

THE AGILE CITY



TNO innovation
for life

FLEXIBLY ANTICIPATING THE FUTURE

Cities interact permanently with their environment. Both that environment and cities themselves are liable to change. This dynamic entails uncertainties, challenges, and tests of innovation that cities have to be able to adapt to. It means that cities have to be able to anticipate the events that will affect their future and deal effectively with change. That requires strength and flexibility, which serve as the basis for cities to develop their design and structure, in terms of organization and processes. A city's smartness and capacity to learn are embedded in its people. It is therefore important that cities are inclusive. Cities have to be open and transparent in their decision-making processes. As well as anticipating, they also have to be able to act, by making strategic use of the data and information available to them.

Urban dynamics are integrated in part in the historic context of a city or region. Its location is important in this context, as are the economic structure (including specializations) and the knowledge base of its citizens and businesses. Chance also plays (or has played) a part in the urban dynamics, at least to a certain extent. Economic strength, economic growth, and urban developments in the past are no guarantee for a flourishing future. It is therefore not possible to give a long-term forecast with one hundred percent certainty on the growth or contraction of urban regions or the spatial concentration of economic and other activities. If regions or cities move from growth to contraction, this is often related to major economic transformations, such as the emergence or decline of *general purpose* technologies and the economic commercial activities associated

with them. Ultimately, changing preferences have a part to play here too - people's preferences about where they would like to live, and businesses' preferences about where they would like to be based.

People's wishes about where they live have changed in recent times, partly because of the emergence of ICT as the most relevant *general purpose* technology and because of the increase in mobility, all in the context of spatial planning policy, which is aimed at suburbanization.¹ As a result, Dutch cities initially started to shrink in size, but recently they have become more popular again. Regardless of the ultimate pattern of economic growth and urban dynamics, there is always an interchange between spatial planning and the way in which built-up areas are managed. Societal developments mean that cities face

1. De Groot, H.L.F. (2016). Naar evenwichtige arbeids- en woningmarkten in de MRA. In: Economische Verkenningen Metropoolregio Amsterdam 2016. Amsterdam: Amsterdam City Council.

challenges of renewal and innovation. The challenges are found in the areas of climate, energy, and demography (the ageing population and immigration), welfare and prosperity (including health), and technological developments (and their speed) and shifts in the global economy. This means that cities have to be resilient on multiple fronts. For example, they have to be able to deal physically with extremes of weather, the rise in sea levels, subsidence and salinization; it is also important that in terms of social aspects, they have to stimulate inclusivity, self-reliance, and participation among residents, while on the digital front, they have to deal responsibly with big data, privacy, and the *Internet of Things*.

Against this background, we are putting the *agile city* at the heart of this position paper, while asking how cities can and should plan flexibly for the future. We examine this subject in depth from the Dutch perspective.

WHAT IS AN AGILE CITY?

An *agile* or *adaptive* city is in a position to keep its region economically vibrant, livable, and accessible within the context of societal challenges, fast-moving technological changes, and fundamental uncertainties that are related to this. In essence, every party deals innovatively and with an open approach to the tensions and dilemmas that are inextricably linked with autonomous trends and the urban dynamics. Crucial elements here are looking ahead, experimenting, learning, and being flexible. This applies not just to regional administrators, but also to companies, knowledge institutions, and citizens. It is important that each of these stakeholders work together, and learn from each other.



It is good to realize what cities are - meeting points for people, businesses, and activities or functions. A key aspect is that proximity and concentration give added value, as compared to dispersal and being based at a distance. A large proportion of the urban dynamics (the flow) is determined by the existential choices that people make concerning where they wish to live, work, and spend their leisure time, and the places where companies seek to base themselves. Ultimately, their choices make or break a city. Too high a concentration of people, businesses, and activities leads to negative effects such as congestion and pollution, as a result of which the balance for being in a city can be pushed into negative territory.

This type of temporal and spatial factor determines which interventions are necessary. The best course of action for anticipating the future is to move flexibly with the flow by facilitating existing activity and the wishes of residents; to go with the flow, in other words.²

An agile city is therefore one with a governance structure that provides sufficient scope for bottom-up preferences and bottom-up initiatives. An agile city is also one that accepts inevitable transformations and then oversees them as effectively as possible. This means dealing smartly and flexibly with the dynamics of

the present while at the same time anticipating how they will be dealt with in the future. The aim has to be to allow today's developments to move as much as possible in harmony with a point on the horizon (the medium and long term). The distant future is obviously uncertain, but the picture is not completely blank.

