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the future  
open, fair  
is a verb  
inclusive

# Research Agenda

'25 - '28

waag  futurelab

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# 1. Introduction

Since 1994, Waag Futurelab ('Waag') has explored how technology, viewed through a social lens, can help build a more open, fair, and inclusive future, both in design and implementation. Waag starts from the understanding that *technology is not neutral*; it is an expression of cultural and political values. Therefore, her research focuses on demystifying black box systems, revealing hidden assumptions and economic mechanisms, and involving the public in (re)design processes. The **Research Agenda '25-'28** ('Agenda'), which expands on Waag's Policy Plan *The Future Is a Verb*<sup>1</sup>, provides the framework for this work.

## Technology

When considering strategic autonomy and the control we have over technologies, Waag is guided by the *Key Enabling Technologies*, as defined in the agenda of Digital Holland<sup>2</sup>. This perspective is applied when thinking about **artificial intelligence** ('AI'), **quantum technology**, **satellite technology**<sup>3</sup>, **smartphone ecosystems**<sup>4</sup>, **data platforms and protocols**, and platforms such as social media.

## Feasible and regenerative

Waag not only investigates the values inherent in technologies, but also focuses on the **manufacturability** and **regenerativity** of technologies. This includes the origin of the materials used in manufacture and the working conditions under which they are produced. Principles such as governance and transparency are central, and are elaborated in models for *data commons*, *public code*, and *public AI*.

## Framework and guidelines

Waag's research centres the **Public Stack**<sup>5</sup>, an assessment framework for existing technology and a guideline for the development of technology that prioritises the interests of society. Waag launched the Public Stack in 2020<sup>6</sup>. Since then, it has been developed and deployed by Waag in a variety of research projects. In this Agenda, a revised version of the Public Stack (as articulated in Chapter 4) forms the overarching framework of the Agenda itself.

## Design

Waag has shared her vision on design in publications such as *Users as Designers*<sup>7</sup>, *Open Design Now*<sup>8</sup>, and the *Co-Creation Navigator*<sup>9</sup>. In recent years, Waag has also actively contributed to the *Key Enabling Methodologies*<sup>10</sup>, as drawn up by ClickNL, the technology knowledge institution for the creative industry in the Netherlands. These form guidelines for the design methodologies

<sup>1</sup> Read Waag's [Policy Plan '25-'28](#) (in Dutch).

<sup>2</sup> Read about the [Digital and Information Technologies](#) of Digital Holland.

<sup>3</sup> Learn about open-source satellites via the [Libre Space Foundation](#).

<sup>4</sup> Waag investigates smartphone ecosystems in the [Mobifree](#) project.

<sup>5</sup> Learn more about the [Public Stack](#).

<sup>6</sup> Read the [Roadmap for Digital Future](#), which was developed in the Public Stack project.

<sup>7</sup> Access [Users as Designers](#).

<sup>8</sup> Access [Open Design Now](#).

<sup>9</sup> Access the [Co-Creation Navigator](#).

<sup>10</sup> Read ClickNL's [Key Enabling Methodologies](#).

Waag uses. The four methodological pillars, in which Waag specialises and that support her **Public Research**, are detailed in Chapter 3.

## A just society

Waag researches and designs technology for a just society; her research priorities therefore are aligned with the needs of contemporary society, which is under pressure from the consequences of climate destruction, geopolitical developments, and social unrest. This alignment makes Waag's work especially relevant as we confront the systemic flaws of our growth-driven economy.

Our addiction to economic growth comes at the expense of the liveability of our planet. As early as 1972, the Club of Rome demonstrated in *The Limits to Growth*<sup>11</sup> that leading economic models failed to take into sufficient account the effects of production and consumption on the climate and biodiversity. This type of economic thinking focuses on the earning capacity of privatised parties: the result is a concentration of power and capital, which has led to a more unequal society. Betting the future on gross domestic product growth figures is unsustainable, because unlimited growth does not exist. We have to make choices. What will replace earning capacity as a measure of success and prosperity? How can we as a society withstand climate crises, geopolitical power struggles, and social unrest?

## Resilience

Resilience is not only society's ability to withstand shocks and disruptions, but also to respond actively to them, learn, and adapt. It involves both restoring existing structures and reorganising or renewing them, based on knowledge and experience gained. In this sense, resilience is not a static characteristic, but a dynamic learning process in which feedback, reflection, and adaptability are crucial. Resilience is therefore a learning cycle, and a capability.

Resilience is also crucial for a just society. Only a resilient society can leave our world liveable for future generations. Only when we have control over our technology can we use it to safeguard and revitalise democracy. Ensuring that local and interconnected social structures support resilience is crucial in this regard.

Waag's research focuses on four forms of resilience: economic, social, planetary, and technological. Waag has created a framework for research and innovation, the Public Stack (as described in Chapter 4), in which these forms of resilience are the criteria.

## Economic resilience

Economic resilience can no longer be based on gross domestic product growth, earning capacity, productivity gains, or the competitiveness of companies. These output indicators, by which innovation is commonly measured, are no longer sufficient because they do not take into account social, planetary, and geopolitical externalities. New economic models are emerging,

<sup>11</sup> Read [The Limits to Growth](#), written by the Club of Rome, an international non-profit organisation of scientists, economists and leaders addressing systemic global challenges.

however, like the *Doughnut Economy*<sup>12</sup>, *broad prosperity*, *post-growth*, and the *commons economy*, that focus instead on regeneration or are non-extractive in nature.

