the proposed disruptive technology; this will help to inform how the technology can be implemented. Besides the problem owner, it needs to be clear who within the public administration would technically implement the disruptive technology and corresponding tools and methods. Ensure that the implementation process of the disruptive technology is clear to all relevant actors.

Open (standards / source / process)

Openness should be applied throughout development and in many different respects: open standards, open source, and open processes, to name a few.

As mentioned, open standards help to ensure interoperability. More so, open standards can be subjected to more widespread public scrutiny due to their openness. Not all open standards have high usability, and not all protect public values (e.g., privacy) by design: Developers should adopt and promote the use and development of open standards which are both functional and in line with public values.

Open source not a box to check, but rather a value to be pursued. There is a great difference between a so-called 'open source' code which is hidden on an unfindable government website, and an enthusiastically open-source project with quality documentation that fosters transparency, usability, replication, and public scrutiny. Going beyond code itself, the entire design process ought to be as open as possible, for example with open design sessions, openness about the project's governance and decision-making, and openness regarding the use of the final product or service.

Education

Education ought to occur in multiple directions during the entire participatory development process. On the one hand, developers are often not experts in the field they are developing for (e.g., mobility), and thus need to be educated on the specific needs faced by people in that field to avoid misunderstandings or unnecessary development. More importantly, however, decision-makers must also be educated throughout the participatory design process.

In order to make decisions based on outputs of disruptive technologies (e.g., traffic modelling outputs from AI), decision-makers must understand the implications and limitations of that technology enough to critically scrutinise it. Education in this regard must be socio-technical and multidisciplinary, beyond functionality and with a focus around ethical and democratically-minded considerations, for example regarding human rights (e.g., equality, privacy), human oversight & decision-making, inclusion & discrimination. Working with such technology in a decision-making capacity requires a deep and nuanced *data literacy*, the development of which is aided by active participation in co-creation sessions alongside others with diverse multidisciplinary expertise (e.g., in social sciences, data science, technology development).

This sentiment is laid out in the European Commission's *Strategic Research and Innovation Roadmap*:

> "In order to achieve public trust in AI systems, the user of an AI system needs to know when a system is operating out of bounds, and this also needs to be clearly communicated. So, a main point in this context is transparency. How can this be achieved? Education can be considered as a preparatory action, in particular in the context of public administrations, where a clear understanding of the overall framework for the potential introduction of AI in the processes is needed, as well as a maturing awareness concerning the limits and capabilities of AI." [4]

Data and disruptive technologies are not magic wands; they are tools that need to be used, fed, interpreted. AI may be good at solving certain tasks, such as outputting simulations that test certain possibilities based upon limited assumptions; but does not predict the future, does not know what is best, and does not consider all factors and possibilities.

Thus, cultivate the relevant expertise within the municipality. Currently, a lot of expertise and investment are needed to develop, employ and implement a new technical solution. This expertise is not always present in public administrations. This is strengthened by the trend of contracting external parties to develop and deal with data-driven solutions. However, to understand and recognise the ethical issues and questions about data, the municipality employees need quality knowledge of data as well as ethics. Bring expertise and understanding

regarding the technology into the government. That will also help the municipality to be a good contractor to their client.

Create an accessible narrative which outlines the relevance of the data literacy course for civil servants. As civil servants often work in silos, the question becomes: how do you invite people from different departments and projects in the administration to attend a course in data and digital literacy? How can you foster cross-department collaboration? An accessible narrative will help to motivate the civil servants to increase their data literacy in the broadest sense of the word.

Moreover, increase citizens' digital and data literacy to allow them to actively engage in the co-creative process. A general apprehension and distrust regarding disruptive technologies makes it difficult to co-design and implement new technologies aimed at facilitating mobility policymaking. Increasing the citizens' digital and data literacy can also help them to approach technology with less fear and apprehension and to assess the technology through more objective and critical evaluation.