As already mentioned, the agenda of urban renewal tasks in the future is determined largely by societal challenges. For example, the Advisory Council for Science, Technology and Innovation states³ that societal challenges "require simultaneous behavioural changes, modifications to infrastructure, and innovations in all aspects of the system." So there does exist at least a directional framework within which parties involved in urban development can work towards concrete goals.

An agile city understands more than anything that *now* is the time to start implementing urban development plans, but that technological innovation could provide even better solutions in the future. However, waiting for these solutions is not an option. In short, it is about renewal and learning and at the same time about the best way to sustain that renewal process. This requires learning by doing - continuously monitoring the effects of interventions and then modifying them as effectively as possible.

2. Social and Economic Council of the Netherlands (2015). *De SER-agenda voor de Stad. Recommendations 15/05*. The Hague. The Netherlands Bureau for Economic Policy Analysis and Netherlands Environmental Assessment Agency (2015). *Cahier regionale ontwikkelingen en verstedelijking*. The Hague. The Netherlands Bureau for Economic Policy Analysis and Netherlands Environmental Assessment Agency (2015). *De economie van de stad*. The Hague. Ponds, R. & O. Raspe (2015). *Agglomeratievoordelen en de REOS*. Utrecht: Atlas voor gemeenten. De Groot, H.L.F. (2016). *Naar evenwichtige arbeids- en woningmarkten in de MRA*. In: *Economische Verkenningen Metropoolregio Amsterdam* 2016.

3. Advisory Council for Science, Technology and Innovation (AWTI) (2013). *Waarde creëren uit maatschappelijke uitdagingen*. The Hague. Vermeulen, W., Teulings, C., Marlet, G. & H. de Groot (2016). *Groei & Krimp. Waar moeten we bouwen - en waar vooral niet?* Nijmegen: VOC Uitgevers.

The city in permanent interaction with its environment

The fact that cities and regions expand and contract is a natural and permanent phenomenon. Scientific research has shown that the growth of urban areas varies, that it has a non-linear pattern, and that such growth can proceed more quickly or more slowly as time passes. The pattern of growth is related to a significant degree to the phase in the life cycle in which various sectors in a city find themselves.⁴ Together with the population dynamics, macro-economic and technological developments are inextricably linked to the future opportunities and challenges in the physical living environment. These developments essentially determine where people live, where businesses carry out their activities, and what is produced, and the burden this imposes on natural resources, the environment, and the climate.

Depending on regional specializations and technological changes (and how rapidly these are taking place), there will be winners and losers, and shifting centres of gravity. In the short term, this could involve more painful transformations. Examples include job losses due to the further roll-out of FinTech or the digitization of financial services, and petrochemical complexes and port

transshipment sites being used for other purposes as fossil energy production is scaled back.

Elements of the physical living environment (its quality as an attraction or location for businesses to be based) help strengthen the starting point for future urban development (economic and otherwise). On the other hand, however, that same environment can itself change because of the macro-economic and demographic context (the ageing population as a repelling force).

In other words, the city and the economy have a mutual influence on each other. An important question is how a city can deal in an *agile* way with good and bad times. At the same time, it is perhaps a comforting thought that cities appear to be able to reinvent themselves and find new ways to grow.⁵ The degree to which urban and other regions explore new routes towards growth depends primarily on whether they are able to successfully create new links and build new cross-sectoral cross-overs between technologies and sectors in a functional region *and* in the international value chain. That way, a city is able to effectively anticipate innovations. This too is part of what we refer to as an agile or adaptive city.

3D printing and the impact of these technologies on the labour market, competencies, and privacy.

4. A sustainable living environment

The themes in this cluster include urbanization in the Netherlands and beyond, smart cities, mobility and transport, growth and contraction, livable countryside.

5. A healthy society

The themes in this cluster include lifestyle and prevention, chronic diseases, costs of healthcare, and ethical questions.

These broad-based clusters of societal challenges that the Netherlands is going to face contain concrete urban renewal challenges.

SMART CITIES

We have already referred to urban dynamics (growth in cities versus decline elsewhere) that lead to the challenges associated with designing built environment. There are possible spatial dilemmas here concerning inclusion and social cohesion, accessibility and mobility (such as support for public transport connections), and the general standard of amenity provision for safeguarding the viability of the living environment in the more peripheral areas. At the other end of the spectrum, technological developments offer options for new urban production systems, especially as it is possible to share data and information quickly and easily thanks to ICT. This means that cities can benefit from ‘smart’ methods of production, such as digitization, automation, robotization, 3D printing, cloud services, and the Internet of Things. These methods of production make it possible to respond flexibly to customer demands, even when it involves small-scale production (series of one) and custom-made solutions in terms of time and place. As well as being attractive bases for knowledge-intensive services, cities are emerging more and more as the breeding sites for modern manufacturing industry, based on the latest technological innovations.

