

Smart citizens in Amsterdam

An alternative to the smart city

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Introduction

The smart city approach has been top down in its implementation; it is a surveillance model in which the data produced by citizens are neither owned nor used by them, but rather by large tech firms and, in some cases, by public administrations.

Waag, an Amsterdam-based non-profit organization, takes a ‘smart citizens’ approach as a direct challenge to the ‘smart city’. The smart citizens approach embraces the potential for technology to improve the city in terms of quality of life, environment, democratic transparency, and administrative effectiveness. Taking this approach, the process of developing technology for the city must be *open* and *citizen led*. In addition to all data and software being open source, the development process must be radically co-creative: citizens are involved from start to finish; prioritizing their needs, ideating solutions, and actually building, prototyping, and implementing those solutions alongside public administrators and experts. Public spaces and the data created within them are considered as ‘commons’. Thus, the data resulting from a smart citizens approach are shared resources managed by communities with the aim of assuring their sustainability, inclusivity, or other shared benefits.

This chapter discusses the development and execution of a smart citizens approach in Amsterdam. We first outline Amsterdam’s historical background as an open, tolerant, and progressive city, and how this political character provided a fertile foundation for the Digitale Stad. This was an effort in the early 1990s to leverage the infant internet to open up Amsterdam’s public databases and allow for direct communication between citizens and lawmakers. We then discuss how the same ecosystem of artists, hackers, and activists that created the Digitale Stad helped to pave the way culturally, politically, and technologically to continue exploring various ways to leverage the internet to foster a more open, fair, and inclusive society. Finally, we outline our vision for the future of the commons, and show how this is underpinned by Waag’s ‘technology and society’ focus towards public research – advocating and building practical solutions to advance citizen participation, data ownership, privacy, and democracy.

The Amsterdam approach

Amsterdam has a rich history that led to the free-spirited use of technology as it is championed by Waag. The city originated in the late 12th century and became world famous and opulently rich during the 17th century in what is called the Dutch Golden Age, mainly resulting from its trading innovations, among which the first stock market exchange and an extensive spice and slave trade emerged. It became home to a large number of immigrants with various cultures and religions, who found the city a welcoming place regardless of their backgrounds. For example, when a religion was formally banned, its members could continue to prosper in minimal disguise—which started the still fashionable Dutch paradox called ‘*gedogen*’, or tolerance, as is practiced for example in its well-known *laissez-faire* politics governing the recreational use of soft-drugs. As the city flourished, it became well known for its painters, philosophers and musicians. During the 19th and early 20th centuries, the city expanded rapidly. As it recovered from the blows of the Second World War from the 1960s onwards, Amsterdam gave birth to several avant-garde movements that practiced mild and humorous forms of civil disobedience, attacking the dominant top-down hierarchical culture, including a ‘white bikes plan’ (De Wildt 2015) as an early (and short-lived) form of free bike-sharing. In the 1970s and 1980s, a vibrant squatters’ movement developed as Amsterdam experienced a severe housing crisis. The squatters regularly teamed up with artists that practiced various critical art practices, transmitted through a myriad of underground television and radio channels. Into this potent mix of free-thinkers, artists, and activists, the invention of the internet fell into fertile grounds: the well-established culture of progressive pragmatism in Amsterdam. The ‘Amsterdam Approach’, developed out of this rich cultural and political history, refers to how the city—residents and government alike—are willing to experiment with alternative and sometimes radical approaches to address emerging societal issues (e.g. see D’Antonio *et al.* 2018). In the next section we will outline how the internet and later the open data movement developed in Amsterdam, and in particular the emergence of the *Digitale Stad*; an early platform that pioneered new approaches to Amsterdam’s relationship with technology.

