Research Agenda
2022 - 2024

waag futurelab

Content

Waag Futurelab

Waag Futurelab builds on more than 25 years of experience in design and artistic research in the field of technology and society. Based on this position, as of January 2021, Waag has been assigned the role of Futurelab by the Dutch Minister of Education, Culture and Science. Described as: *'A Futurelab is a centre for the future-oriented development of design and for the use of design and technology to solve social challenges.'*

Waag's approach towards design is holistic. It is understood as both the design of artefacts, objects and technologies and the intangible design of our institutions, social structures, and economic models. Waag reinforces critical reflection on technology, develops technological and social design skills, and encourages social innovation. Waag works in trans-disciplinary team of designers, artists and scientists, utilising **Public Research** and **Key Enabling Methodologies** to empower people to participate in the collective design of open, fair and inclusive futures. Waag operates via **three key streams** of work.

Waag is a Futurelab for technology and society.

Expedition Future; Photo credit: Wardie Hellendoorn for Waag

Public and presentation

Firstly, our **public and presentation programme** consists of Waag Open and the Expeditions to Planet B. Waag Open organises public activities rooted in its research. It engages the public with design workshops, debates, exhibitions and campaigns. These range from the makerspaces (Maakplaats 021) located in the libraries of Amsterdam, to events and sessions run both at the Waag building and at partners' locations. *'Expeditions to Planet B'* is Waag's overarching public programme, which seeks solutions to the social, technological, and ecological challenges of our time. In 2021, the central question of the first expedition *#Future* was: "*how do we make future together?*". In 2022, the expedition *#Reframe* will explore the hidden underlying structures that define our presence and what we desire for the future. In 2023, the central focus of expedition *#Entanglement* will be the '*more than human*' perspective, which will take a critical look at the position of us humans in our natural environment. In 2024, we will bring these insights together in expedition *#Imagination* by building a new narrative for humans amongst other species on this planet.

Platform

Secondly, Waag functions as a local, national and international platform for Art, Design, Technology and Society. It encompasses residencies for design research (such as with the Sandberg Institute). It also involves Academy programmes (such as the *Fab Academy*, *Textile Academy* and *Biohack Academy*) to train students with a wide variety of backgrounds in design methods, tools and skills development.

As part of an initiative of the European Commission, Waag organises the *STARTS prize* (along with partners like BOZAR and Arts Electronica) to award innovative collaborations that cross the areas of Science, Technology, and the Arts. Waag also contributes to key developments in the area of policy development for the creative industry, including the Key Enabling Methodologies. Finally, Waag is home to key facilities in the historic Waag building that are open for external collaborators to use. These include the *Fablab* and *Open Wetlab* workspaces.

Public Research
The final area of work for Waag is its **Public Research programm**e. Public Research is the core approach and the basis for other activities. This document will present the agenda for the research programme '22–'24.

The focus of the Public Research programme for this period can be summarised in the motto, '*Staying with the trouble*'. In the following sections, we will discuss the key approach for Waag's research, which combines the idea of an intimate relationship between Technology and Culture with a research approach that centres societal issues and actors. This document will address the various research groups and labs at Waag Futurelab that form the lines along which the research is organised.

The work of Waag would not be possible without the generous contributions from various partners. Waag is grateful for the support from the Dutch Ministry of Education, Culture and Science (OCW), the City of Amsterdam, the European Commission, the Dutch Research Council (NWO), CLICKNL and many others.

Public Research is the core approach.

Staying with the trouble

"Our task is to make trouble, to stir up potent response to devastating events, as well as to settle troubled waters and rebuild quiet places." – Donna Haraway, Staying with the Trouble (2016).

Our future is not set in stone. We don't have to wait passively to see what it will bring or let others define what it holds for us. Instead, our future is rooted in the actions we take today. In order to contribute to a future we desire, we must understand where we are today and what structures and processes are at play. We need to reinvent ourselves and rethink our place as humans among other species on this planet.

Facing today's realities can be a brutal affair: our ecological predicament is worrisome, technological developments have increased tensions and exacerbated power imbalances, the legal and regulatory systems struggle to keep up, and the financial-economic systems seem like more of a problem than a solution. These realities feel overwhelming because they exceed the current problem-solving capabilities of our societies. The classic narrative of innovation, competition and growth is obsolete. New technologies bring in new problems as often as they provide solutions, and more extractive business models are not the answer.