Explainability

Algorithms progressively more involved in systems used to support decision-making. Applications became increasingly successful, but increasingly opaque. The need to be understandable, in order to be trusted. There are two main forms of understandability: transparency is defined as the availability of the code with its design documentation, parameters and the training data and explainability is defined as the availability of explanations about the algorithm. In contrast to transparency, explainability requires information beyond the algorithm itself, adapted in relation to the recipients, their level of expertise, and their objectives.

It is also important to note that the requirements for explainability vary from one algorithm to another, according to the potential impact and risks of the decisions made and whether the decision-making process is fully automated or not. It is important to decide how much of an explanation we need, the level of explanation (e.g., on a graph knowledge model, if applies at node, layer or system level).

An algorithm can only be explained if the model can be articulated and understood by a human. An adequate explanation should provide an account of how to input features relate to predictions or outputs, identifying which features play the largest role and have the higher weight or relevance.

Model trustworthiness

The effectiveness of policy decisions, based on data-driven models, relies on the data employed by the model and the specific questions it was designed to address. Ensuring the quality and reliability of models is of utmost importance from a technical standpoint. Also, it is essential to effectively communicate modelling results; therefore, fostering open communication among the technological partners and policymakers is imperative.

The concept of data ethics also plays a role in the trustworthiness of data-driven models. Data ethics encompasses the establishment, protection, and advocacy of ethical principles regarding data, specifically personal data, although not limited to it. By following the EC's guidelines on *Ethics and Data Protection*, the trustworthiness of the model with regards to the usage and management of the data is protected [5].

Models must always be interpreted within their defined purpose and scope, a set of questions must be formulated about the data used for the model, the modelling assumptions (e.g., bias, scope, gaps, accuracy, sensibility), transparency, quality (e.g., peer-reviewed, comparison, unknows, scalation and replicability) and communicated.

Aspects such as trust, precision and reliability, among other non-functional properties, are essential for predictive and analytical techniques to be practices in its use. The term actionability is defined as the characteristic that any system based on data analysis or artificial intelligence must be able to be implemented and used successfully in a real operating environment. Any data-based modelling process should be actionable as its most desirable feature for the engineered model to yield insights of practical value, so managers can harness them in their decision-making processes.

2.3 Social Impact (Informed Human Decision-making and Trust)

Informed Human Decision-making

The purpose of utilising data and disruptive technologies is to help humans make better, more well-informed decisions. However, the limitations and implications of data and disruptive technologies are vast, complicated, far-reaching, and nuanced. Algorithms make mistakes, data sets are inherently biased, and black-boxed outputs cannot be explained; there are myriad reasons why human discretion should always be prioritised and protected when using technology within a public decision-making process. To this end, socio-technical data literacy regarding societal implications of data and disruptive technologies must be a prerequisite for any decision-maker that utilises them.

First and foremost, humans need to make decisions – not AI or other technology.

Beyond this simple tenant, it is also crucial that decision-makers have nuanced understanding of the complex context in which mobility data sits. Without such knowledge, a specific tool will not provide the correct feedback to steer decision making. For example, a simulation to improve traffic flow may recommend to build more roads. Building more roads, however, is contrary to sustainable development goals. Moreover, the simulation is likely to have been fed more data about cars and roads (which is relatively easy to gather) than about more sustainable modes of transportation like walking and cycling (whose data is more difficult to gather). Decision-makers and developers need to avoiding letting data sources determine design decisions, and instead make their own informed choices about what to optimise in their technology and decision-making processes.

Trust

Trust about the use of disruptive technologies is a prerequisite for their application in matters of society and governance. Trust applies on many levels in this regard and from the perspective of citizens and decision-makers alike, for example:

- trust that the data is accurate and reflective of peoples' lived experiences;
- trust that decision-makers are knowledgeable about the nuances and limitations of the technologies they are using, and are comfortable using it;
- trust that decisions are made by humans (not technology);
- trust that privacy and other public values are ensured by the technical systems' design;
- trust that the technology is open and transparent;
- trust that outputs of AI are explainable valid;
- trust that (human) decisions informed by AI outputs are explainable and valid;
- and more.