Achieving a balanced and resilient economy requires a new arrangement between non-profit social entities, private companies, and public institutions, including the government. This triangle of *civil-private-public co-operation* provides space for community-based economics, stewardship of resources, and regenerative business processes and models<sup>13</sup>.

### **Social resilience**

Because a resilient society also depends on a healthy ecosystem of production and consumption, it requires an economic environment where power is balanced, markets are sufficiently supervised, and money creation and capital serve the public interest. When economic structures are oriented toward regeneration and equity, the social fabric - trust, agency, and the capacity to resolve conflicts peacefully - can thrive.

Social resilience means that people can count on constitutional institutions, social security, and collective resilience. Do people have control over their lives and agency around decisions that impact their lives? Can they develop themselves, do meaningful work, and societally care for the vulnerable? Are we collectively capable of resolving conflicts peacefully?

### **Planetary resilience**

Declining biodiversity is endangering the food chain, global warming is making the planet uninhabitable, and rising sea levels are causing severe and long-term consequences for coastal communities and ecosystems worldwide. As such, the ecological system must be central to our thinking and actions. This is particularly important in the research and design of technology, because of its impact on the environment, energy, and raw materials, as well as on ecological systems. Waag takes a *more-than-human* approach, a perspective that teaches that all living species depend on each other, and how urgent it is to recognise the rights of nature.

### **Technological resilience**

As a European society, we have become largely dependent on technology, and this trend is increasing. We can therefore only become socially resilient if we are also technologically resilient. Most technology, however, is developed by companies outside of Europe. Geopolitical developments make it necessary for Europe to become more technologically resilient. This can only be achieved if we develop control over our systems in all areas - not only over software, but also data, AI, and digital infrastructure. In doing so, it is necessary to consider what is needed to create this technology, from raw materials to energy to labour.

<sup>12</sup> Read about the [Doughnut Economy model](#), as developed by Kate Raworth.

<sup>13</sup> Waag has developed a [Public-Civil Cooperation Manual](#) (in Dutch).

## 2. Theory of Change

Waag's mission<sup>14</sup> focuses on researching and designing technology from a social perspective. To achieve a just society, it is essential to understand the underlying cultural assumptions embedded in technologies and the values on which they are based. Curiosity-driven **research** is paramount in this regard.

Waag **experiments** with technology, taking the interests of society as starting point: she makes explicit and clear the public values of society. Together with partners, Waag investigates these values, as well as designing and building technology based on these values. Finally, Waag works on the **further development** and rollout of technology for a more resilient society, with regard to and contributing to planetary and social resilience.

### Pathway to impact

In working on technology for a just society, Waag has defined three phases toward creating meaningful impact:

#### I: Explore

This phase focuses on scientific and artistic exploration of emerging themes and technologies. Researchers, residents, stakeholders, artists, and creatives work together to explore emerging and existing technologies and question their cultural assumptions.

#### II: Experiment

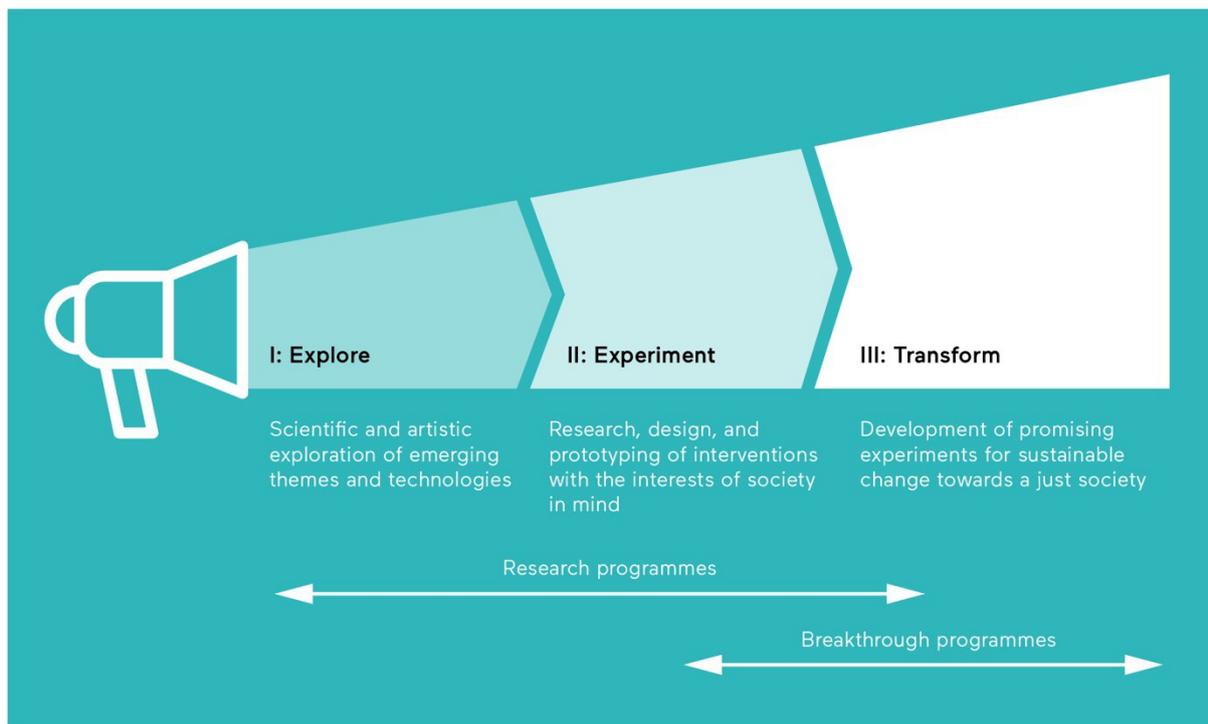
Research, design, and prototyping of interventions that focus on the interests of society are at the core of this phase. Technology is designed and built based on public values and with the collective in mind. Transdisciplinary open collaborations and the application of Waag's *Public Research* approach (as articulated in Chapter 3) are central.