We must, therefore, come up with new forms of collective action, collaboration and creation to move forward. Culture plays a crucial role in activating our imagination. Depending on how we leverage it, the culture we live in can be either a powerful force for change or something that keeps us locked in the past. Culture is also more than the sum of what we can collectively create and experience: it's a web of practices and what 'holds' us in relationships. And it doesn't just play a role in activating our imagination—culture is the result of our collective imagination. To paraphrase Haraway, in her formulation of the task at hand, *"Culture can settle troubled waters and rebuild quiet places"*. There are examples of this being done through civic initiatives, trans-disciplinary and co-creative practices, and artistic exploration, but these are far from being evenly distributed. The same can be said of the technologies we rely on.

For Waag, *"Staying with the Trouble"* signifies that we do not look away, but critically examine why and how things are the way they are and build on that knowledge to collectively change our societies for the better.

Technology = Culture

Culture is deeply rooted in all the artefacts we create. Our technologies are the expression of our culture, values and belief systems. In turn, our technologies contribute to shaping our culture. Changes driven by technological developments are vast and impactful, but their profound and fundamental nature is underestimated. Looming dangers are not recognised and therefore not mitigated. However, opportunities also often go unrecognised. While technologies are regularly deployed in the service of extractivism and destruction, they can also become a force for good. This is especially true when they are based on democratic values and centre the public interest.

Together with partners, Waag presents a **Public Stack**[1] model to demystify technologies and guide us towards the design and development of technologies with societal interests at their core. The Public Stack model highlights how technology design and development are not neutral, but influenced by various issues. In order to design and develop technology that better reflects our societal values, four foundational issues are important to consider. Firstly, the technology being designed should clarify the starting points and assumptions of all involved and make clear what it is optimising for.

Secondly, it should respect public values and guarantee human rights. Thirdly, its governance and supervision arrangements should ensure that society as a whole is in control. And finally, it should adopt a socio-economic model that stays within the boundaries of our planet and ensures a social foundation for all who are affected.

The design and development processes based on these foundational issues share certain **guiding principles**. These principles are open and collaborative instead of proprietary and competitive. They give preference to decentralised and federative technologies over centralised ones. They put privacy, security, inclusivity and sovereignty at the heart of the design process. They lead to fair business models with true pricing that take externalities into account. Each of these principles drives design choices, such as open standards, open source and privacy-respecting data policies. In this approach, we address design not only in relation to technology itself, but also to intangible design of the technical 'system', the complex of technology, social context and rules in which it is used. The research agenda in this document stipulates how Waag will put these principles and practices to the test in various contexts.

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1. https://publicstack.net

Waag Futurelab introduced the term 'Public Research' to describe its developing practices. Public Research takes society as its starting point and focuses on the living environment of people. It is rooted in matters of concern. Public Research democratises knowledge production and authorship based on the notion that everyone has relevant knowledge, experience or skills to contribute. Public Research has a distinctive position in relation to academic research and market-driven research. It contributes to the Key Enabling Methodologies advocated in the Dutch Knowledge and Innovation Agenda of CLICKNL[2]. Waag's main methods and practices are as follows:

Art-Science is an interdisciplinary approach mixing artistic and scientific practices. Both have the ability to shape our understanding of the world and, when combined, they provide new vision and insight, which leads to hybrid forms of knowledge and presentation.

Co-creation is a value-driven, inclusive method for building together based on shared goals and values; co-creation empowers different stakeholders researching 'matters of concern'. It provides a better understanding of the challenges involved and contributes to ownership and perspective for subsequent activities or actions.

Critical Making involves hands-on activities linking technologies to society. It mobilises creative practices of arts, design and technology for critical reflection. The emphasis of the practice is on the value of collective learning as a method to shape new critical understandings of technology and to create equitable solutions.

Commoning focuses on public interest and resource management by communities. Commons promote bottom-up initiative and encourage self-determination by bringing together cultural and economic practices.

Citizen Sensing enables residents to measure their living environment with open hardware and sensors. By collectively gathering data and building knowledge they influence their world, in an open and participatory fashion.

Maker Education enables people to learn by doing. This method aims to demonstrate that learning is doesn't just happen in the mind, but also in the body (i.e. embodied learning). The method develops critical attitudes towards tools and technology and teaches participants what it means to explore and test while learning to express creativity.

Waag's research labs develop and apply these methods and practices to ensure that society is involved in all stages of the research.