WHY SHOULD CITIES BE, OR BECOME, ADAPTIVE?

SOCIETAL CHALLENGES REQUIRE CONTINUOUS URBAN RENEWAL

In research⁶ carried out in collaboration with the Ministry of Economic Affairs, we have concluded that the most important societal challenges for the Netherlands can be positioned in five clusters:

1. A safe and resilient society

The themes in this cluster include dealing with external threats and instability, critical infrastructure,

terrorism, social cohesion and polarization, immigration and refugees.

2. The sustainable use of natural resources in production and consumption

The themes in this cluster include the production of renewable energy, water management, climate adaptation and mitigation, reliability of the supply of natural resources, closing production and consumption chains, bio-based production, food safety and food security.

3. Dealing with new technology

The themes in this cluster include digitization, automation and robots, biotechnology, nanotechnology, big data,

4 Neffke, F., Henning, M., Boschma, R., Lundquist, K.-J. & L.-O. Olander (2011). *The dynamics of agglomeration externalities along the life cycle of industries*. In: *Regional Studies*, 45(1), pp. 49-65.

5 Edward Glaeser (1998, 2005) *in particular has conducted research in this area*. See the summary of the literature overview by Ponds, R. & O. Raspe (2015) in: *Agglomeratievoordelen en de REOS*.

6 Bakker, B., T. van Bree, G. Gijsbers and T. van der Horst (2017). *Portfolioanalyse: kansrijke innovatieopgaven voor Nederland. Fundamenteel voor het maken van keuzes*. TNO report 2017 R10266. The Hague: TNO.

With regard to the management of the built environment, modern ICT and other technology offer ways of designing the physical infrastructures of cities ‘smartly’ (data-driven metropolis, see Figure 1). This involves taking continuous measurements using sensors and big data analyses that can predict, for example, how much maintenance is needed, and when (predictive maintenance). Urban ecosystems can be optimized in this way as well. An example that comes to mind is that of energy production (centralized and decentralized) that is adapted to current local usage and the possibility of flexibly meeting demand elsewhere. Another is that of physical flows through cities, such as water, waste, traffic, and the emission of harmful substances. In ‘smart cities’, the responsible use of measurements and the analysis of big data lead to a symbiosis of technology and society, in which stakeholders are able to respond flexibly (in time and space) and with *agility* to bottlenecks affecting flows through the city.

ENERGY IN THE BUILT ENVIRONMENT (SMART ENERGY)

The production of renewable energy in the built environment requires direction, regulation, and planning. There is an important role here for new business models, in which energy is both produced and consumed on a decentralized basis. The further emergence of the ‘prosumer’ (consumers of energy who also generate or produce energy themselves) is an essential part of this. The next challenge for cities is to ‘smartly’ align the supply of and demand for energy through the use of smart grids, ICT systems, data, computer models, and regulation. Another option in this context is to share energy via existing infrastructure. Smart systems of this kind should include a place for storage systems for renewable energy (from the sun, wind, and water). Planning is also needed so that energy can be saved on a large scale in urban areas, and in industry, traffic, and transport.

CLIMATE CHANGE REQUIRES SMART CLIMATE SOLUTIONS

Spatial planning and urban-planning solutions are needed in order to combat climate change. Given the location of urban areas in river deltas and/or by the sea, the task of making the Netherlands climate-proof entails the major challenge of designing dynamically and creating space for rivers, the coast, and landscape. This was endorsed by the national climate adaptation strategy ‘Aanpassen met