It is not possible to achieve trust in these necessary instances without a participatory and educational design process that prioritises socio-technical data literacy and follows the necessary development steps. Public administrations could increase their communication with citizens and stakeholders, through for example organising events and initiatives that include the

citizens in the technical project. This helps to eventually close the gap and build trust between civil servants and citizens, which could then increase the trustworthiness of disruptive technology. To quote one Urbanite partner, “There can be no trust without understanding and scrutiny.” In other words, the goal is not to develop trust amongst society (about the use of disruptive technology); but rather to build technology and protocols that merit public trust because of their openness and alignment with public values.

3 Conclusion

Stakeholders’ concerns and focus are quite similar; they involve trust, public values, human decision-making, openness, and public involvement, and how to address these issues through concrete choices in technical design processes.

There is a persistent belief that data-driven technologies can pose solutions to contemporary urban mobility issues. Our findings point to the need for shared public values to form a foundation that guides urban mobility development through various challenging steps and requirements. Only then can decision-makers ensure that technical solutions are in line with the mission of democratic institutions; and only then can developers have a common ground to align and develop other necessities like access and interoperability.

References

[1] M. Jokiniemi, *Simulaatioista parempi selkänoja kestävälle liikennesuunnittelulle*, 27 September 2022. https://forumvirium.fi/simulaatioista-parempi-selkanoja-kestavalle-liikennesuunnittelulle/

[2] Waag Futurelab, *The Public Stack*, 2021. https://publicstack.net/layers/#foundation

[3] European Commission, *A European approach to artificial intelligence*, 2021. https://digital-strategy.ec.europa.eu/en/policies/european-approach-artificial-intelligence

[4] TAILOR, *Strategic Research and Innovation Roadmap*, 21 July 2022. https://tailor-network.eu/research-overview/strategic-research-and-innovation-roadmap/

[5] European Commission, *Ethics and data protection*, 5 July 2021. https://tinyurl.com/ydpyummv

Appendix The local contexts of the pilot cities

This chapter introduces the local contexts of the pilot cities which inform the challenges and recommendations. For more information about the urban and societal landscape in the pilot cities, refer to the Urbanite deliverables D2.3, D2.4, and D2.5 which respectively report on the first, second, and third social policy labs in each of the pilot cities.

Amsterdam

The Amsterdam pilot focussed on working together with different local organisations to build a data commons surrounding bike mobility and on citizen inclusion in such a data collaboration. Instead of collecting data about citizens, a data commons facilitates the collaboration between local governments and citizens as a central mechanism in policy-making through identifying and unifying existing (open) data sources.

Cycling is one of the main forms of transport in the Netherlands, which means even children cycle to school and back every day, sometimes by themselves, sometimes with friends or family. In order to develop and test a data management platform that would support Amsterdam policymakers, the Urbanite partners formulated the use case of high schoolers who cycle to school in the Amsterdam suburb Noord. This use case is interesting as these students are quite vulnerable: they just switched schools and need to find a new, safe route; they often cycle in groups which can be distracting, and there is an increase in electric bikes which travel at a much higher speed than the children on manual bikes.

One of the key issues in Amsterdam is the fragmentation of knowledge, information and data. There are several civil society organisations as well as commercial actors and departments of the municipality of Amsterdam that collect bike data and work on different clusters of bike mobility policies. However, the municipality does not have access to enough data: not enough data is collected, there is a lack of overview of what data *is* collected, and on top of that, the data that is available is 'enclosed' in private platforms. Plus, the municipality is organised in silos, which leads to a lack of communication and makes it hard to get an overview of who is a stakeholder and who has what role, access to data or need for more data.