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2. https://www.clicknl.nl/en/knowledge-and-innovation-agenda/

Research Groups

Waag organises its research in four research groups: **Code**, **Life**, **Make** and **Learn**. Each group is led by one (or, in the case of Learn, two) Head(s) of Programme. Each group has a core perspective. *Code* cracks open the black box of engineering, *Life* empowers people and nature in their living environment, *Make* touches on making-practices and materials and Learn looks into our skills and attitudes towards learning. Each group has one or more labs with an associated Lab Lead. The per-spectives of the labs and groups are all intertwined and collectively form our research practice.

Ultimately, Waag's research is oriented towards having a positive, lasting effect on our societies. In this section we will present the research context and key research questions for each group and lab. On Waag's website, the impact of the research is presented and will be updated on an ongoing basis.

Urban Ecology; Photo credit: Florian Geerken for T-Factor

Code researches how we can crack open the black box of technology in order to research and experiment with the design and development of digital spaces based on public values. These spaces are inherently interactive: places where people exchange views, experience digital life and make purchases. We refer to them as *public* when they are founded on 'the public interest,' which is often expressed through an articulation of the public values they embody. They can only exist when they are considered a shared societal resource.

The research in Code has both brought about the model of the Public Stack and continues to build upon it, apply it and refine it through application in projects and research published on a dedicated website. Code conducts its research in two labs: the **Future Internet Lab** and the **Commons Lab**. Jointly, these Labs research how the triangle of state, market and civil society can be activated in the production of digital public spaces.

Future Internet Lab
The Future Internet Lab focuses on research and experimentation in the service of open, democratic and sustainable digital public spaces. It develops and encourages critical reflections on the values that underpin emerging technologies, like artificial intelligence (AI). Many digital platforms are parasitic on existing economic and social structures. Market dominance of a few corporations causes an erosion in the innovation of business models. The state does not always adopt digital technologies in the interests of the people, which creates an imbalance of power. Systems seem to be built from a position of distrust and, as a result, are lacking in openness and critical reflection of the effects these systems have on citizens. This analysis has led to the following research questions:

1. **Open business models:** How do we achieve a market that is accessible for new initiatives and loses the winner-takes-all attitude?
2. **Tech regulation:** What rules can constrain the omnipotence of BigTech?
3. **Public Stack building blocks:** How do we create technical building blocks that constitute public digital infrastructures?
4. **AI models:** how can we increase the knowledge of AI models in the public domain and it use in the citizens' interest?

Code researches how we can crack open the black box of technology.

Future Collider; Photo credit: Wardie Hellendoorn for Waag

Commons Lab

The Commons Lab researches the ancient and emerging practices of sharing resources and the design principles for managing it collectively. It deals with themes of scarcity and abundance within the context of ecological challenges. Scarcity is associated with economic, ecological and social resources, while resources such as data, content and knowledge are regarded to be abundant. However, the material and immaterial world are becoming increasingly intertwined.

The Commons Lab wants to understand how technology influences the management of resources and the governance of people's concerns. There are no validated approaches for digitally mediated governance. These issues manifest themselves in the energy transition and physical-spatial development. The urgency of climate adaptation is met with deference—even in the Netherlands. Both the social and civic and the imaginative and spontaneous have proved difficult to incorporate. Our research revolves around experimental and imaginative work. We see commoning as the creation and reproduction of a new ecological-public domain composed of assets and infrastructures, both tangible and intangible. Research questions are:

1. How can (digital) tools and commoning principles play a role in empowering residents' initiatives to self-manage their assets in the context of the energy transition and urban developments?
2. How do we shape governance in a data-driven world? Commoning suggests the development and customisation of reiterative, mixed and 'open' models of governance for different contexts. What are they and how can they be adopted widely?

Life empowers people and nature in their living environment. Life does this by researching how people create agency and owner-ship in the future of their health and living environments through the use of open technology and public-civic collaborations. Life emerged as a new research group based on the work done in the **Smart Citizens Lab** and the former **Make Health Lab**.

Climate change, digitalisation and social upheaval affect our living environments, our lives and our bodies. The focus of Life is on strengthening the position of people in relation to govern-ments and corporations, so they can have a positive impact on their lives and livelihoods. Everyone lives in a context connected to others (e.g. friends, neighbours, or relatives) in their local environment. More and more societal initiatives arise from these collectives and there is an increased willingness of governments to collaborate with these collectives in *public-civic collabora-tions*. The role of technology so far has been designed to build larger centralised systems based on commercial values, but there is an untapped potential to support small-scale initiatives and connect these decentralised parts. People, communities, and local culture should decide how we use and apply technology.

