VISION2050

Flanders
State of
the Art

A long-term strategy
for Flanders

CONTENTS

INTRODUCTION

Citizens expect their government to tackle today's problems quickly, judiciously and efficiently. They demand more jobs, workable careers that allow them to combine work with their family life and other socio-cultural aspects of their private life, better education, a care provision that matches people's needs, healthier air, less congestion, etc. In short, they demand short-term solutions and results. And justifiably so as well. In light of the current social problems and uncertainties, the question can well be posed of whether it is responsible to be thinking of 2050 today?

The Government of Flanders thinks it is. It is convinced that looking ahead, working together and helping to shape a number of evolutions and transitions is important. Change is inevitable but we can also shape our future.

Flanders' future is influenced by evolutions in the rest of the world. We cannot separate the challenges which face Flanders from those which face the world. Flanders is therefore not alone in mapping out a long-term policy. Many other authorities, governments, international organisations, large companies, NGOs, etc. are currently developing plans for the future, and long-term strategies, often using 2050 as a time frame.

This is not a distant future. 2050 is the year in which anyone who is born today will turn 35. Or, in other words: 2050 may still seem a long way away, but it is only as far away from 2015 as 1980 is. For the older generation among us, 1980 is like yesterday.

Moreover, that same past has taught us that a long-term policy is fruitful. When the very first autonomous Government of Flanders was voted in in 1981, it kicked off the Third Industrial Revolution in Flanders (Derde Industriële Revolutie in Vlaanderen, DIRV). The Flemish knowledge centres that are considered among the world leaders today largely owe this to the foresight and the courage to think ahead of the then Government of Flanders.

In recent years, the Government has also acquired valuable experience in working with long-term policies aimed at major social and economic challenges, together with stakeholders such as the social partners and associations, under the umbrella of Flanders in Action and Pact 2020. As stipulated in the Coalition Agreement, with this vision paper we aim to build further on the achievements and success stories of Flanders in Action to speed up the necessary transitions in society in the fields of new industry, materials, energy, mobility and care. In other words, focusing on a policy for the future is fascinating and challenging. It makes us think deeply about the world of today and Flanders' position, about where we are coming from and where we are going and where we want to go, about our strengths and our challenges. A broader time perspective casts a different light on the questions that we are currently thinking about.

We are taking progress optimism as our starting point. However, we have to be aware of a number of pitfalls, including utopianism, fatalism or ignoring global developments because of navel-gazing. At the same time, we must not harbour the illusion that the future is predictable, so we must take into account unexpected evolutions. Finally, a lack of imagination can prevent us from achieving what is really scientifically and technologically possible. Often we do not spot a number of changes and innovations, or we notice them too late. While they often start out small, they have the power to turn an entire economic or social sector upside-down. In other words, they have a disruptive nature.

With this in mind, in the Flemish Coalition Agreement the Government of Flanders committed itself to implementing a long-term policy that speeds up the necessary transitions in our society. With input from the social stakeholders, and through cooperation among Ministers and across policy areas and policy levels. This paper defines the desired long-term policy for Flanders and sets priorities for the transitions to 2050.

The paper starts out from a thorough environmental analysis of the international trends and megatrends. Megatrends are change processes that are already visible, with a broad scope and with major, far-reaching implications.

The second part describes a vision for Flanders' future. This vision for the future outlines the Flanders that we would like to see in 2050. The vision for the future is aimed at Flanders but also takes into account the direction in which Europe and the rest of the world are evolving. Flanders contributes to this by focusing on the United Nations Sustainable Development Goals for 2030.

We can summarise Flanders' ambition for 2050 as follows: *To create prosperity and well-being in a smart, innovative and sustainable way, in a social, open, resilient and internationally-connected Flanders, in which every individual counts.* We want to achieve this ambition with a new economy, for an inclusive society and within the ecosystem boundaries of our planet. This vision for the future has been explored in further detail using nine themes, listing the opportunities and challenges for every theme.