#### III: Transform

Promising experiments are further developed and applied more widely during this phase. Knowledge and skills are transferred, multiplying change in line with public values. This requires the application of principles such as *spreading, not scaling*<sup>15</sup>, or *scaling out* instead of traditional upscaling. Insights lead to more sustainable change through the involvement of politicians, policymakers, and other partners who safeguard and implement findings for a more just society.

<sup>14</sup> Read [Waag's mission](#).

<sup>15</sup> As described in "Spreading and scaling innovation and improvement: understanding why the differences matter" (Bevan, H. et. al, 2024) <https://doi.org/10.1136/bmjinnov-2024-001251>



## Research & breakthrough

The **research programmes** (outlined in Chapter 5) focus primarily on the first two phases, Explore and Experiment. In the third phase, Transform, the research focuses on how results can be adopted more broadly and how systemic change can be achieved. Waag has also defined three **breakthrough programmes** (detailed in Chapter 6) that move beyond the exploration phase and require the necessary involvement and commitment of a larger group of parties to achieve sustainable systemic change.

## 3. Public Research

Waag calls her research practice *Public Research*. Public Research emphasises that social knowledge production is not only developed in academic contexts, but also in other knowledge domains such as artistic and design research. It is grounded in societal issues with a resultant focus on '*matters of concern*'<sup>16</sup>.

Waag always takes society as the point of departure, focusing on the lived environments of residents, citizens, and social organisations, and on the issues that arise from them, in her research. Her research democratises knowledge production, based on the belief that everyone has relevant knowledge, experience, and skills to contribute to research. It complements academic and industrial research, is transdisciplinary in nature, and encompasses both artistic

<sup>16</sup> '*Matters of concern*' is a concept introduced by philosopher Bruno Latour. It shifts attention away from '*matters of fact*' as isolated and settled objects, and toward the complex, entangled assemblies of human and non-human actors, along with their histories, dependencies, and controversies. Waag applies a *matters-of-concern* approach to our work, further informed by Donna Haraway's thinking on situated knowledge, relationality, and responsibility, which foregrounds how values, culture, and power are inseparable from the production of knowledge and technology.

and design-based research methods. The Public Research methods are represented by four pillars:

## I: Art-Science

*Art-Science* focuses on artistic and scientific research as complementary forms of knowledge production, promoting collaboration between the two. This approach makes use of artistic curiosity, creative practices, and interdisciplinary methods. It leads to new forms of knowledge production, raises new questions, and develops new approaches to economic, social, planetary, and technological issues.

## II: Citizen Science

*Citizen Science*<sup>17</sup> treats society as the research community in which residents help shape the study design, collaborate with experts, and guide the research itself. Waag focuses specifically on *Citizen Sensing*, in which residents use open-source tools to measure and interpret their living environment. The data gives them a stronger position in discussions with governments, knowledge institutions, and companies about a healthy living environment.

## III: Critical Making

*Critical Making* uses hands-on making practices to explore how technology interacts with society. The term was coined by Matt Ratto, scholar and theorist of technology, to bring together the maker movement and the term '*critical thinking*'. It bridges the gap between critical theory and practice: the practice itself is critical and is always interactive. Waag integrates these insights into both formal and informal education, as well as through the physical infrastructure of its maker spaces.

## IV: Value Sensitive Design

*Value Sensitive Design* is an approach to technology design that proactively weaves values, like privacy, safety, autonomy, and fairness, into technology development and use. A characteristic feature is that the research into values is comprehensive. It takes place from the start of the design process, seeks to minimise harm to both humans and the environment, and takes into consideration the interests of organisations developing technologies, as well as stakeholders who are directly or indirectly affected by the technology. The method takes into account that different values may conflict with each other in specific situations, and devises ways to settle such value conflicts. The approach is participatory, and encompasses conceptual, empirical, and technical research.

# 4. Public Stack

All technology consists of visible and invisible layers, including hardware, software, design processes, and business models. All of these layers influence the relationship between people and technology - as consumers, subjects, citizens, and people in a democratic society.

<sup>17</sup> Learn about [Citizen Sensing](#).

The **Public Stack model** (first developed in the European research consortia DECODE<sup>18</sup> and ACROSS<sup>19</sup>) challenges developers, financiers, and other stakeholders to develop technology based on shared public values by using participatory design processes and open technology. The goal is to position people and planet as democratic actors, and as more equal stakeholders in decision-making about the development and implementation of technology. Waag researches and develops the various dimensions of the Public Stack in relation to the Key Enabling Technologies and Methodologies (as noted in Chapter 1). The results of this research are translated into the Research and Breakthrough Programmes (outlined in Chapters 5 and 6).

The Public Stack model defines **six dimensions** in the design of technology. In these dimensions, Waag puts public interest first. She can apply the questions which arise to the design of new technology, and to the analysis and redesign of existing technologies, to bring them into alignment with public interest and values. In this way, Waag is developing the Public Stack as an assessment framework and guideline for existing and future technology. The Public Stack can also be used as a guideline for experiments.