Life will also experiment with the role that '*more-than-human*' perspectives can play in addressing societal challenges in the living environment and climate. The fact that we as humans place ourselves outside of our natural environment has contributed significantly to the issues we are facing today. Learning from what has already been done in this regard, Life aims to further develop the theory and practice to create space for non-human perspectives. Life explores how new collaborations can be formed to address the concerns at hand, how technology can facilitate this, and to what extent they empower people in the systems so that trust can be restored. Research questions are:

1. To what extent do public-civic collaborations contribute to the empowerment of people and the restoration of trust in public institutions?
2. How can we develop technology for specific practices to support societal initiatives and public-civic collaborations?

Citizen Science; Photo credit: Groene Maakplaats

Smart Citizens Lab

The Smart Citizens Lab researches how people and communities develop agency to live in balance with their environment. The Smart Citizen, both as individual and as part of a collective, critically explores how and which technology empowers him/her to understand, act, improve the local environment and/or the physical and mental well-being. In doing so, the Lab explores how technology can function as an instrument for democratisation and empowerment to achieve social and environmental change.

Research questions are:

1. How do we facilitate citizen collectives to take agency over their own living environment and lives through the use of technology and contribute to systemic change?
2. How do we create or facilitate local ownership of both social and technical infrastructures to contribute to a sustainable continuation of projects and initiatives? And how can open technology, based on the principles of the public stack, contribute?
3. What other applications of technology are there for people to take control over their lives and living environments? How do we relate to technological developments in our lives so that we are in control instead of being controlled by technology? How can we create a meaningful relation with our natural environment, learn from its intelligence, and build agency based on ecological principles?

Citizen Science; Photo credit: Groene Maakplaats

Urban Ecology Lab (in development)

Our relation to our planet causes climate change and ecological destruction. The current worldview puts humans at the top of the pyramid and allows us to exploit earth's resources for our own short-term interests. It's time to tell a new story, use a different frame, and create a new relation to our environment: one in which we see humans not as disconnected from our environment, but as an integral part of nature and the ecological system.

Within the Urban Ecology Lab (UEL), the city is viewed as a living space. A dynamic system wherein a multitude of entities, materials and flows are constantly working and re-working each other, being made, and unmade. The UEL underscores that, within this complex web of socio-ecological networks, it is of vital importance to take a humble approach to 'getting-to-know-what's-there'. In our research, we include more-than-human perspectives, which go beyond the subject of entities (both human and nonhuman), and refocuses on the messy relations and borders between them, especially those related to concerns and justice.

That way, we can start to include the plural perspectives of more-than-humans, materials, histories and future generations and actively work towards our (re)making of this world.

The UEL has a primary focus on the urban. Yet, because almost the whole surface of the Netherlands is man-made, we believe it is of interest to broaden our horizons to include rural areas and the countryside. Everything from our agricultural lands and heavy industrial zones to our nature reserves are planned and developed by humans. Research questions are:

1. How can we rethink the relationship of people and environment in the context of urban planning?
2. How do we advocate for city-(un)making as something that can and should be done with and by more-than-human life?
3. How can we foster refashioning the relationship between people and their environment and create practices under which the ecologic system can be rebuilt?

Make deals with the factors and actors that shape the man-made world influence the design and engineering of textiles, the way we work with living matter, and our relationships with living systems. Observing this at a global scale may change the ways we act as humans.

Finding its origin in the **FabLab**, the **Open Design** programme, and **Art-Science** collaborations, Make's research ranges from material to urban ecologies & earth observation. It experiments with collaborations across disciplines and organisational models. The fundamental questions are:

1. **What** is made – and consequently what is not made?
2. **Who** makes – and who does not make?
3. **How** are things made – and how not?

These questions are addressed in Make's overarching research programme Material Stack. It follows a value-driven approach that is *counter-extractivist*, inclusive, and staying with the trouble. In addition, Make operates through four labs:
the **Open Design Lab**, the **Open Wet Lab**, and the **Textile Lab**.

Make deals with the factors and actors that shape the man-made world.

Tech & Craft: Trash Hacking Workshop; Photo by Waag

Open Design Lab

Waag houses the first FabLab in the Netherlands. The FabLab is a workstation for personal, collaborative, digital and, most importantly, bottom-up design and fabrication. Being a home to *fabbing* enthusiasts, designers, artists, activists and citizens, a variety of objects, materials, experiments, designs, and products are made in the FabLab. Here, we critically re-imagine technologies not only by making things, but also by unmaking them or making them open.