Digitale Stad/digital city

In 1993, the use of the internet, which had been reserved for government and education, was opened by the US government to companies and individuals. At the same time, the Mosaic web browser that popularized the World Wide Web and the internet became available. Many people realized that the internet had an enormous potential for public services and democracy, which resulted in a wave of new initiatives around that time. In Amsterdam, hackers and programmers joined the mix of free-thinkers, artists, and activists and started to explore the medium as a way to stimulate encounters, debate, and expression. In 1994, this culminated in the so-called Digital City: a virtual city made out of bits, as a discursive counterpart to the atom-based physical city (Stikker 2013; Willis and Aurigi 2018, pp.13–14) (Figures 11.1 and 11.2). The platform allowed people to access the internet through a public interface. Users could have their own homepages, send and receive mail, and have access to large amounts of data that had previously been inaccessible in the city archives. The Digital City exploded, as if the Amsterdam population had silently waited for it to happen, into a large network of like-minded pioneers from all walks of life: the new medium of online communication was born never to be silenced again.

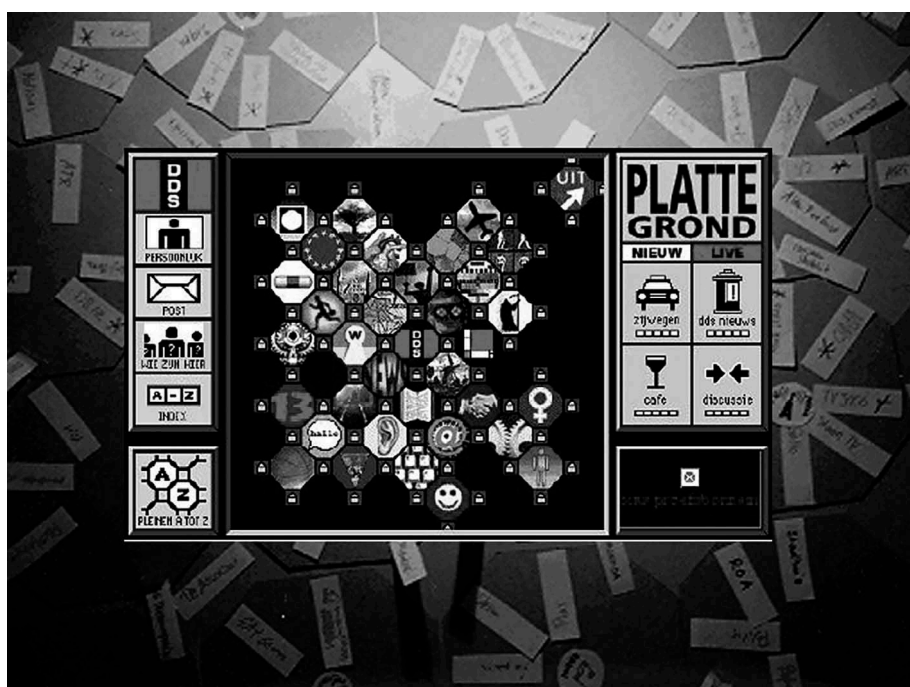


Figure 11.1 The Digitale Stad DDS

Source: Waag (BY-NC-SA)