## I: Power & representation

In investigating power and representation, it is clear to Waag that broader participation in design and decision-making about technology should be central to technological development. Large companies and governments should not be the only stakeholders that determine the direction of development or growth. Civil society organisations, amongst others, must also have a voice. It is essential to consider who sits at the design table and helps shape what our world looks like. Who determines which skills matter? How do you get people to the table? What capacities do we need to develop to enable people to participate fully in the design process? Does nature have a voice? What about future generations? This translates into methodology and knowledge development, but also into regulations that ensure specific groups are not excluded from full participation in society.

## II: Assumptions

Those who decide on the design and function of technology have a major influence on its social impact. Most technological development is based on economic or productivity goals and lacks social considerations. Problems with AI and other technologies arise primarily because of the interests of owner and developer, not because of their potential and applications for a better world. The resulting power imbalance is increasing in relation to social organisations, individuals, and small- and medium-sized enterprises, who do not have the same investment capacity as large technology companies. What is the worldview of those sitting at the design table? What assumptions are inherent in these worldviews, and how are these expressed in the design?

## III: Ownership

Technology is always owned by a person or legal entity when brought into being - when it is developed, paid for, stolen, appropriated, or modified. This ownership is often held by private

<sup>18</sup> Learn about the [DECODE](#) project.

<sup>19</sup> Learn about the [ACROSS](#) project.

individuals or corporations, entities of agglomerations of capital, market position, and political cover. However, another form is possible. Instead of ownership by individual people or private entities, we can organise ourselves toward social ownership. The core of this is that ownership is not in private hands, but in those of the community. The influential strategist Henry Mintzberg is an advocate for what he calls the *plural sector*, in which ownership is not held by state or private investment<sup>20</sup>. But how do we increase ownership that focuses on the common good? How can we design ownership based on public values? And what is the role of licensing models such as *open source*, or the possibilities of *steward-ownership*<sup>21</sup>?

## IV: Governance

The organisation of control, regulation, and oversight of technology is crucial. It is a misconception that we must choose between the primacy of government or that of business. Civil society has significant potential to generate solutions. The energy transition, for example, shows that this is only possible with the involvement of strong social initiatives. The same applies to the digital domain. Strengthening the *digital commons*<sup>22</sup>, in which the community collectively controls technology, offers Europe the opportunity to develop an uncompromising digital infrastructure aligned with European values of openness, inclusivity, and democracy. What structures and processes do we use to govern technology? Which governance models put public interest first? And how can we apply them at scale?

## V: Legislation & regulation

Technology has a profound impact on our *fundamental rights*. However, it is not self-evident that laws and rights are taken as the baseline for design. *Move fast and break things* is an adage of big tech, where the existence of rules is often seen as an obstacle. Reijer Passchier, designer and researcher specialising in technology, digitalisation, and the rule of law, shows how our legal system has facilitated the rise of big tech companies<sup>23</sup>. To break their dominance, a critical attitude towards our legal system is essential. Fundamental rights are about more than just privacy; human rights and competition policy should not be negotiable. *Data minimisation* and *privacy by design* should always be the foundation stone. Waag considers how she can put justice at the centre and investigate how new laws and regulations can contribute to a just society.

## VI: Ecology

The environmental footprint of technology is enormous and continues to grow in all areas: water, energy, raw material consumption, land use, and emissions of harmful substances. Instead of being taken into account in the balance sheet, these are treated as externalities, and therefore are not included in the annual figures of companies and the state, resulting in private gain and public loss. Extraction is central, whether the extraction of value is ecological or economic. The consequences lie with society and often remain invisible<sup>24</sup>. Only by explicitly taking these

<sup>20</sup> Read an [article about the plural sector](#), authored by Henry Mintzberg.

<sup>21</sup> Learn about [steward-ownership](#).

<sup>22</sup> Read about the [European Collaboration for Digital Commons](#).

<sup>23</sup> De vloek van big tech, Reijer Passchier (Boom, 2024)

<sup>24</sup> Read about the social and environmental effects of investment in [this publication](#) by SER (in Dutch).

questions into account can we turn the tide. How can we keep technological developments within the limits of the planet? How can we better understand which practices, knowledge, and technologies shape the planet in fair and caring ways? How can principles such as regeneration or care, rather than extraction and consumption, contribute to solving this?

## 5. Research programmes

The research programmes address and investigate the challenges that arise from the six dimensions of the Public Stack. These dimensions allow us to question, develop, and design technology while centring values explicitly.

### I: Public technology

Digital technologies are often touted as enhancing well-being and prosperity, but in reality increasingly cause fundamental problems. Consider the ecological footprint of data centres and AI models, the undesired control exerted by algorithms, the loss of control and autonomy over democracy, or digital environments that fail to protect vulnerable groups on social media. While digital technologies cause more and more of these problems, there are insufficient opportunities for those directly affected to have a say in the development of these technologies.

Waag develops participatory and design-based research methods, positioning people in the roles of designers and developers of digital technology. Waag also develops collaborative methods with public institutions, designers, and developers who translate these technologies into practice. Waag explores the values that contribute to liveability and how technologies can help achieve justice. Waag pays particular attention to the issue of the digital divide, which leads to social and economic inequality<sup>25</sup>.

In the coming years, Waag will focus on the *decentralised internet*, in which data storage, digital social environments, algorithmic models, and other components of the internet can be designed independently of one another to provide an answer to societal problems. Examples include building secure moderation tools for decentralised social media, data-sharing mechanisms for energy data to collectively coordinate energy consumption, experimenting with Solid<sup>26</sup>, and a transparency toolkit that provides insight into citizens' rights and possible actions with regard to algorithmic systems. In this way, Waag contributes to the development of a *public tech stack*, an alternative technology approach that centres public rights and values as well as open-source technology.