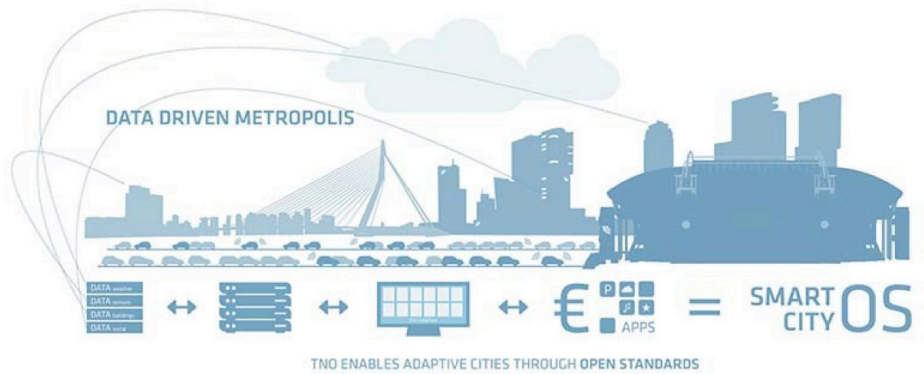


Figure 1: TNO enables agile cities through open standards

ambitie’, which the State Secretary for Infrastructure and the Environment presented to the Dutch House of Representatives in late 2016. The cities face planning and coordination challenges concerning construction, water disposal, and the recycling of residual streams (such as residual heat from industry). In order to meet the climate targets for 2030, a major

task for urban areas is to reduce the emissions of harmful substances and CO₂. This task is related to domestic energy consumption, and to that of businesses, industry, transport, and traffic.

SMART USE OF NATURAL RESOURCES

In order to use and recycle raw materials, residual products, residual heat, and

Climate-resilient cities and infrastructures

We need strong and resilient cities and infrastructures. Developments like climate change, digitization, the new economy and globalization offer new opportunities and entail new risks. Cities that succeed in responding to this dynamic are in a position to seize opportunities for growth (www.resilient-rotterdam.nl).

TNO is leading a major European research project with the aim of making cities and vital infrastructures more climate proof. The RESIN project (Resilient Cities and Infrastructures - www.resin-cities.eu) is looking at

integrated ways of making both the vital infrastructure, such as the emergency services, the provision of drinking water and data and energy infrastructure, and other parts of cities like buildings, streets, and squares, climate proof (see Figure 2). The project places a particular focus on standardizing procedures in order to determine the vulnerability of sectors and areas or to select measures and to assess how effective they are. The latter is important not just for decision-making processes at local level, but also for Europe, because the means by which vulnerable sectors, and cities in particular, should be adapted to climate change is a political priority at European level.

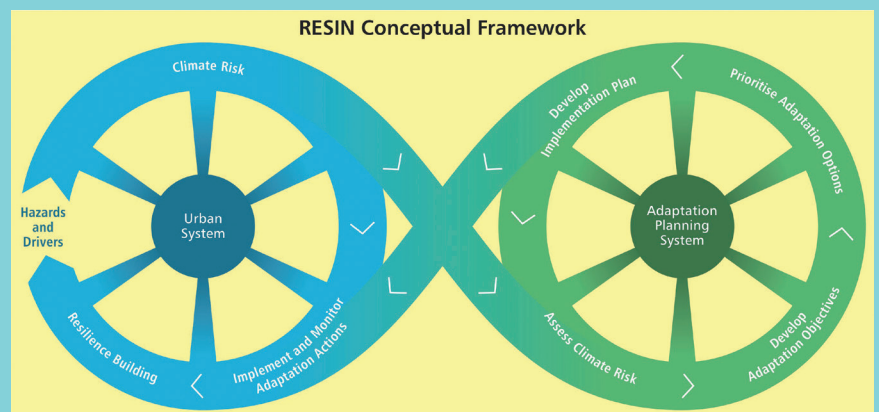


Figure 2: RESIN conceptual framework

water smartly on an urban scale, it is important that parties collaborate, share information, and coordinate investments. After all, closing energy, raw material, and water chains (integrated water management systems) is primarily a question of matching supply and demand. The regional economic specialization pattern and the major local players in it are in a position to determine which flows are the most relevant and how they might be optimized. As well as important technological trends, concerning the efficient use of new biomaterials (for both food and non-food applications) and the development of new separation techniques, for example, there is a key role for governance structures and flexible regulation. They should create the space for new value chains and business models that are needed for taking concrete steps towards a more circular economy.

MOBILITY (SMART MOBILITY)

Demand for mobility is very likely to increase in urban areas. This is especially true if we assume the trend for people and companies to be concentrated more and more in cities is to continue, and if life expectancy rises at the same time. Technological changes to mobility and logistics mean a ‘smart’ physical infrastructure and advanced systems for traffic management based on sensors, data and digital communications between the various transport modalities and equipment along the route in question are needed. Examples that come to mind are different sources of energy such as electricity, hydrogen, or gas, and other forms of transportation, from cooperative and autonomous driving to the latest developments like the hyperloop. If there is an increase in self-organization in the mobility system, which will come to resemble a physical internet, the challenge for urban mobility planners and for regulators will be a continuous one.