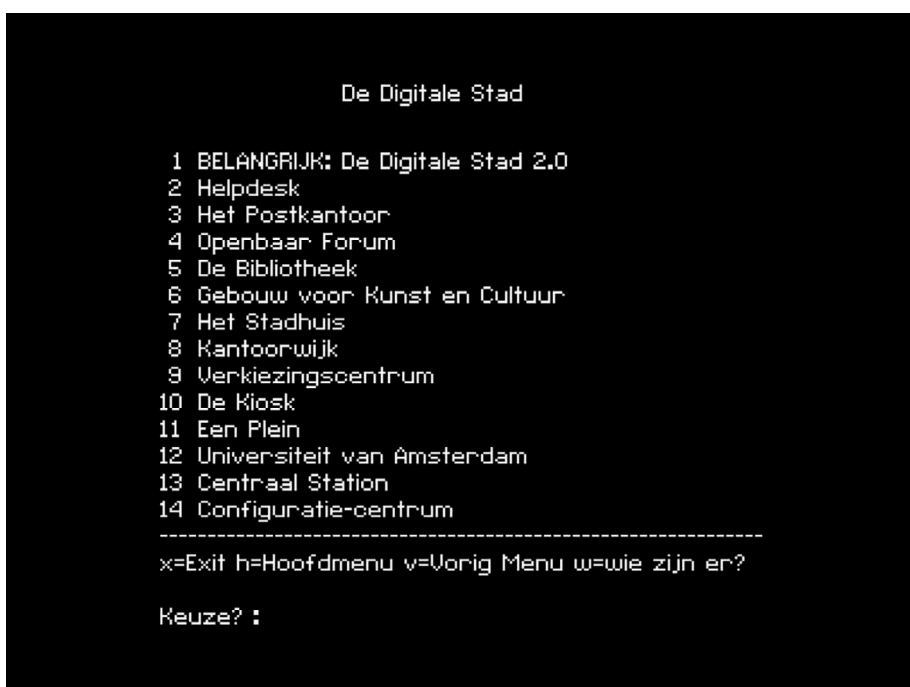


Figure 11.2 The Digitale Stad DDS 1993/remake

Source: Waag (BY-NC-SA)

One of the Digital City's founders was Marleen Stikker, who also established the Waag foundation later that year (it was originally called the Society for New and Old Media). Waag has its roots in the Digital City, and started as an independent media lab, and its first projects aimed to make technology more accessible. For example, it advocated for more publicly available bandwidth, created a public reading space where people could access the internet, and worked with disadvantaged groups to find out, together, how technology could be an enabling force for them. From those early days, Marleen recalls (cited in Stikker and Kresin 2010) how the Digitale Stad opened up new connections between citizens and city government:

Back in 1993 I founded the Data Liberation Front, that later resulted in the first free access community on the Internet, called the Digital City. I visited newspapers, cultural organisations, libraries, political parties and the city council, educating them about the wonders of the Internet and meanwhile collecting floppy disks full of documents. Although most people had no clue about the Internet, they were all intrigued by the idea to build a digital city together. It was a real citizen-driven initiative, designed and facilitated by artists, hackers and activists. A powerful combination, as history shows again and again.

When a civil servant of the City of Amsterdam provided me with the disks of the complete governmental information system, both he and I could hardly understand what would be the consequences of his action. Official documents used to be confined to the city network. From the moment we put them on the servers of the Digital City on the 15th of January 1994, the documents were open for anyone to access. Within a few weeks it led to situations in which citizens were better prepared on topics than the city council members and city officials were themselves. It opened a completely new playing field for the checks and balances between citizens and politicians. It was a small step for a hacker, but a giant leap for democracy.

These early initiatives provided the initial impetus for Amsterdam's current relationship with technology in two major ways. Firstly, they opened and introduced the internet to the public, with an interface that people could use and with resources that people found valuable and wanted to use. Secondly, these efforts demonstrated the benefits of technological openness to the local city government. As the Digital City required collaboration with the city government, it opened the door to future collaborations between the local city government and this community of artists, hackers, and activists in an emerging symbiotic relationship.

Open data

In the first decade of the 21st century, the open data movement gained ground and altered the relation of society and government with regards to information. The open data movement, striving to make data available and free to use, share or mash-up by anyone, attracted attention both globally and in Amsterdam. It put pressure on governments to become more transparent and work from the principle of 'open, unless' in considering their datasets, which expanded the power of citizens to make use of digital public resources. The concept underpinning it was that governments should not wait until they know what the data will be used for, since the whole point of open data was to open a field of possibilities for others. Adopting this approach in Amsterdam, slowly

but surely, more and more data were opened up to the public. Initiatives like ‘Apps for Amsterdam’,¹ launched in 2011 by a collaboration between Waag and the City of Amsterdam, helped to create spaces for the development of solutions, software, and public interfaces by other parties in society. ‘Apps for Amsterdam’ specifically called upon developers to submit applications focused on the use of real estate, tourism and culture, democracy, mobility, safety, and energy. These themes reflected growing areas of interest for local citizens, and helped open the door for citizens to start addressing issues collaboratively along with the local city government.