### Research questions

- I. Which participatory and design-oriented methods are suitable for working with the public, designers, and developers to build decentralised internet technologies based on public values?

<sup>25</sup> Learn about the [Bridging the Digital Divide](#) project.

<sup>26</sup> [Solid](#) is an open-source technology that grants users ownership of their data.

- II. What factors enable or constrain the appropriation of decentralised internet technologies by individuals and public interest organisations?
- III. How can we develop digital systems based on public values and existing social infrastructures that promote inclusion and enable everyone to participate fully in society?

### Example projects

- In **Mobifree**<sup>27</sup>, Waag contributes to an ecosystem of ethical smartphone software that makes people less dependent on non-European companies, designed according to society's conditions and needs.
- In the projects **Algo-Lit**<sup>28</sup> and **Algo-Resist**, Waag gives citizens and civil servants the tools to critically question algorithms used by public organisations. Through these projects Waag improves the position of citizens vis-à-vis public organisations.
- Within **Local Connections**<sup>29</sup>, Waag is strengthening the social and local infrastructure needed to bridge the digital divide. Together with social organisations, their target groups, and the Municipality of Amsterdam, Waag is developing an accessible overview of the support available for online assistance and support requests. This involves identifying the needs of the various target groups in terms of digital assistance and support.

### Partners & networks

PublicSpaces, NLNet, Open Future, Ministry of the Interior and Kingdom Relations, Social Coalition on Information Accessibility, Royal Library, Rathenau Institute, University of Amsterdam, People vs. big tech, Murena, e.foundation, Art & Technology, Cybersoek, SINA, Amsterdam Public Library

## II: Regenerative technology

Waag is experienced in working with regenerative practices in circular manufacturing<sup>30</sup>, with regenerative textile practices<sup>31</sup>, and with the development of ecological citizenship<sup>32</sup>. Her focus now shifts toward experimenting with, and applying the lessons learned, to questions regarding technology.

All components of the technology stack leave their ecological footprint somewhere in the chain, and in the world - think of energy, water, land, and rare earth minerals. Completely green digital technology is still a utopian vision. It is necessary to fundamentally review the way we question, design, and develop technology. Waag's goal for the coming years is to explore what technology looks like when regeneration is central.

<sup>27</sup> Learn about the [Mobifree project](#).

<sup>28</sup> Learn about the [Algo-Lit project](#).

<sup>29</sup> Learn about the [Local Connections project](#).

<sup>30</sup> Learn about the [CENTRINNO project](#) and [Maatschap Amsterdam](#) (in Dutch), a project and initiative that involve circular manufacturing.

<sup>31</sup> Learn about the [REFLOW project](#) and about the [Local Color project](#), focussing on regenerative textile practices.

<sup>32</sup> Learn about the [T-FACTOR project](#) which focuses on the development of ecological citizenship.

How can the Public Stack framework support this? Waag is investigating what such technology might look like and what this implies for the future; for example, she is researching alternative technologies that consume little energy, such as mesh networks.

A *Material Stack*<sup>33</sup> is also being developed. This is a foundational layer of the Public Stack, looking at the origin of the raw materials, semi-finished products, working conditions, and energy sources that form the material sovereignty of this Stack. To this end, Waag is experimenting with new materials in her own physical labs: FabLab, TextileLab and Wetlab.

## Research questions

- I. How can we make technology a constructive part of a healthy planet for humans and other life forms, with materiality in mind?
- II. How can mesh networks contribute to a stronger decentralised internet?
- III. How can we make room in our human- and money-centred systems and technologies for the interests of the *more-than-human* in order to restore the health of people, ecosystems, and the planet?

## Example projects

- In **Designing Regenerative Technologies**<sup>34</sup>, Waag is determining how to shape technology within the limits of the planet. Together with the permacomputing<sup>35</sup> community, Waag looks at the development and application of regenerative principles in the context of technology. Waag also challenges herself as a **Zoöp**<sup>36</sup>, working to improve her own relationship with the living environment by researching and applying alternative, ecological ways of designing and using technology within her own organisation.
- In **Stem van het Water** (Voice of the Water)<sup>37</sup>, Waag designs a method that draws attention to the perspectives of humans as well as animals, plants, soil, air, and microorganisms - in other words, the polyphony of the area around the river IJ in Amsterdam.
- **Meshtastic**<sup>38</sup> is an open source, analogue, decentralised mesh network optimised for low-energy devices. It enables users to communicate with *LoRa* stations over long distances without using the internet. Together with user groups, Waag designs use cases that contribute to the technology and interfaces.

## Partners & networks

Embassy of the North Sea, Zoönomisch Institute, Ministry of Infrastructure and Water Management, Foundation for Applied Water Research STOWA, Doggerland Foundation, Netherlands Institute of Ecology, the permacomputing community, Willem de Kooning Academy, National Coalition for Sustainable Digitisation, Critical Infrastructure Lab, Mozilla network, Fab Foundation, Fab City Foundation, Internet Resilience Club

<sup>33</sup> Read the position paper, "[Towards Regenerative Technologies](#)", which sets the foundation to further develop the Material Stack.

<sup>34</sup> Learn about the [Designing Regenerative Technologies](#) project.

<sup>35</sup> Read about the concept and community of practice known as [permacomputing](#).

<sup>36</sup> Read about the [establishment of Waag as a Zoöp](#).

<sup>37</sup> Read about the [Stem van het Water](#) project.

<sup>38</sup> Read about [MeshTesting](#) and the [Meshtastic](#) project.