The greatest element of uncertainty here is the speed of technological change, disruptive and otherwise. Investing in the physical infrastructure is costly and the decision-making process is relatively long. The infrastructure also has a long technical lifespan. The ultimate challenge, therefore, is to be able to respond flexibly to new

Circular economy - not a goal in itself, but a means

From an *economic* point of view, circularity is about the balance between all societal costs and benefits, direct and indirect. It is also about winners and losers - that is, the *negative* ‘benefits’. One dilemma that is inextricably linked to the circular economy is that reducing footprints will lead to loss of economic activity and jobs somewhere in the international value chain: *circular destruction*.⁷ This immediate short-term effect should not be overlooked. The other side of this coin is that - as well as the direct positive economic effects of business activities that facilitate greater circularity - direct cost savings (from the purchase of new materials and raw materials for use in the production process) lead to expenditure and investments (rebound effects) and therefore to more economic activity elsewhere.

It is not clear at this stage whether the balance for the Dutch economy and the cities that form part of it will be positive

in every case. Much depends on the spatial level (including abroad) where the costs and benefits present themselves. TNO has databases and models for estimating the level of greenery or circularity in relation to economic effects (see Figure 3). In any case, dealing with circular destruction requires agility and, especially, radical renewal and innovation in order to compensate losses with employment opportunities in other business activities.

Together with a solid understanding of this complex societal cost-benefit analysis, circular destruction can form part of the toolkit of adaptive regional administrators. The purpose of this is to prompt or facilitate radical innovations that contribute to the growth of alternative business activities. Such activities can make up for jobs lost elsewhere, while at the same time helping to achieve societal objectives. This requires collaboration and a shared vision of the relevant subjects that make and keep cities livable and vigorous.

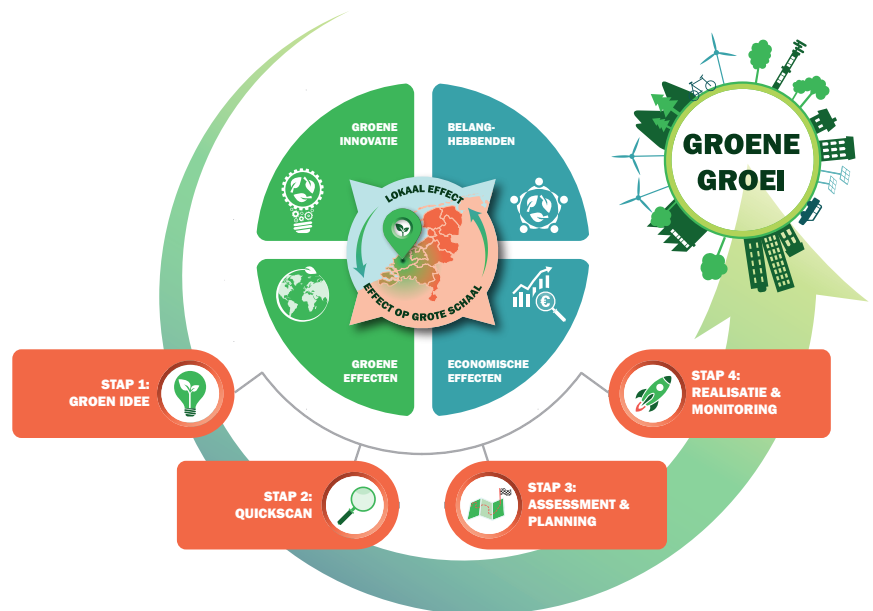


Figure 3: TNO step-by-step plan for analyzing green growth

7. This is analogous to the effects and disruptive innovations described by Joseph Schumpeter as ‘creative destruction’.

8. Bos, F., Van der Pol, T. & P. Zwaneveld (2016). Beter omgaan met onzekerheid in MKBA’s infrastructuur. In: ESB, volume 101 (4731), pp. 234-237.

technologies while at the same time keeping the infrastructure affordable.

The norm will have to be that cities are gradually able to modify the dimensions of their transport and traffic networks, and a suitable physical infrastructure in which ‘mobility as a service’ can prosper. In short, investing flexibly and with agility in infrastructure saves costs and enhances the options for responding to or anticipating future developments.⁸

TNO AND THE AGILE PROGRAMMING OF SMART MOBILITY AND/OR INFRASTRUCTURE

The first stage in the agile programming infrastructure challenges, such as in the context of the *Meerjarenprogramma Infrastructuur, Ruimte en Transport* (MIRT, the long-term programme for infrastructure, spatial planning and transport) is to make concrete policy and other objectives the priority. An objective like ‘an optimally harmonized and sustainable traffic and transport network’ would not be concrete enough. What matters is that any such all-encompassing objective should be made up of measurable tasks, such as:

- currently making maximum use of renewable energy, 100 percent by the year x;
- reducing the emissions of CO₂ and NO_x as much as possible now, to zero by the year x;
- guaranteeing availability of mobility (as a service) according to everyone’s needs and levels of comfort.