Moreover, for developers from outside the municipality, and sometimes even civil servants themselves, it is hard to get the full overview of who takes decisions, on what grounds, and when and how these decisions relate to the municipality's overall strategies. Partly, the fragmentation of data and knowledge is created to safeguard citizens' rights. When a municipality department has collected valuable data, this data cannot be used for a different purpose than it was collected for. While this complexifies realising the mission of the Urbanite pilot, it is important that the data is only used for the purpose for which consent was given. If citizens are involved in data collection and creating awareness, project partners and the municipality must ensure that the data is actually used for its stated purpose.

Within the Amsterdam pilot, the values of transparency, openness and fairness played a central role. The main challenge was to converge these shared goals with the concrete developments and (technical) outputs of the Urbanite project. One central question was: how should residents be included in policy-making, data collection, data analysis and application? In order for residents to co-decide, it would be necessary to restore trust in the government, formulate clear expectations regarding what it is that residents can influence by collecting data and take the residents seriously. This will always be complex due to the opposing interests among residents, as well as the low level of data literacy among public servants and citizens alike.

Bilbao

Over the past three decades, Bilbao has been going through an urban transformation. Whereas 25 years ago the city prioritised the industrial stakeholders, the citizens are now given more space in the city. Citizens are incentivised to move around the city by foot, bike, or public transport, as the infrastructure caters to these modes of transport over cars. Traffic lights prioritise pedestrians and cyclists, car parking spots have been reduced and certain streets across the city are fully pedestrianised. In fact, in the case of Bilbao, the Urbanite platform was tailored to simulate the impact of one of these types of interventions, i.e., the closure of a square to car traffic. In general, the municipality is working on cultivating a cultural shift, changing consumption habits, and raising awareness amongst citizens regarding sustainability, other forms of mobility, and the environment.

Moreover, a Bilbao Open Data Strategy is in place which offers standardised data about traffic and mobility in the city in order to motivate third parties to use the data for the development of user-centric mobility services. However, there is still a need of establishing agreements and procedures for data sharing with other mobility service providers. Additionally, social, economic and cultural factors that influence in the mobility choices are unknown and are thus considered to a lesser extent in mobility policy-making. The challenge that the Bilbao pilot is aiming to tackle is user-centricity in mobility and urban planning.

On the other side, there is a need for consistency in the purpose, requirements, and regulation for data gathering between local, regional and national authorities; there is a lack of uniformity in how the data itself is formatted, shared, stored, and utilised; and there is a subsequent lack of understanding from citizens regarding how data is being used by various administrative bodies.

Helsinki

The Urbanite partner Forum Virium Helsinki is supporting the city of Helsinki with its efforts of becoming a smart city. There is a large amount of data available in Helsinki regarding traffic flow, however, this data is stored in different places and formats and is sometimes not readable or exploitable. The Helsinki pilot aims at helping to city to build a data platform to combine the existing data sets regarding traffic in the city by producing modular 'solutions' that the city can use. The target is to help urban and traffic planners to find and analyse data sets easily and effortlessly and to advance development where data is becoming part of traffic and urban planning. Before the project, finding and analysing needed data has sometimes been time-consuming and certain data sets were in hands of certain traffic planners only. The use case for this pilot is the West Harbour area of Helsinki, Jätkäsaari. This area is a growing passenger and transport harbour as well as a new residential district that partly still is under construction. It is close to the Helsinki city centre and provides the main connection to Tallinn, Estonia. While an important area to the city and the surrounding regions, Jätkäsaari is subject to heavy traffic congestion. Using the existing data and state-of-the-art simulations, the Helsinki pilot is trying to understand the flow and development of mobility in the harbour.

This pilot is a collaboration between municipal stakeholders and Forum Virium Helsinki but also privately-owned companies, the Aalto university and a civil society organisation that represents cyclists in Helsinki. Importantly, there is a selected group of experts that design and work with the traffic simulations, which tend to be behind expensive licences and require a high level of expertise. This means that not everyone involved in the pilot is able to interact with the existing traffic simulations that are used by a few experts. In a similar vein, in *A Strategy for Urban Data*, Schouten explains that even when technology and data are open and shared, that does not mean it is accessible to everyone. Therefore, the one target of the Urbanite platform is to

increase the availability of traffic simulations, make the platform easy to access and use, and popularise them for a wider group of urban and traffic planners. Data handling and interpretation predicate knowledge, effort, and investment. People who lack these necessities can thus lack actionable access to data and technology. Consequently, other stakeholders such as policymakers and citizens are not directly involved in the design process of the Urbanite simulations.