### III: A grip on renewal

Residents face great uncertainty and can feel that they have limited control over their lives; many people often feel powerless as a result of this overwhelming situation. A recent report by the Scientific Council for Government Policy (WRR)<sup>39</sup> states that the combination of uncertainty and lack of control can lead to poorer health, is a source of social dissatisfaction, and is associated with the adoption of worldviews and beliefs that may be at odds with the democratic constitutional state.

Perhaps even more important than research and gaining insights through research is the question of what happens to those insights, and who makes decisions on what from research is shared. Waag is committed to building, documenting, and sharing her insights, knowledge, and expertise in the field of co-creative citizen science, with a specific focus on measuring the living environment by residents using citizen sensing practices.

In collaboration with residents, governments, and experts, Waag works on pressing issues in the living environment and developing practices that foster meaningful reciprocal relationships. Only then can sustainable solutions to problems within the living environment be created. The role of technology in this is pivotal. By having technology at their disposal and being part of the design process of technologies, communities can regain control over their environment. Think of measuring not only air quality and the harmful substances in the air to which people are exposed, but also water quality in relation to pesticides and heat stress caused by global warming. Finally, Waag explores the significance of emerging technologies such as AI and quantum technology within these contexts.

#### Research questions

- I. How can communities use technology to gain more agency over their living environment?
- II. How can people be co-designers of technology in their living environment?
- III. How can people gain more agency in their own living environment by building strong and reciprocal relationships between communities, governments, knowledge institutions, businesses, and the living environment?

#### Example projects

- In **Hollandse Luchten** (Dutch Air)<sup>40</sup>, Waag investigates how residents can gain agency over the air quality in their environment by collecting data with open-source sensors and using it in collaboration with governments, businesses, and knowledge institutions. This enables them to develop courses of action for improving the living environment.
- **Enforce**<sup>41</sup> aims to strengthen the position of residents to improve their living environment by linking environmental data collected by citizens to data that authorities need for enforcement purposes.

<sup>39</sup> Read the WRR's [Grip report](#) (in Dutch).

<sup>40</sup> Read about the [Hollandse Luchten project](#) (in Dutch).

<sup>41</sup> Learn about the [Enforce project](#).

- Within the **MEENT** initiative, Waag helps to accelerate the energy transition by setting up communities that optimise their energy consumption and generation by jointly managing their energy data and sharing insights in an energy data commons<sup>42</sup>.

### Partners & networks

National Institute for Public Health and Environment, TNO, Vrije Universiteit, Institute for Risk Assessment Sciences (University of Utrecht), Province of North Holland, Municipal Health Services, water boards, libraries, Citizen Science initiatives, Citizen Science Nederland, NWA Smart Liveable Cities route, European Citizen Science Association, Science for Change, King's College London, Ars Electronica

## IV: Planetary imagination

Some of today's most pressing challenges cannot be addressed in a systemic or technocratic manner because they stem from the very structures that cause them, and are therefore difficult to change. When knowledge systems, institutional logics, or technologies are considered neutral or universal, their embedded assumptions and exclusions remain invisible.

This is particularly evident in the question of how we deal with the future of the planet. The philosopher Bruno Latour argued that we do not live on the same planet. In other words, divisions between people have become so pronounced that opposing groups inhabit different realities. However, we can also consider this expression literally, because people's conceptions of Earth are based on many and varying factors.

Environmental concepts and data about Earth are not enough to make us sensitive to the urgency of the climate and ecological crisis. They alone do not provide sufficient motivation to take action and do not have a drastic impact on policy-making. It is therefore important to recognise that new methods must be developed to increase the awareness of the public and involve them in generating new and multiple perspectives in times of crisis.

Waag therefore investigates the concept of *mattering*<sup>43</sup>, which reframes relational, situated, and ethical questions about how realities are created. How are they created, and by whom? This requires attention not only to systems, but also to the ontologies and epistemologies that underlie them. Who gets to determine the problem, to define what matters, and what the 'matter' is?

### Research questions

- I. How can artistic practices, cultural studies, humanities, and environmental and spatial technologies work together to produce new ways of seeing, and new forms of planetary imaginaries?
- II. How can we use Earth observations, satellite data, art, culture, and philosophy to arrive at new knowledge and narratives about how we see our planet?

<sup>42</sup> Learn about energy datacommons and the work of ATELIER in [this workshop presentation](#) (in Dutch).

<sup>43</sup> Read about the [More-than-Planet Atlas](#), which examines the concept of mattering.

## Example projects

- The **More-than-Planet Online Library**<sup>44</sup> increases the visibility and accessibility of marginalised knowledge cultures by providing a shared bibliography of unique disparate collections, libraries, and archives of publications that demonstrate the importance of art, culture, humanities, and social studies in relation to space.
- In the essay *Radical re-imagining: why we need planetary imagination*<sup>45</sup>, Waag explores how new forms of imagining our planet, across the boundaries of arts and science, can help us address the problems of our time in new ways.
- In **Trouble with Labour**<sup>46</sup>, the future of work in relation to technological developments such as AI and robotics is explored. In the horticultural sector, Waag investigates the collaboration between humans and robots that meets the needs and values of those involved.

## Partners & networks

Ars Electronica, Matrice, Zavod Project Atol, The Northern Photographic Centre, Territorial Agency, European Space Policy Institute, Space Pride, Libre Space Foundation, Fab Foundation, Leiden Observatory, Space4Good

## VI: Skills for the future

Lifelong learning is often now thought of as the new norm, more commonly embraced alongside traditional formal education. To build a liveable future, for both individuals and society, we also need strong critical-thinking skills, agency, resilience, and flexibility. Because technology increasingly shapes our democracy and social values, we must develop the abilities to understand what technology and their designs are based on. The six dimensions of the Public Stack, as well as how they relate to our lives and the world, can help us better examine technology and allow us to actively shape the future, rather than merely react to it.