Smart citizens

As citizens became more involved with addressing pressing local issues into the 2010s, urgency grew amongst both citizens and public administrations to undertake deeper collaborative action together to solve these challenges. One of the most complex challenges urban areas face is air quality and a healthy living environment. The UN estimates that in 2050 68% of the people will live in cities (United Nations 2018). At the same time, research shows the indisputable evidence on the harmful effects of air pollution on people’s health and wellbeing. For example, data show that in the Netherlands 12,000 people die prematurely every year, and people are being hospitalized everyday due to air pollution.² In Amsterdam, one day of simply breathing the air has the equivalent lung damage of smoking 6.4 cigarettes³ (Kruiswijk 2016).

Raising awareness on air quality and inviting citizens to be partners with official institutes and governments is much needed. In Amsterdam, official institutes like the National Institute for Public Health and Environment have traditionally been responsible for official measurements of air quality. Official measurements are used for political decisions and policy design, such as the creation of an environmental zone, limiting traffic in city centres, putting in place speed limits on highways, and siting industrial and economic activities in certain areas. However, the official government air quality measuring network is limited in scale, with few official measurement stations, while the air quality can show great variety from street to street and from day to day. Therefore, the idea of a dense, decentralized citizen sensing network is a promising method for both citizens and public institutions to collect air quality data.

In the mid-2000s, sensor and networking hardware started to become cheaper and smaller, and physical computing became more accessible. Mapping services like Google maps became available, allowing for cheap and quick integration of real-world data into an essentially free, relatively accurate map. From around 2007 onwards, Waag became inspired by several citizen sensing initiatives where motivated citizens used low-cost technology to measure aspects of the environment such as noise around Amsterdam’s Schiphol airport,⁴ air pollution in Paris,⁵ and nuclear radiation in Japan.⁶

These developments in citizen sensing coincided with the global emergence of so-called ‘smart city’ programmes that were increasingly pushed on city governments by multinational technology developers like IBM, CISCO, and Huawei. These programmes promoted the use of networked technologies, with the promise that cities would become smarter and more efficient (Söderström *et al.* 2014). However in practice they reinforced a singular top-down, control focused, privatized, and black-box system of control (Kitchin 2014). But a potent countermovement to the smart city was unleashed by initiatives linking people from the do-it-yourself, bottom-up technology groups (communities of practice) to ordinary citizens who care about the place they live and work (communities of interest). These efforts

took the city and the monopolized data acquisition back into civic hands, as is detailed in the Manifesto for Smart Citizens (Kresin 2013):

We, citizens of all cities, take the fate of the places we live in into our own hands. We care about the buildings and the parks, the shops, the schools, the roads and the trees. But above all, we care about the quality of the life we live in our cities. Quality that arises from the casual interactions, uncalled for encounters, the craze and the booze and the loves we lost and found. We know that our lives are interconnected, and what we do here will impact the outcomes over there. While we can never predict the eventual effect of our actions, we take full responsibility to make this world a better place.

Therefore, we refuse to be consumers, client and informants only, and reclaim agency towards the processes, algorithms and systems that shape our world. We need to know how decisions are made, we need to have the information that is at hand; we need to have direct access to the people in power, and be involved in the crafting of laws and procedures that we grapple with every day.

Fortunately, we hold all the means in our hands. We have appropriated the tools to connect at the touch of a button, organise ourselves, make our voices heard. We know how to measure ourselves and our environment, to visualise and analyse the data, to come to conclusions and take action. We have continuous access to the best of learning in the world, to powerful phones and laptops and software, and to home-grown labs that help us make the things that others won't. Furthermore we were inspired by such diverse examples as the 1% club, Avaaz, Kickstarter, Couchsurfing, Change by Us and many, many more.

We are ready. But, as yet, our government is not. It was shaped in the 18th Century, but increasingly struggles with 21st Century problems it cannot solve. It lost touch with its citizens and is less and less equipped to provide the services and security it pledged to offer. While it tries to build 'Smart Cities' that reinforce or strengthen the status quo that was responsible for the problems in the first place—it loses sight of the most valuable resource it can tap into: the Smart Citizen.