This requires the complicated interaction of various fields (traffic and transport, energy, spatial planning, construction, economy and the environment) and technological developments and movements on the energy market (developments in relation to supply, demand, and prices). Moreover, much depends on how the energy transition (now and in the future) can be slotted into urban areas. There are uncertainties and different stakeholders in every aspect of this interaction.

What is clear is that somewhere in the limited urban space, multi-modal hubs should be created. Not just hubs where different traffic flows come together, but also those made up of fossil and renewable energy flows - a smart multi-commodity grid. Things like heat, electricity, and gas, for example, could be quickly and flexibly transported and stored here. This would make it possible to exchange

In advance:
Consider alternatives



During
Modifications based on new information/ revised expectations

Retrospectively (accountability):

- Transparency regarding the decision-making process
- Sharing knowledge with every stakeholder

Figure 4: Learning cycle for agile programming

and recycle, and to respond to patterns of the supply of and demand for energy. In the process, electric cars could function as batteries via a vehicle-to-grid facility, incorporated into charging points.

It is difficult at this stage to assess what exactly the infrastructure that has to be selected (and paid for) now should look like. Future developments may result in conflicts or dilemmas, such as between the size of the fleet of vehicles (can be smaller in principle, from the point of view of mobility as a service) and the initial ‘claim’ that the smart energy infrastructure network believed it could make as a flexible storage and exchange facility on the battery capacity of cars. This would then impact on the level of scale required for spatial integration and possible stranded assets (now or in the future).

With uncertainties of this kind, agile programming means that the transition to the concrete challenges can be launched simply by beginning and using the objective information currently available (see Figure 4). This requires flexibility in order to gradually anticipate new information or forecasts. After all, the uncertainties mean

there is a risk of overdimensioning (and unnecessarily high costs) of choices ‘set in stone’ on the basis of advance estimates. That flexibility therefore requires that progress and effects be continually monitored and evaluated. The goal is fixed, but the dimensions can be altered along the way. It is important, then, to phase in and implement measures flexibly, and to similarly flexibly allocate the resources being used. In the long run, this will produce the most durable solution at lower cost, but perhaps not the most sustainable short-term solution.

TNO is giving objective and independent consideration to the uncertainties and developments that could be in conflict with each other, and to that end can deploy various tools in participative processes (see Figure 5).

A RESILIENT SOCIETY

The urban economic dynamic in the playing field of technological innovation and international trading links makes it necessary to deal in an agile way with the knowledge and skills of citizens. There is a never-ending task for keeping the declining

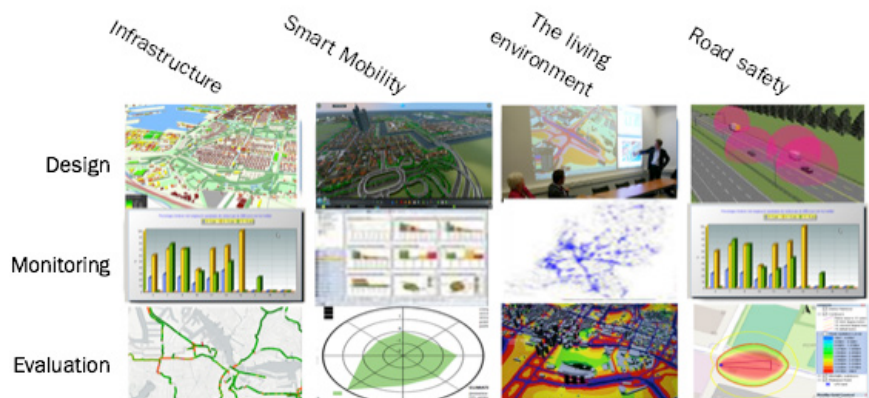


Figure 5: Learning cycle linked to fields and their related tools

working population fit for future economic activities in the digital age. At the same time, the changing composition of households (smaller in size but greater in number as a result of the ageing population, among other things) means there is a need for smart homes and that neighbourhoods have to be planned correctly. The new way of working and the trend towards smaller-scale industry (such as sole traders) also makes it necessary to harmonize the availability of property (offices and business sites) with demand. Erecting buildings that subsequently stand empty should be avoided at all times. The same applies to commercial property, where shifts in the wholesale and retail sectors are sometimes all too painfully visible in shopping streets. Collaborating and coordinating building and development plans (at regional level) are better options than competing. After all, support for urban amenities (the geographic reach in terms of visitors and users) often extends beyond the boundaries of the relevant local authority. It therefore makes more sense to ensure that every possible type of amenity is easily accessible within the functional urban region than it is to ensure that every city has the same package of amenities.