Finally, the third part contains an overview of the seven transition priorities which the Government of Flanders wants to use in order to achieve sustainable long-term solutions and *system innovations**. It is important to make the right choices and work on the priorities that are crucial for a transformation. By focusing on the transition priorities, the Government of Flanders wants to contribute to achieving the desired future vision. The last part also presents the adapted, supporting governance model that is needed for realising the transition priorities.

1 TOMORROW'S WORLD

1.1 FUTURE GLOBAL TRENDS

1.1.1 Trend analysis

In the general environmental analysis we study change processes that are already visible, with a broad scope and with major, far-reaching implications. Trends are surrounded with great uncertainties: they influence each other, and counter-movements can emerge that may weaken or undo the impact of a trend. Disruptions - i.e., breakthroughs that turn the laws of an economic or social sector upside-down - are even more unpredictable but will occur.

Disruptions

New technologies and new insights offer new opportunities. Sometimes they give rise to new business models that can completely disrupt existing businesses and sectors. The term "disruption" is often used in this context. Disruption refers to the dislocation caused by a development in a sector or in society.
Disruptions are breakthroughs that serve a consumer or the market in a new way, through the combination of technological innovation and global integration.

The newcomers who are heavily oriented towards the digital not only offer great added value, they also use alternative business models, changing the rules of the game as a result. Disruptions create huge opportunities for innovative enterprises but turn things upside down for many industries and sectors.

Innovations that can bring about disruptive change in the near future include:

- *the Internet of Things** with many appliances fitted with sensors and their own IP address so they can be connected together, with a large number of applications that make our lives more pleasant and easier;
- artificial intelligence, which when used in cars for example (autonomous cars) can significantly reduce the number of road accidents or increase the self-sufficiency of persons with disabilities by using smart mobility and other aids;
- breakthroughs in robotics, which among other things help make healthcare affordable and take over routine jobs in industry;
- 3D printing*, which will become available to everyone, thereby reducing the distinction between consumer and producer;
- infinite computing, using hundreds and even thousands of computers simultaneously to help solve complex problems;
- lab-on-chip technology, allowing doctors to establish diagnoses for many illnesses, regardless of the availability of labs and hospitals. Combined with artificial intelligence, this can lead to personalised medication, which thus becomes far more effective.
- genomics*, which will drastically improve insights into the nature of illnesses, and thus the prevention and combating thereof;
- nanorobotics and nano-assembly*, allowing for the manufacture of extremely small objects, with countless applications, among others in medicine.

These technologies can radically change the lives of citizens, the business community and the global economy, at many levels. They have the potential to strongly improve the quality of life, health and the environment. Many of these technologies can change consumer behaviour (what and how consumers purchase), as well as the overall consumption of resources, such as energy and materials. Others will fundamentally change the content of jobs for many people around the world. These technologies offer entrepreneurs and small businesses the opportunity to rapidly conquer new markets. They offer new opportunities for emerging economies, where a growing number of breakthrough innovations are expected.

The trends described here were selected based on a review of literature. Sources included the reports from international public institutions, such as the UN, the OECD, the EC, supplemented with a few visionary studies (see list of literature).

The following developments are discussed in this general environmental analysis:

- demographic trends: population growth, ageing and rejuvenation, migration;
- scientific and technological trends: the emergence of disruptive and exponential technologies, driven by science and innovation. A number of breakthroughs can make a substantial contribution to improving our quality of life;
- environmental trends: climate change and the burden on natural resources;
- economic trends: disruptions due to technological breakthroughs, the shift of the world's economic centre of gravity to the East, industrial transformation, new relationships between producers and consumers;
- political and governance trends: changing geopolitical relationships, the transformation of governments and institutions;
- social trends: individualisation and diversity.

1.1.2 Demographic trends

By 2050, the world's population will have hit 9.7 billion people

While population growth is slowing down, it remains high and will only slightly weaken in the long term. Due to a lasting lack of good education and limited access to birth control, the turning point for fertility has still not been reached in a number of developing countries, especially in African countries south of the Sahel.