While not every stage of this process can be opened to citizens (such as complex data analysis), project partners can search for opportunities to open up parts of this process, making it more transparent and understandable to citizens, and incorporating citizen voices. This could be done, for example, by building popularised versions of traffic simulations that could be included in (local) master plans that are openly available for everyone.

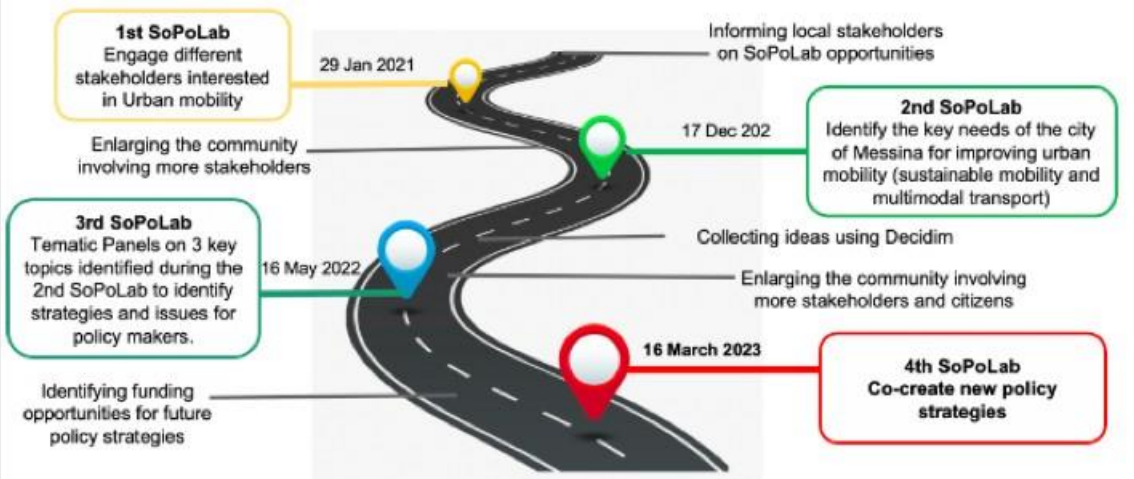
The impact of Urbanite has been relatively wide. Along with the technical approach, we have explored what disruptive technologies (especially in the context of traffic simulations) could mean in practice and how they could change. We also have had many opportunities to advance work on the city's traffic and mobility data ecosystem (LIDO project), which the Urbanite ecosystem is strengthening.

Messina

The municipality of Messina is undertaking activities and projects to deal with traffic congestion, such as the development of a port just south of the city, which means the cargo traffic avoids entering the city centre. The goals of the Messina pilot during the project have been understanding how the municipality can be supported in improving the public transportation services for the citizens, fostering the use of ICT technologies in the municipality departments and creating a forum of stakeholder experts at local and international levels around urban mobility topics.

The SoPolabs activities in Messina were finalized to provide new opportunities to the policymakers of the Municipality in facing urban mobility problems by involving local stakeholders and different expertise and visions, through the experimentation of participatory processes.

Objectives, priorities and possible strategies were discussed during four SoPoLab events in Messina.



The first SoPoLab was a virtual event (due to the pandemic) aimed at presenting the project and the opportunities for the local context, and starting the engagement of stakeholders. The event promoted the adoption of disruptive technologies to avoid the departments isolation on data

and processes and to enable the involvement of technical group supporting decision-making processes.