TOOLS THAT FACILITATE AGILE RESPONSES TO THE CHALLENGES OF TODAY AND TOMORROW

The framework for action in managing urban regions primarily means creating conditions for socio-economic development and broad-based prosperity. The scientific consensus here is that it is generally easier to eliminate obstacles (so-called agglomeration disadvantages) than to enhance agglomeration advantages. In concrete terms, this mostly concerns *accessibility, spatial planning, livability, and security*. This includes such matters as inner city transport and logistics and ensuring that they function optimally at a supra-regional level, a housing stock that meets local demands, and ensuring that the knowledge, skills, and competencies of residents meet the needs of businesses. An important precondition for the future economic vitality of Dutch regions is that high-quality residential environments, amenities and accessibility are compatible with economic structures (including those in the future) and with the range of jobs available.

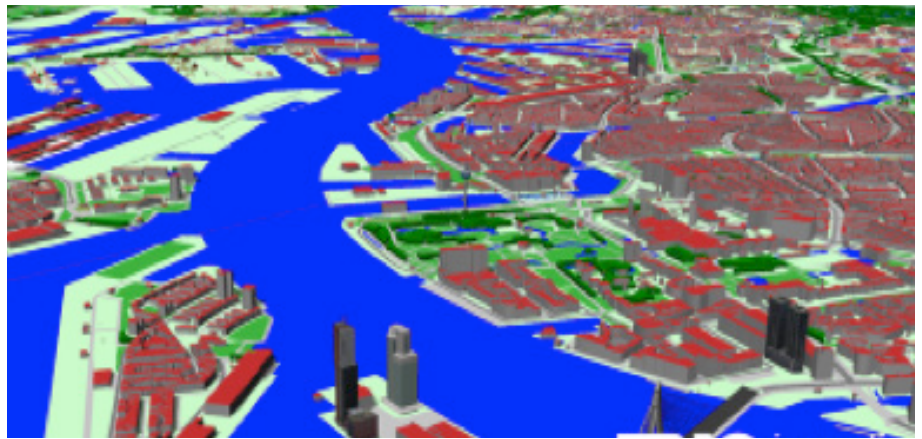


Figure 6: Image of Urban Strategy tool

Development scenarios: TNO Urban Strategy - interactive spatial planning

TNO has devised a digital calculation model for making interactive plans and for finding the right settings for urban parameters, such as air quality, traffic flows, noise nuisance, external security, and energy consumption, and how they develop in space and time. The model makes development scenarios transparent and visualizes their outcomes (see Figure 6), resulting in a shared and cohesive information base on which to build decision-making processes in relation to urban planning, real estate, demography, the regional economy,

infrastructure, the physical environment, and healthcare. At the heart of this is that solutions to the issues of today also provide the right answers in the future.

Additionally, TNO's SUAM (Sustainable Urban Accessibility and Mobility) range of instruments offers cities the opportunity of linking operational monitoring to tactical and strategic decision making (see Figure 7). This way, we can link the short and long term. An example of this is urban traffic management in which traffic lights, parking information, and route information panels are harmonized as efficiently and effectively as possible in real-time.