Waag researches and develops *best practices* for lifelong learning, based on Public Research methods and others like *futures literacy*<sup>47</sup>, *ethnographic research methods*, *envisioning futures*, *learning-by-doing*, and *art-based learning*. She focuses on questions about learning and the development of current and future citizenship, particularly in relation to emerging technologies. Waag then applies best practices learned from this research in designing and guiding learning experiences for participants in the Academy programmes<sup>48</sup>.

In these programmes, Waag combines knowledge and methods into a curriculum. At the core of these programmes is the Fab Academy, the international training programme in digital fabrication in which participants learn to design, create prototypes, and document their work in Waag's FabLab<sup>49</sup>. In the BioHack Academy<sup>50</sup>, participants learn the basics of biotechnology and how to

<sup>44</sup> Visit the [More-than-Planet Online Library](#).

<sup>45</sup> Read the essay "[Radical re-imagining: why we need planetary imagination](#)".

<sup>46</sup> Read about the [Trouble with Labour](#) project.

<sup>47</sup> [Futures literacy](#) is the capacity to know how to imagine the future and why it is necessary.

<sup>48</sup> Learn about Waag's [Academy programmes](#).

<sup>49</sup> Learn about Waag's [Fablab](#).

<sup>50</sup> Learn about the [BioHack Academy](#).

set up their own open-source lab. The Fabricademy<sup>51</sup> is a six-month international education programme at the intersection of textiles, digital fabrication, and biology. Finally, the Public Stack Academy helps designers, developers, policymakers, journalists, and teachers develop perspectives on action for an internet that puts public values first. Based on Waag's research projects, the Academy programmes are continuously developed and new modules are created.

### Research questions

- I. How can formal and informal education better equip young people for active citizenship with regard to technology? And what is the role of art in promoting cultural understanding and social engagement?
- II. How do we develop an open, public platform that offers students and professionals concrete knowledge and skills to gain ownership of technology as well as use it responsibly?
- III. What is the relationship between technology and traditional and emerging crafts in promoting economic and social resilience?

### Example projects

- In **Critical ChangeLab**<sup>52</sup>, Waag organises and implements research labs with young people to raise their awareness of democratic values and their role as active citizens by combining critical making and futures literacy.
- In **PULSE-ART**<sup>53</sup>, Waag is designing a methodology for project partners that they will implement in educational contexts to increase cultural awareness and expression for a more resilient society.
- **Tracks4Crafts**<sup>54</sup> researches and transforms the transfer of traditional craft knowledge to increase the social and economic value of crafts. What can we do to transfer traditional craft knowledge to future generations of craftspeople, and what technology can facilitate that process?

### Partners & networks

Kennisnet, Cubiss, Esprit schools, College Zuyd, Montessori Lyceum Amsterdam, University of Amsterdam, HKU University of the Arts Utrecht, Amsterdam Public Library, Nemo, Allard Pierson Museum, Municipality of Amsterdam, Ministry of the Interior and Kingdom Relations, Fab Foundation, Cultivamos Cultura, Kersnikova, Living Station Lab, Coalesce BioArt Lab, MIT Media Lab

## 6. Breakthrough programmes

Waag has defined three breakthrough programmes in domains in which she aims to achieve lasting impact – systemic change and social breakthrough – through collaboration with partners. The first of these programmes, **Public Nodes**<sup>55</sup>, involves a transition to social media platforms that are not designed by private companies for commercial or political interests, but where society

<sup>51</sup> Learn about [Fabricademy](#).

<sup>52</sup> Learn about the [Critical ChangeLab](#) project.

<sup>53</sup> Learn about the [PULSE-ART](#) project.

<sup>54</sup> Learn about the [Tracks4Crafts](#) project.

<sup>55</sup> Learn about the [Public Nodes](#) project.

can determine what our news feed looks like and how moderation takes place. The second breakthrough programme, **Art x Science x Society**, focuses on partnerships that promote structural recognition and funding for artistic research and a reassessment of the relationship between art and science. Finally, the third breakthrough programme, **A Workshop for the Future**, aims to strengthen the role of cultural workshops in contributing to the major social transitions we face as a society.

## I: Public Nodes

The Public Nodes initiative was launched to help digital and social designers in the creative industry with the design of successful fediverse-based social media<sup>56</sup>. Waag, together with partners and stakeholders, is investigating the conditions and success factors for a transition from current mainstream social media platforms to the fediverse. The aim is to enable people to use these platforms with the same ease as the current offerings. This programme will develop knowledge that is essential for the success of the creative industry in designing for the fediverse, to ensure it is widely valued and adopted. The focus is on public alternatives to big tech platforms, sharing knowledge, experimenting with users, and creating sustainable economic models that guarantee reliability and continuity.

### Research questions

- I. What must be done to support designers in making fediverse-based social media an alternative to big tech-developed social media that people accept and use?
- II. What are the obstacles that stand in the way of a transition to decentralised internet technologies, in terms of behaviour, social relations, institutional norms, legislation, and technological infrastructure? How can we remove these obstacles?