Mortality, including child mortality, mainly depends on the lifestyle in developing countries, the availability of clean drinking water, food and sanitation and the prevention or otherwise of global pandemics and resistant bacteria. Globalisation, urbanisation and climate change promote the spread of infectious diseases. Several new, technological applications can save lives however.

By 2050, 85% of the world's population will live in the least developed countries and in the emerging economies, including China and India as the leaders of the pack. The European population will continue to grow for a while, but will shrink from 2030 onwards. The only growth will be in the core region around London-Paris-Milan-Munich-Hamburg. Peripheral areas and regions with an older economic structure are already seeing an exodus.

More migration movements within continents and the move to large urban areas

The number of migrants in absolute terms is growing worldwide. The direction and intensity of the migration are regularly changing. People are constantly going in search of better living conditions or sometimes flee in droves from conflict and environmental disasters. Currently half of migration is from the South to the North. A growing number of migration movements are happening on people's own continents, from "weak" to "strong" regions. The largest migration movements are from south-eastern Asia to the Gulf States in western Asia, from South America to North America and within Africa. Large cities especially exercise a strong attraction on migrants (young ones in particular).

Europe still has many migration movements. The European Union has a migration movement from eastern Europe, and more recently from southern Europe to the core region of London-Paris-Milan-Munich-Hamburg, from peripheral depopulating and older industrial regions to urban regions, with better access. As a result, the share of migrants in the population in the core region is growing, which, in turn gives rise to a diverse society in terms of nationalities, language, culture and religion. By 2030, 78% of the EU population will live in urban areas.

The world's population is ageing. Any region with a sufficiently large young workforce will stand to benefit from this economically

The average age is on the rise, above all in the most prosperous countries. The share of people aged 65 and over in the world's population will increase by 16% by 2050. In the OECD countries, a quarter of the population will be over 65 by 2050. Europe will have the oldest population in the world from 2025 onwards. In emerging countries, such as China and Brazil, the population will also age by 2050, which will also lead to a shrinkage of the working population.

The share of the working population in the total population will be reduced. The share of people who are dependent on the economically active population is especially growing in Europe, China, Russia and Japan.

India, Africa and the Middle East, however, stand to benefit economically from their young population if they invest sufficiently in education and health and if political stability can be maintained. By 2050, 70% of the world's workforce will be employed in emerging countries. India will become the country with the largest workforce.

Uncertainties about demographic trends

- It is possible to make a long-term demographic projection. Given the uncertainty about the further evolution of fertility and mortality in a number of developing countries, especially in Africa, various scenarios are possible however. Uncertainty also prevails about the intensity and the direction of the migration movements that are the consequence of disasters, political tensions and so on.
- How will the demographic shrinkage areas evolve? Will they further depopulate because they are suffering economically due to the departure of their most dynamic and creative inhabitants?

1.1.3 Scientific and technological trends

"In effect, innovation inspires change and progress but it also thereby causes problems. It is the root cause of all the major issues of our era. The global population's explosive growth is the outcome of better healthcare and increased agricultural yields. Economic globalisation is possible thanks to the worldwide network of telecommunication, cheap and fast transport and the digitisation of information. The climate crisis has been caused by the enormous consumption of fossil fuels in power stations and means of transportation. These themes will dominate 21st-century global politics." Bert Koene, "De wereld van onze kleinkinderen", 2014.

Ground-breaking scientific and technological developments

There are a number of technological and scientific innovations in the pipeline, that will drastically improve our quality of life. A breakthrough in artificial intelligence combined with the abundant availability of computer capacity means that machines and computers are increasingly acquiring a growing number of typically human skills (creativity, learning capacity, problem-solving by connecting knowledge with each other, etc.). Machines and installations (vehicles, robots, pipelines, aids for persons with disabilities, etc.) will become "smart".
The miniaturisation of chips not only helps an exponentially larger number of applications to exist, it also makes them cheaper, faster and more energy-efficient.