The Open Design Lab, of which the Fablab is part, researches open collaboration methods and processes, and how the results of those processes can have a shared ownership. We believe that *design cannot remain exclusive* – a concept that encompasses movements like open hardware and the (legal) models that support it. The Open Design Lab re-values the notion of *craft*. Craft represents disciplines and activities from the past, as well as from contemporary and future-oriented practices. With every new tool, new ways to work

with this tool emerge, often with local maker signatures and dialects. These dialects make every FabLab unique, giving many accents to the global network of FabLabs and maker spaces. The Fab City Network is a context where agile, small-scale fabrication is gaining traction in fabrication for housing, public spaces, citizen collaboration. In Waag's Open Design Lab, Fab Lab practices also show a greater interest and faster appreciation and uptake of the need to work with more circular production and responsible provenance of materials. Research questions are:

1. How can Open Design contribute to collaborative and responsible use of open materials and shared open technologies?
2. How can we learn from historical making and maker practices to better understand and master (digital) contemporary fabrication?
3. How can personal fabrication and open design contribute to transformation to a zero-carbon economy and address other urgent SDGs?

Open Wet Lab

Living organisms can and have been industrialised, consumed, bred and genetically modified. This modification has brought humankind many benefits, but we've recently begun to realise what costs are associated with this approach towards the living world (e.g. the rapid decline of biodiversity, antimicrobial resistance, pandemics, and animal harm). Open Wet Lab's research focuses on three areas: body, food and shelter.

The lab enables embodied learning through applied biology and fosters hands-on learning to work with living matter in ethical and inclusive ways that respond to the environmental crisis. It includes an artist-led initiative that promotes citizen literacy about biotechnologies while producing cutting-edge ideas and research around key topics from the life sciences, presented as artworks and prototypes for further development and implementation. Research questions are:

1. How we can critically and sustainably innovate with living matter, working in collaboration with species as varied as mammals, plants and microbes? How can it contribute to nutritious and sustainable alternatives for food?
2. How can we create access to open knowledge when it comes to life and living materials, and what are governance models of genetic and bio information?

Tech & craft; Photo credit: Waag TextileLab Amsterdam

Textile Lab

The textiles, clothing and materials industry is one that we are all part of. Every day of our lives is permeated by textiles. Textiles are often the first thing we touch when we come into this world and the last one when we leave it.

The industry has always been one of the most technically innovative and competitive. It is one where sharing isn't valuable and collaboration is a linear chain addition, not an opportunity change. It is a field that needs and wants to innovate in a more holistic way, yet struggles to do so, lacking an approach that is value- and nature-driven.

The Textile Lab operates locally, nationally and internationally, combining hands-on research that taps into heritage knowledge and emerging technology, mutual literacy, research on language to craft necessary new narratives, and embody the process of transition towards change. It strives for impact through distributed networks, shaping enabling environments and feed in/from the ripple effect of the replicable outcomes.

The Textile Lab has a holistic and embodied approach to textiles, that is personal (care), value driven and networked. It tackles research through five entry points: materials, tools, processes, systems and culture. Its research questions are based on those layers:

1. Materials & Tools: How can we create, engineer, design materials from alternative raw materials with their product-life-cycle in mind? What are the open tools to craft, locally produce and scale to distributed networks?
2. Processes & Systems: Can we shape and enable others to shape more value-driven processes through the opportunities that tech, crafts and heritage knowledge, teaching and training our community bring us? What enabling infrastructure/systems do we need to support our communities and networks in their development?
3. Culture: Can we create and foster a supportive (caring) open, fair and inclusive culture for this transition towards value-driven, circular, sustainable textiles to happen?

Space Lab (in development)

In a world in which 75% of the planet's land surface experiences measurable human pressure, the way people apply their imagination substantially impacts the planetary environment itself. Today's dominant idea of the Earth connected as a global system emerged through the 20th century with *space science and technologies* playing a central role. With major state and private actors behind the development of these technologies, the rest of society remained spectators. The space sector still behaves as if they can be a neutral interpreter of the environment. At the same time, the majority of the population struggles, and struggles along with the environment.