Smart Citizens:

- Take responsibility for the place they live, work and love in;
- Value access over ownership, contribution over power;
- Ask forgiveness, not permission;
- Know where they can get the tools, knowledge and support they need;
- Value empathy, dialogue and trust;
- Appropriate technology, rather than accept it as is;
- Help the people that struggle with smart stuff;
- Ask questions, then more questions, before they come up with answers;
- Actively take part in design efforts to come up with better solutions;
- Work agile, prototype early, test quickly and know when to start over;
- Will not stop in the face of huge barriers;
- Unremittingly share their knowledge and their learning, because this is where true value comes from.

All over the world, smart citizens take action. We self-organise, form cooperations, share resources and take back full responsibility for the care of our children and elderly. We pop up restaurants, harvest renewable energy, maintain urban gardens, build temporary structures and nurture compassion and trust. We kick-start the products and services we care about, repair and upcycle, or learn how to manufacture things ourselves. We have even coined new currencies in response to events that recently shook our comfortable world, but were never solved by the powers that be.

Until now, we have mostly worked next to governments, sometimes against them, but hardly ever with them. As a result, many of the initiatives so far have been one-offs, inspiring but not game changing. We have put lots of energy into small-scale interventions that briefly flared and then returned to business as usual. Just imagine what will happen if our energy, passion and knowledge are teamed up by governments that know how to implement and scale up. Governments that take full responsibility for participating in the open dialogue that is needed to radically rethink the systems that were built decades ago.

To get ourselves ready for the 21st Century, we have to redefine what ‘government’ actually means. We ARE our government. Without us, there is nobody there. As it takes a village to raise a child, it takes people to craft a society. We know it can be done; it was done before. And with the help of new technologies it is easier than ever. So we actively set out to build truly smart cities, with smart citizens at their helms, and together become the change that we want to see.

(Kresin 2013)

Waag joined this countermovement when it established its Smart Citizens Lab.⁷

Smart Citizens Lab

The Smart Citizens Lab explores tools and applications that help make sense of the world around us. Waag works with citizens, scientists, and designers to tackle environmental issues ranging from air and water quality to noise pollution.

In recent years, improved access to open hardware tools and makerspaces, as well as the creation of online data sharing platforms, has made possible the design of low-cost, open-source sensors that citizens can use to measure the environmental health of their neighbourhoods and take action: from starting a campaign, to co-creating solutions and influence policy.

Waag believes the public interest should be at the heart of innovation, and therefore society is the ideal research community. This is what Waag refers to as public research. Starting with ‘curiosity driven research’ where ideation and formulation requirements are central, Waag moves to ‘context research’—building prototypes and piloting them, with the aim to eventually move to sustainable innovation solutions that meet needs in society with ‘transformation focused research’ (Figure 11.3).

This process for public research provides a blueprint for the evolvement of the work on air quality within the Smart Citizens Lab. Starting from curiosity, small experiments took place with the distribution of a hundred ‘Smart Citizen Kits’. The small and cheap sensors delivered low-quality data results, however the participants were highly engaged and enthusiastic. More and more partners came on board, including the City of Amsterdam, the SenseMakers community,

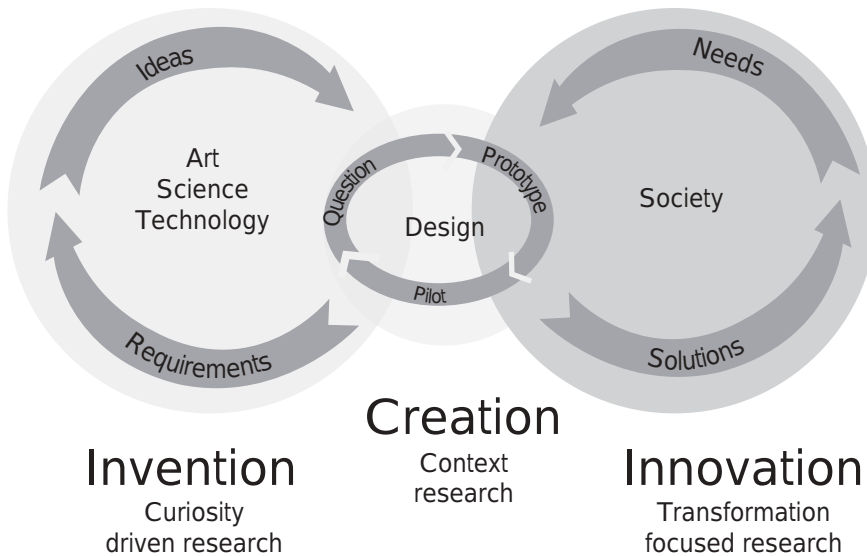


Figure 11.3 Waag's approach to transformation-focused research

the National Institute for Public Health and the Environment, and the Amsterdam Institute of Advanced Metropolitan Solutions. May 2017 marked the official start of the Smart Citizens Lab.