Bioscience is the future. Many of the innovations between now and 2050 will originate in the interplay between biology, nanotechnology and information technology. The scientific knowledge about life on earth will drastically increase and will lead to many new applications, because of the combination with nanotechnology and ICT. The growing knowledge about how our brain really works will give rise to countless innovations in pretty much every scientific and technological discipline.

We can expect to see two important transformations in healthcare. Firstly, the use of technology will make "remote care" (certainly when establishing a diagnosis) a very common practice by 2050. Secondly, we can expect important developments in terms of genomics*, which will drastically improve insights into the nature of illnesses, and thus the prevention and treatment thereof. These transformations will be important in increasing the effectiveness of care. The authentic involvement of the care provider, however, will be indispensable for providing high-quality care.

Towards a hyper-connected world

The Internet of Things* connects people and appliances with each other using sensors. A growing number of devices are connected through the Internet, giving rise to an exponentially growing number of applications. The exchange of information is becoming faster and is now possible wherever you are. Consequently, activities are no longer space and time-dependent. The need for, but also the availability of, greater bandwidth and wireless networks, is growing.

The global information infrastructure is evolving towards a communication infrastructure. New applications are based on cloud computing, creating a growing number of cloud-based services. This in turn elicits questions about privacy and information security.

Emerging countries are catching up

Emerging countries are rapidly catching up on the current frontrunners (USA) in terms of research and development (R&D). As a result, productivity is growing fast in the emerging economies. Moreover trade promotes the spread of new technology. China is already investing the most in R&D resources. By 2030, China and India will account for 20% of global R&D investments.

Uncertainties about scientific and technological trends

- At the moment, we do not know whether certain technologies will be available in due time for large-scale and economically profitable applications. Will sufficient resources be available for R&D, taking into account countless other challenges?
- Which side-effects can be expected from these technological solutions? Using resources more efficiently can give rise to increased consumption because products become cheaper. At the same time, we will have to make sure that technological solutions are not limited to certain income groups, thereby maintaining or even increasing the poverty gap.
- To what extent may new information technologies be used to analyse and influence behaviour?
- How great is the risk that information and knowledge fall into the wrong hands and are used for the wrong objectives (e.g. cyber attacks)?
- What are the long-term effects of new technological applications on man and the environment?
- Will the jobs that disappear due to new technologies be compensated for by jobs in new, innovative industries?

1.1.4 Environmental trends

Climate change, with far-reaching consequences around the world and in many areas

Climate change is the consequence of the cumulative effect of greenhouse gases, which have been emitted over a long period of time, and the resulting natural phenomena.

Without an effective policy, greenhouse gas emissions can increase by 50% because the population is growing and prosperity is increasing. CO2 emissions as the most important component in greenhouse gases can even increase by 70% by 2050 in the worst-case scenario. Emissions of

greenhouse gases is falling in Europe and North America, but are still increasing sharply in Asia because of the economic growth and less far-reaching measures.

The consequences of climate change are multiple and global: urban heat islands, rise in sea level (10 cm by 2050), the melting of the ice caps, the shift of the seasons and the climate belts, more frequent and more damaging storms, shifts in agricultural productivity with consequences for our food supplies, a larger spread of diseases such as malaria and yellow fever. The economy and the social systems of the affected regions may be disrupted as a result. Some regions may even become permanently uninhabitable as a result. Climate change can therefore also influence the demographic balance. A 1°C temperature increase will affect 10% of the global ecosystems, a 3°C increase will affect up to 22%.

The currently observed emissions are following the trend of the most extreme scenario with a probable temperature increase of 3.2-5.4°C compared with the pre-industrial period. The global climate goals that were agreed in Paris must ensure that we leave this path. This will temper the negative consequences of climate change, also in Flanders.

Ecosystems are under pressure

Ecosystems are under pressure because of economic and demographic growth and the ensuing greater demand for food, space, energy and raw materials, because of the changing consumption patterns and climate change.

The oceans and the tropical areas in Asia, southern Africa and Latin America are losing species. By 2050, biodiversity on earth will have been reduced by 10%. Developing countries, whose economy is based on natural resources, will suffer the most as a result of the degradation of these ecosystems.