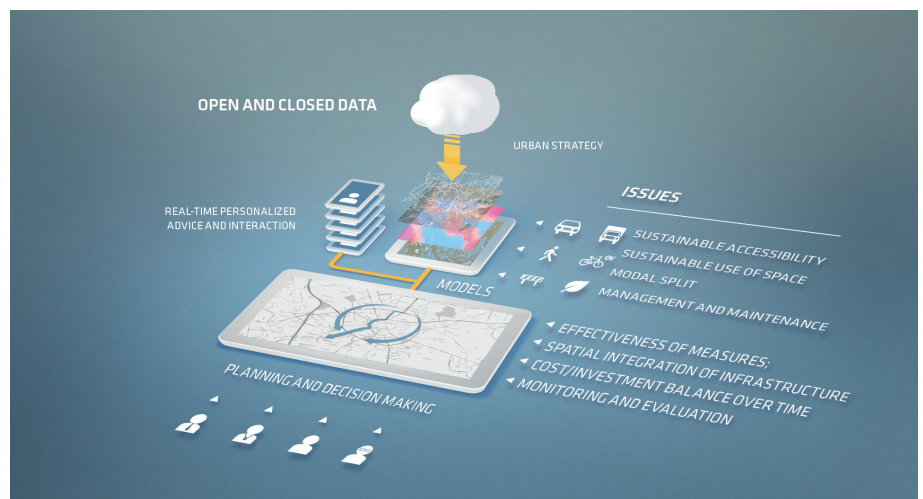


Figure 7: TNO Infographic on Sustainable Urban Accessibility and Mobility

9. OECD (2014). Territorial Reviews: Netherlands 2014. Paris. In its recommendations, the OECD lays the emphasis on an administrative structure at the level of functional urban regions.

It requires first and foremost broad-based collaboration between government, the business community, education, knowledge institutes, and citizens in order to distribute economic activity as effectively as possible over the space available.⁹ Additionally, it means that people and organizations get involved and take responsibility in an urban context.¹⁰ Development scenarios for cities, embedded in their own immediate surroundings - the functional urban region - contribute towards such a future-proof *urban strategy*.

It is important not to underestimate how great an administrative challenge agility is. That is because administrators have to accept that policy interventions involve learning by doing and are surrounded by complexity and uncertainty. Taking modifying action on the basis of factual information can be useful here. Reliable feedback is crucial for the purpose of making modifications to administrative process, in terms of both the degree to which goals are attained and how effective the instruments being used are.¹¹

“DO NOT KEEP ENDLESSLY DEVISING SCENARIOS AND A VISION, BUT ACT AND LEARN AS YOU GO ALONG!”

A real-life example: agility of the Amsterdam Metropolitan Area

TNO has made a modest contribution to the Amsterdam Metropolitan Area’s Spatial Economic Agenda for 2016-2020.¹² After the financial crisis, which was at its worst point in 2009, the realization grew in the Amsterdam Metropolitan Area that economic uncertainties led to the need for *agility* and - despite that uncertainty - immediate action. This growing realization ran parallel to the notion that rapid changes were on their way for several of the region’s pillars, such as in the port where many fossil fuels are transshipped - so that port transshipment locations would have to acquire a different function if the transshipment of fossil-based energy production were to be reduced - and financial services, which are becoming increasingly digitized.

A key aspect is that there is a great deal of scope needed in this process for improvising and experimenting, such as with new economic sectors, regulatory flexibility, and the making available,

temporarily or structurally, of physical space. This is important as it allows the metropolitan area to quickly adapt to a changing society and to respond to new opportunities - an *agile* strategy.

Innovating, improving regional accessibility, being climate-proof, building enough homes - these are the pillars on which the Amsterdam Metropolitan Area is building its continued economic renewal. All of this is to be able to safeguard the welfare and prosperity of the people who live and work there. The goal is clear, but road there is not (or not completely). However, there are means for responding quickly and effectively to changes, such as:

- flexibility in the construction of new homes and in the approach towards large infrastructure projects;
- more flexible zoning plans;
- continuous monitoring of what is actually happening - not just the relevant external trends, but also unplanned initiatives by citizens (and responding to these).

IN SUMMARY

“How can you get ahead and respond to changes?”

It starts with a broadly supported (by society) goal for direction, but requires flexibility and an open approach on the way there. Or:

“Do not keep endlessly devising scenarios and a vision, but act and learn as you go along!”

This requires interaction between short-term acts and long-term effects. It also means not standing still, but responding to the long term by taking no-regret measures in the short term. However, there may be conflicts between the short term (pain) and the positive effects in the long term. It is therefore important that decisions are transparent and that for every party in the partnership, and for stakeholders outside it, there is clarity about the information based on which decisions are made and, where necessary, will be modified in the future. This is an agile strategy and approach.

TNO.NL

LIVING ENVIRONMENT

As part of the Living Environment theme, we apply ourselves to devising innovations for vital urban regions. We work together with partners to create solutions for today and opportunities for tomorrow to enhance the viability, accessibility and competitiveness of these urban regions.

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10. Social and Economic Council of the Netherlands (2015). *De SER-agenda voor de stad*. (pp. 17-18). The Hague.

11. Camps, M. (2017). *Durf te leren*. In: ESB, volume 102 (4745)

12. Zie ook: <http://www.mraagenda.nl>.