After the 'invention' phase that led to the establishment of the Smart Citizen Lab, the partners and citizens joined together to work further on the topic of air quality and low-cost sensors (Figure 11.4). Sixty citizens, scientists, and technicians dived into the complex issues of air quality and sensors, with the needs and worries of citizens as the guiding force. Armed with new knowledge they sought help from experts and searched for the best way to collect relevant data. They formulated research questions, selected and tested sensors, or custom made them when necessary. Citizen-led sensing and data collection still experienced challenges, from technological problems to a lack of skills on data analysis, but the lab proved it could actively involve citizens and enable them to be better informed.

One of the key projects in the development of the Smart Citizens Lab presented itself in 2015 with Waag's involvement in the Making Sense project. This project was designed to explore how open-source software, open-source hardware, digital maker practices, and open-source design could be used effectively by local communities to appropriate their own sensing tools to make sense of their environments and address pressing environmental problems. Building upon the knowledge and experiences of the lab, Waag initiated a local Dutch pilot as part of this wider project, Urban AirQ, which brought together a consortium with European partners and managed to research and iterate citizen sensing on air quality.⁸ In this project the eight-step method for citizen sensing (Woods *et al.* 2018) was developed that included the following steps (Figure 11.5): start with *scoping* of project, then undertake *community building* and *planning* of sensing activities, followed by the *sensing* and data collection, then raise *awareness* on the data

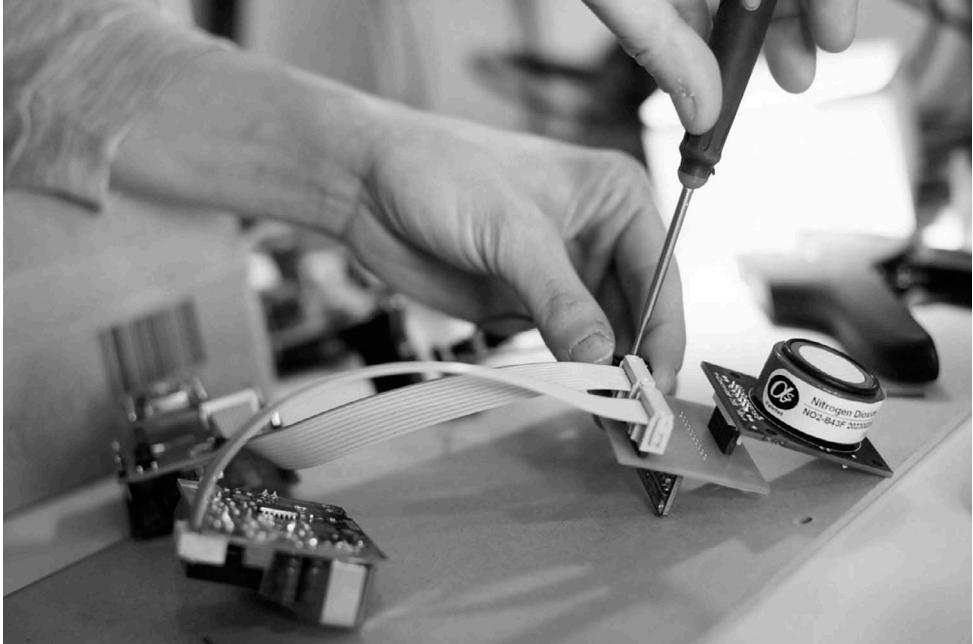


Figure 11.4 A citizen sensor is assembled in Amsterdam

Source: Waag (BY-NC-SA)