The 2nd SoPoLab identified two specific targets of interest for the local ecosystem of stakeholder and the Municipality: 1) improving multi-modal transport and 2) increasing sustainable mobility. The event allowed the audience to deeply analyse these two thematic areas, identifying opportunities and possible problems, stimulating the discussion of stakeholders also by means of the participatory democracy platform developed in the project (based on DECIDIM).

The 3rd SoPoLab, starting from the two targets of interest identified in the second SoPoLab and the interactions of the stakeholders on that through the DECIDIM platform, aimed to identify specific problems on the sustainable mobility and multi-modal transportation in Messina, also enlarging the discussion to citizens and university students, who proved to be proactive and interested to the proposed topics. Several interesting hints were collected, such as the need to improve services but also to support a change in the culture of citizens on green and sustainable initiatives through awareness campaigns, events and other initiatives; multi-modality as a focal point for improving the quality of life; new infrastructure (parking lots, bike lanes, etc.) to improve the traffic situation in the city centre supported by simulations and analysis using data from the municipality.

The 4th SoPoLab was a technical event focused on how to solve one of the problems identified during the 3rd SoPoLab, characterized by the proactive participation of the Municipality policymakers and several stakeholders involved in the domain. The specific topic of the 4th SoPoLab was the promotion of sustainable mobility culture with particular attention to public transportation. The SoPoLab was also aimed at validating the application of social-political co-creation models to support policymakers. It allowed to discuss about objectives and priorities in the context of the diffusion of the public transport service in Messina, often highlighting the opportunities for additional mobility services in support (such as interchange car parks and pedestrian areas). It has allowed also to identify strategies for a concrete action of the Municipality, which has been summarized in a Digital Policy Canvas model.

The overall outcome of SoPoLabs was very positive thanks to the availability, great collaboration and proactivity of all the parties involved, which made the events constructive and productive. Also, we proved the opportunities coming from the co-creation methodology and its fundamental effect in creating a trusted ecosystem of local bodies, institutions and holders of different interests and perspectives.

With reference to the promotion of ICT solutions in local urban services, because of the need to improve the sharing of information between municipal departments caused by the lack of communication between the old silo-like systems, new interoperability services were planned together with the Municipality of Messina. Such services are made available through shared dashboards and customizable analyses performed by the exploitation of the Urbanite platform and tools. Studies on city mobility, the collection of new heterogeneous data sources and the extraction of useful information resulting from the cross-relating of different data could also be useful in the future design of new strategies, such as the identification of new bus lines or stops on existing lines, which would be useful for disposing of the traffic flows recorded from historical data and/or analysed in the various phases of the Urbanite project.

The municipal administration and the public transport company were very interested in the results of the Urbanite project, and they consider them a good starting point to be expanded and improved in the near future.

Social impact in the context of pilot cities

The path of SoPoLabs was characterised by a progressive involvement of stakeholders aimed at identifying problems in the urban mobility and priorities for the public administrations and citizens. Through the SoPoLab events, different targets and size of stakeholders were involved, accordingly to the type of discussion faced and the necessary skills for active contributions. This made it possible to gradually introduce the tools and potential opportunities provided by the SoPoLabs to the specific use case ecosystems, to explore trust in the use of disruptive technologies in the decision-making process.

The social impact of the SoPoLab experience is evident in the new way to involve professionals, communities, institutions and citizens in planning future solutions for our cities, increasing transparency and collaboration spirit. This enables a stronger sense of belonging to the same community and increases enthusiasm and appreciation for the public management of our cities.

Another social impact is related to the wide dissemination and promotion of technologies due to spreading of new digital services. The disruptive technologies endorsed in the Urbanite project will affect the next generation of urban services, which will be provided to end users through digital means.

The social impact derived from these activities highlighted how stakeholders and municipalities are interested in these new opportunities. In particular, the experimentation carried out by Urbanite and the SoPoLabs has shown how these tools can be useful in broadening the audience, not only decision-makers, but also citizens. The element of co-creation experimented with the SoPoLabs, among the different actors present in the use case scenarios was appreciated, bringing out the potential of the technological tools made available in the co-creative process.