Earth's absorption and buffer capacity will drop due to a waning biodiversity, intensive food production, water scarcity, claims on open space, climate change, etc. Without further interventions, the degradation of the ecosystems will continue unabated until 2050. Science and technology can help endangered species and their biotopes to recover and adapt to their changing environment.

The pressure on material resources is constantly growing

The supply of non-living resources (fossil fuels, minerals and ores) is finite. Economic growth and the use by households and the energy industry are shaping this growing demand. Combined with the fact that emerging economies are claiming an increasingly larger share of the raw materials, this leads to geopolitical tensions. Countries that have few raw materials are especially impacted by the (artificially) increasing prices.

Biotic resources (from agriculture) such as cereals and sugar are also under ever-increasing pressure. The use of these resources for nature, food or renewable energy compete with each other.

Technology can help access sources that remain as yet untapped and offer an alternative to the traditional resources. Technology helps with more energy-efficient consumption, replacement, re-use, more efficiency, etc., but cannot solve all the problems in the world. It is itself a user of energy and rare resources after all.

Energy is produced, stored and distributed more intelligently

The global demand for energy is set to increase by 80% by 2050 as a result of the growth of the global economy. The emerging countries are the largest energy consumers and will remain dependent on fossil fuels for a long time, although they will systematically replace coal with gas.

The share of fossil fuels in our global energy generation will continue to fluctuate around 85%, renewable energy including biofuels around 10%, nuclear energy around 5%. The balance between types of generation will above all depend on large investments in emerging countries, that continue to invest in large-scale hydroelectric and nuclear power stations and on the availability of smart networks.

The great breakthrough in terms of renewable energy will only happen when the large-scale generation, storage and distribution of energy become commercially viable thanks to technology.

Water stress is increasing

Forty percent of the world's population lives in water-sensitive areas (above all in northern and southern Africa, southern and central Asia), and is more susceptible to the consequences of climate change as a result. Smart infrastructure networks and good spatial planning can reduce the risks.

Climate change and pollution due to human activities threaten our water supplies. The general demand for water will increase by 55% by 2050. The water shortage has consequences for agriculture, economy, health, etc. Without intervention, 1.4 billion people will have no access to basic sanitation and safe drinking water.

Innovative technology and government measures can improve the consumption and re-use of water by households, industry, agriculture, the energy industry, etc., making it more effective. They can develop a more efficient fresh water storage and better infrastructure for distributing water to regions suffering from drought or where the population has no basic sanitary facilities.

Enough food for everyone?

The demand for food will double in the next 40 to 50 years. The agricultural area will increase until 2030 to be able to feed everyone. After this date, the growth will weaken. The circumstances for food production are however not as favourable everywhere. This means food production's productivity must increase unless our eating patterns change.

Thanks to technology, food production is being more separated from land use (e.g. hydroponics and aeroponics)*. Agro-environmental techniques are being used to increase productivity. New forms of food are being developed. Genetic engineering gives rise to more production and food with a higher nutritional value (e.g. cassava, a food staple of one billion people, enriched with vitamins and minerals).

Uncertainties regarding environmental megatrends

- The ecosystem is a complex system that is influenced by many components. Effects are cumulated over the long term. Where is the tipping point, when recovery becomes impossible?
- On what scale and at what pace will we experience the effects of climate change first-hand in Flanders? And to what extent can we really intervene? What will be the cost if we do not intervene? How much solidarity is there between us and the developing countries, which are suffering most acutely because of climate change?
- To what extent will the (sometimes artificial) scarcity of raw materials slow down economic growth?
- How fast will new product locations and raw materials become available on a large scale, thanks to new recovery technologies and alternatives?
- Will the free market fail or will it solve the problems? Will governments make agreements to prevent geopolitical tensions about the environment and resources at the international or regional level?
- The way in which urbanisation occurs is uncertain. What impact will urbanisation have on rural areas and on the way space is used there?

1.1.5 Economic trends

New technologies are growing exponentially and are disrupting the economy

In the next few decades, we will experience the greatest industrial revolution since the introduction of mass production in the 19th century.