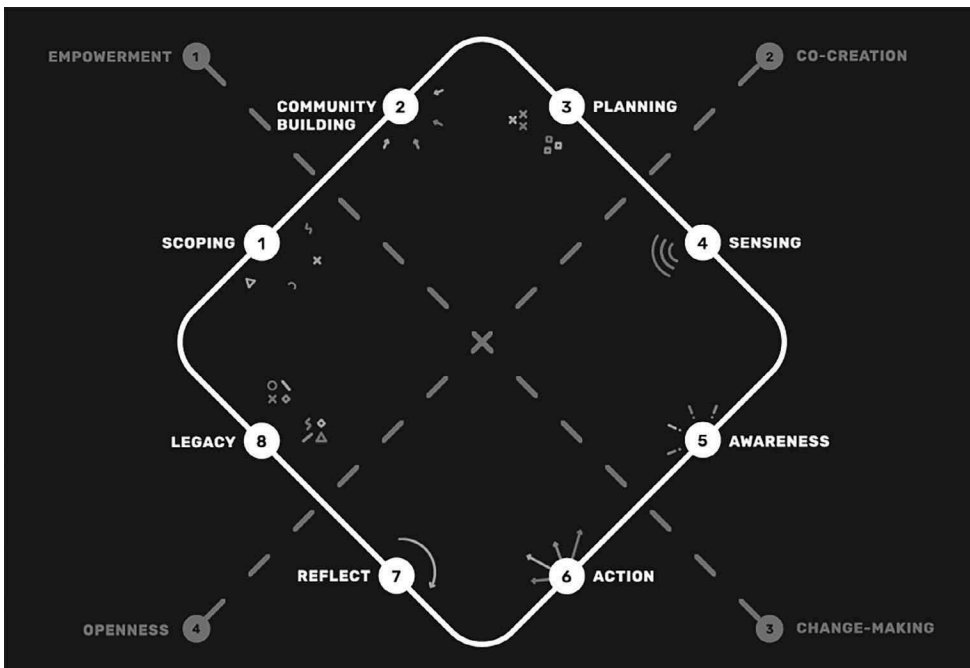


Figure 11.5 The 'making sense' framework in the 'Citizen Sensing: A Toolkit' developed as part of the Making Sense project

Source: Coulson 2018 p. 820

collected and formulate next steps (*action*), and finally *reflect* on the citizen sensing and make sure that the knowledge built during the citizen sensing is documented and can be shared with others through a *legacy*.

The Making Sense pilot delivered answers to concrete questions posed by citizens—like ‘What is the air quality on my street?’ and ‘Should I open my front or back window to air out my house?’—and had a local impact on policy-makers and raised awareness in the neighbourhood. Making Sense had two wider impacts: firstly, formal institutions observed the power of smart citizens and it provided a catalyst for open data initiatives; and secondly it inspired the development of a knowledge base on sensor technology. Using the lessons learned in the design phase, the Smart Citizens Lab aims to have lasting impact on air pollution through the creation of a citizen sensing network on a much larger scale and with a longer lifespan than in previous projects. In this way Waag aims to facilitate societal change.

For example, the Hollandse Luchten (Dutch Skies) project builds upon earlier experiments and pilots to deploy 200 sensors in three pilot locations in the Province of North Holland (Figure 11.6). One of these pilots is located in the industrial IJmond region, where Tata Steel, the second largest steel factory of Europe, is located. Citizens have been concerned with air quality and their health for decades, but due to recent graphite ‘rains’ in the autumn of 2018, the concerns sky-rocketed. Previous projects were often experimental and focused on designing and prototyping sensor technology and community engagement on data collection. Now, with the government and the steel factory as a partner to the project,



Figure 11.6 Sensor demo during the launch of Hollandse Luchten

Source: Waag (BY-NC-SA) Photographer: Ilyas bin Sarib

Waag aims to focus on a new type of impact: the path is clear to actually use the data collected by citizens to improve design of policy.