Because it matters what planet we portray (and which one we do not), the Space Lab researches the relationship between the *ways of mattering* (drivers) behind environmental narratives. Beside the established *matters-of-fact* produced by science and *matters-of-interest* maintained by industry and states, the Space Lab aims to bring to the forefront *matters-of-concern* by empowering citizens and non-human persons, *matters-of-care* through those who manage to engage, and *matters-of-justice* when environmental harm becomes irreversible. Understanding and situating the relationships between different ways of mattering will contribute to a more inclusive and know-ledgable society as it deals with emerging environmental urgencies. The lab sees itself as a transmitter of novel, mainstream narratives. Research questions are:

1. What is the impact of different ways of mattering on the way society makes its environmental technologies? And what kind of different societal and manmade environments are emerging from the use of these technologies?
2. How can we empower citizens and the civil sector with space technologies in ways similar to how the industry does so for their own agenda? With space agencies focused mostly on business applications targeting customers, what kind of innovative ecosystem is required for more civil and public benefits?
3. What is the role of planetary imaginaries, especially now that there is such a variety of them that it seems we even don't live on the same planet anymore?
4. What are the benefits of collaborative and art-driven research and innovation practices for the space sector? What activities are required to improve an understanding of these practices? Can they contribute to the narrowing of a gap between existing models of understanding the planet Earth and the messy and complex liveliness that composes the planetary environment?

Learn focuses on the development of skills and attitudes towards learning. Learn approaches learning as a collective and *hands-on process* in which knowledge and meaning are constructed and competencies are developed. The fundamental questions:

1. What do we have to learn and unlearn for a shared future?
2. How do we grow as human beings, and how can we connect in a changing and increasingly technology-dominated society?

Learn builds on the research of the Fablab and the Maker movement and aims to develop the *maker mindset*: an integrated approach that connects head, heart and hands. *Learn* does this for, by and with others within learning ecosystems. Alvin Toffler, futurist and philosopher, said '*The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn'*. In order to learn new concepts, we need to unlearn existing ones and develop new vocabularies and ideas. Learn's research is carried out in two Labs:
The Future Heritage Lab and **Maker Education Lab**.

Learn focuses on the development of skills and attitudes towards learning.

Museum Camp; Photo by Waag

Future Heritage Lab

Future Heritage Lab researches the stories we tell to make sense of our lives. Heritage is what binds us, divides and engages us as we build our future. Heritage is a dynamic field of curation and inter-actions rather than a static collection of artefacts. We look at the ways in which (digital) technology influences how we assemble, relate to and share society's (big) narratives. The main questions are:

1. How can heritage be an inspiration for con-temporary culture? Connecting heritage and maker culture could help give new meaning to heritage by linking it to social issues; it could help create greater polyphony, which could present unexpected perspectives.

2. How do we make sure future generations have access to digital-born heritage? As we are losing the resources and information from the start of our digital lives, we need to define strategies to preserve this for future genera-tions. For complex, dynamic information systems consisting of several applications, developed over time, there are currently no archival strategies in place.

3. How do we increase the agility and resilience of the heritage sector/cultural sector in a changing society that is increasingly domi-nated by digital technology? By resilience we mean: the competencies of individuals and organisations to be able to innovate them-selves and to respond to current develop-ments in the sector and society.

Maakplaats 021; Photo by Waag

Maker Education Lab

The Maker Education Lab (MEL) researches ways in which a *maker mindset* and *21st century skills* can help youngsters to (better) find their place in society. Maker education enables people to learn by doing and to develop critical attitudes towards technology. Through *Maakplaats 021*, the *Maker Faire* and with the *Mokum Maakcoalitie*, steps have been taken towards securing this focus within (in) formal education. In this way, the lab has been successful in addressing the importance of maker competency in informal learning, which has been recognised and adopted by many organisations over the last years. Now, MEL will connect maker-ship to open schooling formats and possibilities for young adults to become professional makers. Open schooling describes learning which is 'open' in terms of timing, location, teaching roles, methods, and any other factors related to the learning process. It is where schools, families, companies, and neighbourhoods become part-ners in school life and the learning journey of the students. *Maakplaatsen*, *Open schooling Hubs* and a *Fab city Hub* together will become an ecosystem for maker education, and open to

other organisations joining in.

With Waag becoming a FutureLab in 2021, MEL also shifted its focus towards the future and, more specifically, towards how young people can take ownership over their future and develop agency over designing their own future scenarios. Together with partners, MEL will explore and combine methods of enabling people to under-stand different types of futures and make their ideas about these futures explicit. The lab will work on these '*futures explorations*' from a *critical making* perspective. By making ideas about the future more tangible, it enables the youth to learn about those futures in an experiential way. MEL's main research questions are:

1. How can critical making help young people become aware of their own share in the future, be able to (help) design future scena-rios, and develop agency over their paths towards a future?
2. How can we design future-forward, hands-on educational programmes that help build an ecosystem of maker education?

Colophon