New technologies (network technology, sensor technology, 3D printing*, artificial intelligence, synthetic biology, nanorobotics, etc.) and the new business models no longer have a linear but an exponential growth curve in their economic application. They can be disruptive as a result and transform a business segment, market or revenue model in a short period of time.

Those who do not innovate or transform will be mercilessly punished. At the same time, such breakthroughs also offer a lot of opportunities for innovating companies and entrepreneurs who are just starting out. The new technologies create more possibilities to become an independent e-entrepreneur and allow new forms of the sharing economy* to grow faster.

There is a shift from capital to knowledge. This in turn requires more highly trained employees and higher investments in R&D, as well as more flexibility from the employees and the organisation.

The trend is towards more services: the industry will limit itself to its core tasks and will contract supporting tasks to the services industry. The boundary between services and industry (product-service combinations) will fade in high-tech sectors. Services will increasingly be traded.

The transition to a circular economy continues

Materials rotate in smart, closed circuits. Chains are being created from the supplier of raw materials to the consumer, with goods being taken back or recycled. Technology will help recycle goods that have come to the end of their lives and transform them into a new raw material or energy. Products will be designed in such a way that they can be repaired and consumers will learn how to repair their goods themselves or will have them repaired by technologically trained workers. The circular economy will create new jobs and will make Flanders less dependent on the international import of raw materials.

The global economy and trade are growing

By 2050, global economic growth will (unless disaster strikes) have tripled the GWP (3% on average every year). Global trade will continue to grow by 3% on average per year, but at a slower pace than in the period before the crisis of 2008-2009.

Not everyone will be able to share in this growing prosperity. Although extreme poverty is decreasing worldwide, the income inequality between countries but also within most countries is increasing, both in relative and absolute figures. Poverty is concentrated in the large cities, but the rural areas also have hidden poverty. The gap between the pay of highly skilled workers and medium to lower skilled workers is becoming greater. In the long term, this will undermine consumers' purchasing power, slowing down economic growth.

More than 30% of the population in the OECD countries and almost 20% in the rich G20 countries lives in poverty.

Economic clout is tipping in favour of the emerging countries

In the next few years, China will become the largest economic power. India will become the third power after the United States, followed by Brazil, which will overtake Japan after 2030. By 2050, Mexico and Indonesia will have become more important economies than the United Kingdom, Germany and France. Africa continues to be the poorest continent, but its economy will be the fastest growing economy in the decades between 2030 and 2050. The countries with the greatest growth potential are Vietnam and Nigeria. Colombia, Poland and Malaysia also have the potential for sustained growth in the longer term.

The share of the OECD countries in world trade will drop to 25% by 2050. The centre of gravity of trade will shift from west to east. By 2030, China will be the world's largest trade partner. The shift eastwards is already apparent in the top ten of the most important sea ports (Shanghai, Singapore and six Chinese ports in the top ten) and airports (Beijing, Tokyo, Jakarta, Dubai in the top ten).

The need for mobility will increase

Transporters will look for the shortest route (even via the North Pole), will transport goods to mainports in vehicles with an ever-larger loading capacity, from where distribution will continue, in order to increase their transport performance. Standardisation (e.g. containers) is aimed at, the synchro-modality of vehicles will improve and route planning (full both outbound and return) is carried out.

Without intervention, passenger transport to and from the EU is slightly increasing, but by less than the growth of GDP. Passenger transport by road will remain the most important transport mode in all its variants (e.g. car sharing) but there will be a limited modal shift to rail.

Without intervention, goods transport to and from the EU will be in keeping with the growth of GDP. The expected growth in tonne/km is greater for overseas transport and coastal shipping. The share of goods transport by road is dropping slightly. By 2030, there will be capacity problems in air transport.

The breakthrough of other economic production and consumption models (e.g. sharing economies) will determine the extent and method of mobility.

Cities will become gateways to the world

Urbanisation is part and parcel of economic development. Large urban complexes are hives of innovation. The competition between cities for attracting economic activities is becoming ever larger. Assets for investments will be quality of education, infrastructure, the living, care, residential and innovation climates and a flexible labour market.