### Example projects

- **TheNextSocials**<sup>57</sup> is a growing movement of people and organisations building social media platforms on which healthy public debate can take place, privacy is guaranteed, and people can connect with each other safely and securely. It is a strategic collaboration between Waag, PublicSpaces, and the coalition around Mentaal.nl.
- In the **Public Nodes**<sup>58</sup> project, Waag creates a transition strategy that defines the barriers to the transition to public social media. In living labs, Waag experiments with media companies and libraries to co-create and apply new social media platforms. The Public Nodes project is foundational to Waag's breakthrough programme of the same name.
- For the **PROCOT programme** of the Ministry of Justice and Security, Waag is developing a policy letter to specify what role the Dutch government can play in facilitating social moderation. The aim is to ensure that the moderation of public debate in the Netherlands is once again determined by society itself.

<sup>56</sup> Learn about Waag's [work on the fediverse](#) and how we can better connect online.

<sup>57</sup> Read about [TheNextSocials](#) movement (in Dutch).

<sup>58</sup> Learn about the PPS project [Public Nodes](#).

## Partners & networks

PublicSpaces, Amsterdam University of Applied Sciences, New Public, BBC R&D, DPG Media, University of Amsterdam, Radboud University, Post-X Society, Mentaal.nl

## II: Art x Science x Society

The complex and urgent social challenges of our time call for transdisciplinary collaboration and the systematic use of creativity and new knowledge - characteristics of both the sciences and the arts. Together with partners, Waag is developing a programme for research and initiatives in which art and science work together. This will demonstrate and prove the social impact of the complementary collaboration between these fields of knowledge and their practices. This surfaces new perspectives for research, design, and imagining the future; it generates a new practice with historical and epistemological roots that Waag wants to anchor in order to promote the addressing of urgent fundamental and societal challenges.

### Research questions

- I. How can we structurally connect art and science across the entire spectrum of artistic, academic, and applied disciplines, remove barriers, and optimise conditions for equal collaboration?
- II. How do we connect this task to social expertise and issues in order to strengthen innovative power with regard to social challenges?
- III. For which issues and areas of society is this important, and what new questions and approaches to address societal issues does this promote?

### Example projects

- **Closing the Loop**, commissioned by the European Union's S+T+ARTS project, is the most important study providing evidence of the significance of the S+T+ARTS programme. In this study, Waag examines the results and impact of collaboration between the arts and sciences, concluding that it gives rise to new areas of research and policy recommendations around several areas, including climate, AI, and medical innovation.
- **S+T+ARTS4Water** and **Aqua Motion**<sup>59</sup> are artist-in-residence programmes in which artists in Europe work in the context of marine ecology and hydraulic engineering. Artistic research questions are developed in collaboration with partner institutions and research results between artists and institutions intersect, leading to new insights and avenues for research.
- In **AR Clinics**, Waag uses artistic practice to explore the relationship between the phenomenon of inflammation in health, healthcare, and socio-ecological justice with regard to the communities most affected.

## Partners & networks

Academy of Arts, The Young Academy, Royal Netherlands Academy of Arts & Sciences, Lecturers' Platform Art is Research, Arts '92, Climate Initiative Netherlands, Rathenau Institute, Hortimare, S+T+ARTS.eu, New European Bauhaus

<sup>59</sup> Learn about the [S+T+ARTS Aqua Motion project](#).

### III: A Workshop for the Future

To safeguard our society's resilience, we must regain control over our production processes, innovations, and social structures. Continuing to rely on distant international supply chains and massive industrial complexes is increasingly precarious. A Workshop for the Future thus emerges as a timely approach - a network of cultural organisations at the crossroads of art, technology, and craftsmanship, where programming is co-created with local initiatives and residents. This programme works toward a future in which the Netherlands is less dependent on external forces, citizens have control over their own environment, and communities are strengthened.

Within this programme, Waag is building self-confidence in society, the belief that we are capable of initiating change. In addition, Waag is strengthening local craftsmanship, creativity, and technological knowledge, thereby increasing our autonomy and control over the future. The programme builds on Waag's white paper, *Werkplaats voor de toekomst (A Workshop for the Future)*<sup>60</sup> which argues for the importance of such workshops for the Netherlands and highlights imaginative examples of such spaces.

#### Research questions

- I. How can a nationwide network of cultural workshops contribute to solving the social issues and challenges of our time through the active involvement of citizens?
- II. To what extent does a nationwide network of cultural workshops contribute to our social, technological, and planetary resilience?

#### Partners & networks

Tetem (Enschede), SETUP (Utrecht), Internationale Architectuur Biënnale (Rotterdam), Arcadia (Leeuwarden), De WAR (Amersfoort), Fablab Oldenzaal

## 7. Conclusion

This Research Agenda maps broad, question-driven programming that links Waag's core belief - that technology is not neutral - with pathways for creating a more open, fair and inclusive future. By foregrounding the Public Stack's six dimensions, Waag creates a framework for probing the cultural, economic, and ecological assumptions embedded in every layer of technology. Within the research programmes, Waag repeatedly asks how we can surface hidden values, redistribute ownership, redesign governance, and reduce ecological footprints, while simultaneously building the knowledge, tools, and networks needed for systemic change. The three breakthrough programmes - Public Nodes, Art x Science x Society, and A Workshop for the Future - illustrate how Waag translates its guiding questions into collaborative interventions that can reshape digital media, bring together artistic and scientific inquiry, and empower local cultural workshops.

With these programmes, Waag aims to contribute to a resilient society that regains control over its technologies, economies, and ecosystems. As the research progresses, the continual refinement of its questions will keep the work responsive to evolving societal challenges. In this

<sup>60</sup> Read the [Werkplaats voor de toekomst](#) whitepaper (in Dutch).

way, Waag's research will keep advancing efforts to design and develop a just, regenerative, and technologically sovereign future.

# Colophon

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