Smart city: a responsible digital city

As the ‘smart city’ is now starting to be more fully implemented, concerns are increasingly raised with the technology provided by private corporations, platforms, and consultancies (Hollands 2015; Wylie 2017). The potential risk lies in the fact that private corporate values of the companies developing and deploying the technology will replace public and inclusive values that should underpin city life. Smart city projects need to acknowledge that technology is not a neutral (Haraway 1991) set of instruments that merely solves problems but instead contains implicit social expectations and policy directions of its owners and developers. Organizations like the World Economic Forum and the Dutch Social Economic Board (SER) have both identified the necessity to shift from an instrumental perspective on technologies to an approach in which technological potential is explicitly designed and articulated with the public values a city wishes to embody and achieve (Caragliu *et al.* 2011).

The discussions on public values and principles within Amsterdam were solidified in 2017 after several organizations and citizens had become critical of the deployment of technology and data collection in city life. This led to the Tada initiative⁹ and the ‘Tada-data disclosed’ manifesto of which Waag was an initiator. The manifesto elaborated on six principles that should be applied in the digital city:

- (1) Inclusive
- (2) Control (by residents)
- (3) Tailored to the people
- (4) Legitimate and monitored
- (5) Open and transparent
- (6) From everyone—for everyone

With the municipality of Amsterdam committed to Tada, there is consensus on the principles that should be the starting point for technological development and implementation. The next step is to translate Tada into the daily practice of local government. The Tada trajectory demonstrates how collaboration between government, citizens, and local organizations can help to make concepts like open data, data privacy, and data ownership concrete within a city.

The bright future of the commons

Where data are being produced and used in both ‘smart city’ and ‘smart citizen’ models, each model requires some kind of framework for data governance. In a smart city model, this governance framework is often a closed form of ownership by the companies and governing bodies who own the technical infrastructure for gathering and working with data (Kitchin 2014). Waag takes the view that this type of ownership, which excludes those citizens who produce the data, is not appropriate for a smart citizens model.

The opportunities for smart citizenship and citizens sensing are accompanied by the revival of the idea of the commons. Waag defines commons as ‘shared resources managed by communities with an aim of assuring their sustainability and inclusivity’. They foster bottom-up

initiative and community self-determination, while keeping a close watch on the needs of the wider public. Thinking about the city as a commons, where air quality, water quality, and general liveability are the shared resources, sets the stage for a governance model that aligns with the concept of smart citizens as an equal partner in designing the way forward.

Not only can the governance of physical space follow the logic of the commons, but the same logic can be applied to management of data, especially when these data are collected by citizens with their own sensors. Data commons is a citizen-centric approach to data governance. Here, data are self-controlled and available for broader communal use, with appropriate outcomes for privacy protection and value distribution.

Conclusion

Who owns the city? This is the central question in the debate between smart cities and smart citizens. It can be taken as a given that technology will continue to play an increasing role in our cities. Frameworks that do not address issues of ownership and access in smart cities pose a fundamental threat to those who champion democracy, fairness, and civil rights. As cities become more digitized, those who own and control that digitization will increasingly own and control the city itself.

The amount of data about our cities, and about us as individuals, will increase; there is little we can do to change this development. The precise manner in which this will take place—how citizens will be made aware of and have access to the data that are produced about and by them, and to what extent those data will be used to address societal challenges that citizens deem relevant—is still taking shape. This is the area in which the smart citizen approach taken by Waag and the City of Amsterdam aims to make an impact, by keeping control of the city and its data in the hands of citizens.

Notes

- 1 <https://waag.org/nl/project/apps-amsterdam>
- 2 www.longfonds.nl/buitenlucht-en-je-longen/ongezonde-lucht
- 3 www.parool.nl/nieuws/amsterdammer-rookt-ruim-6-sigaretten-per-dag-mee-door-luchtvervuiling~bf5755aab/
- 4 www.sensornet.nl/sensornet/geluidsnet
- 5 <http://fing.org/?Green-Eyes-Montre-verte-CityPulse&lang=fr>
- 6 <https://blog.safecast.org/>
- 7 <https://waag.org/en/project/amsterdam-smart-citizens-lab>
- 8 <http://making-sense.eu/campaigns/urbanairq/>
- 9 <https://tada.city/en/about/>

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