By 2050, 2/3 and possibly even 3/4 of the world's population will live in cities (currently it is 1/2), with ever more fast-growing megacities of more than 10 million inhabitants. They will face major problems if there is no decisive policy for drinking water, food production, pollution, security, well-being and unemployment.

Large cities will become nodes that are part of national and international urban networks. Within the EU, the core region of Paris-London-Munich-Hamburg-Milan is an attractive region for investments. Corridors with large cities along the major European transport axes will be created out of this core region. The Amsterdam-Le Havre port corridor will become even stronger thanks to major national investments in water, roads, railways and coastal shipping.

Uncertainties regarding economic megatrends

- When will economic growth in the emerging economies cease? There will be other fast growers, besides BRICS, but it is difficult to predict which countries.
- How long will the economic crisis and the resulting debt crisis continue to have an impact on our economy's recovery? Other developments such as ageing and climate change place additional pressure on government finances, which have been hit by the banking crisis.

- Where will products be made, assembled, distributed? Will there be sufficient knowledge-intensive jobs in the West? Is globalisation related to sectors, job groups or types of jobs?
- Will lower skilled workers lose their jobs because of robots? Will highly skilled workers compete with technologists from emerging economies? Which skills do we need for the future? How important will our knowledge centres be or remain?
- Will shifts in economic power, logistics chains and production chains have consequences for the positions of the western mainports?
- How will our trade evolve, given that the EU's impact on world trade is shrinking?
- How will the operation of the market evolve? Does the shift of the economic centre of gravity from west to east have consequences for the dominant value system: free market versus state capitalism?
- How will consumption and consumer confidence evolve in the future? Will mass consumption continue or will individual self-determination and choice win out?
- To what extent will the growing inequality influence geopolitical relations, international terrorism or conflicts and migratory movements?
- What influence will economic megatrends have on social cohesion within society as a whole and citizens' quality of life?

1.1.6 Political and governance trends

Growing multipolarity and networking at all levels

New political power blocks will be created in Asia and South America based on economic, financial and/or military power. Emerging economic powers will request stronger representation in international platforms such as the UN Security Council.

There will be a further completion of European integration, with free movement of persons, goods and services. But the EU's political negotiating position continues to be weak due to the lack of a European identity and a collective defence of interests in its foreign policy. The uncertainty about the survival of the eurozone and internal tensions between richer and poorer Member States will weaken the EU.

Intermediary, cross-border partnerships will be established, such as Euroregions, urban regions, etc., that are becoming increasingly aware of their potential.

Non-state actors, such as international organisations, companies, NGOs, etc. are also carrying more weight in international decision-making platforms.

Since the introduction of the nation-state, there has never been so little war between large countries as today. There is a good chance that this will last in the decades to come. But there are risks of outbreak of new, armed conflicts. Scarce natural resources can give rise to conflict, but possibly there will more likely be a "war for water" than a "war for oil". A risk of border conflicts always remains,

e.g. Kashmir and the islands in the South China Sea, as well as risks of wars in which states and organisations participate. Internal armed conflicts, civil wars and terrorist organisations continue to pose a lasting threat to global stability.

The following trends can be expected at the military level:

- extensive availability of military technology (including drones and robot soldiers), also for smaller states and non-state organisations (including terrorist organisations);
- cyber attacks as an instrument of warfare;
- further spread of nuclear weapons;
- China as a new military power, which will surpass the US, measured in military expenditure.

Governments and institutions in transformation

The government is expected to provide a quick and flexible answer to changes around it and to meet the expectations of citizens, companies, etc. Cultural change is needed in civil servants and politicians, so they become flexible, innovative, efficient and effective.

Whereas earlier technological evolutions above all gave rise to changes and efficiency gains in the private sector, in the future it will above all be the public sector that will change as a result. Governments will evolve from bureaucracies to cooperative platforms, which rely on volunteers, individual citizens and companies. Schools, universities and hospitals as well as socio-cultural enterprises will undergo major transformations.

Alternatives to the government will be established. Governments will lose power to social networks (citizen participation based on social media), as well as to multinationals, the media, justice and science.

Uncertainties regarding political and governance trends

- How strong will the EU's role remain at the international level? What consequences will the economic crisis and the debt crisis in the EU have on stability in Europe? How strong will the euro remain?
- How will attitudes to the EU evolve? To what extent will Member States tolerate EU interference in their policies to achieve strategic goals (e.g. balanced budget)? To what extent will the EU take into account the regions and a subsidiarity framework?
- Will scarce resources, dependence on IT, etc. become the new weapons?
- How to arrive at a consensus in complex cases, with so many different networks?
- What role will the government play in international networks where multinationals and large cities play a more prominent role?

1.1.7 Social trends

Increased individualisation

Traditional institutions of authority will have less impact on citizens' way of life. While the group of atheists, agnostics and people who do not consider themselves to belong to any religion is growing, Christianity and the fast-growing Islam will each be practised by 30% of the world's population by 2050.

The government-citizen relationship will shift from a relationship of authority to one of negotiation. Citizens will search for information themselves thanks to computerisation and form their own opinion. New media (including social media) disseminate new ideas quickly, allowing citizens to organise themselves rapidly. It will become increasingly unclear who the citizens represent, as they belong to different networks, often for short time spans and focusing on one specific theme. Civil society organisations and political parties become less representative as a result.

A diverse society sets high requirements for individuals and society

The trend of individualisation is not developing at the same pace across all population groups. In order to make choices and assume responsibility, citizens rely on material, social and cultural capital. The increased prosperity and a changing demographic composition (age, origin, religion, size of the household, types of partnerships, etc.) will give rise to different preferences about the quality, sustainability and reliability of products and services. At the same time, people must be able to develop a stable identity, on which they can rely, at the social, psychological and cultural level, in a continuously changing society.

The competences of the future are creativity, curiosity, innovative entrepreneurship and entrepreneurial spirit, and the skills to find and select information, devise solutions and process them into new, personal skills. At the social level, people will have to be able to function well, will have to continuously reposition themselves and connect with various groups and environments. This requires a high level of sensitivity, social and adaptive skills. Not everyone will be as quick on the uptake, which may result in new fault lines. Education provides us with the skills to jointly form a community and participate in the labour market. Education plays an important role, offering young people a shared value pattern and mutual respect. Diversity is not an obstacle, but a source of learning and can provide added value for society.

Technological and sociological evolutions can cause uncertainty and fear in citizens, becoming a meaningful source of stress. Resilience and being able to cope with stress will be essential in order to maintain one's quality of life.

Language knowledge is essential in a globalised world, but a commitment to one's own language and culture is also important to form communities in an increasingly diverse society.

Solidarity in care is under pressure

The demand for care is growing, on the one hand because of our ageing population, the more accessible and extensive care provision, better diagnoses and treatment methods, etc., and on the other hand also because of the growing number of people living alone, the combination of work and family, working longer at an active age, etc. As a result, the pressure on informal care by one's partner, family or friends is coming under increased pressure, resulting in a greater demand for professional support.

At the same time, the expectations of people with care needs have evolved. Citizens have become more vocal, also as patients and clients. Everyone wants to live at home as long as possible, retain autonomy and use their own expertise to organise their care or self-care and thus control their own life as much as possible.

Our society is becoming more heterogeneous, making it more difficult to organise care universally and take individual expectations into account.

Besides technological developments, including the option of remote care, the demand continues to be for accessible, high-quality, personalised and tailored care.

Uncertainties about social trends

- How will solidarity between people and generations evolve? Which organisational model will we choose to meet the growing demand for accessible, high-quality and tailored welfare and healthcare?
- What is the future of citizenship?
- Do new, temporary networks on a specific theme with specific groups give rise to the forming of new groups or communities?

2 FLANDERS 2050: STRONG ASSETS, FAR-REACHING CHALLENGES

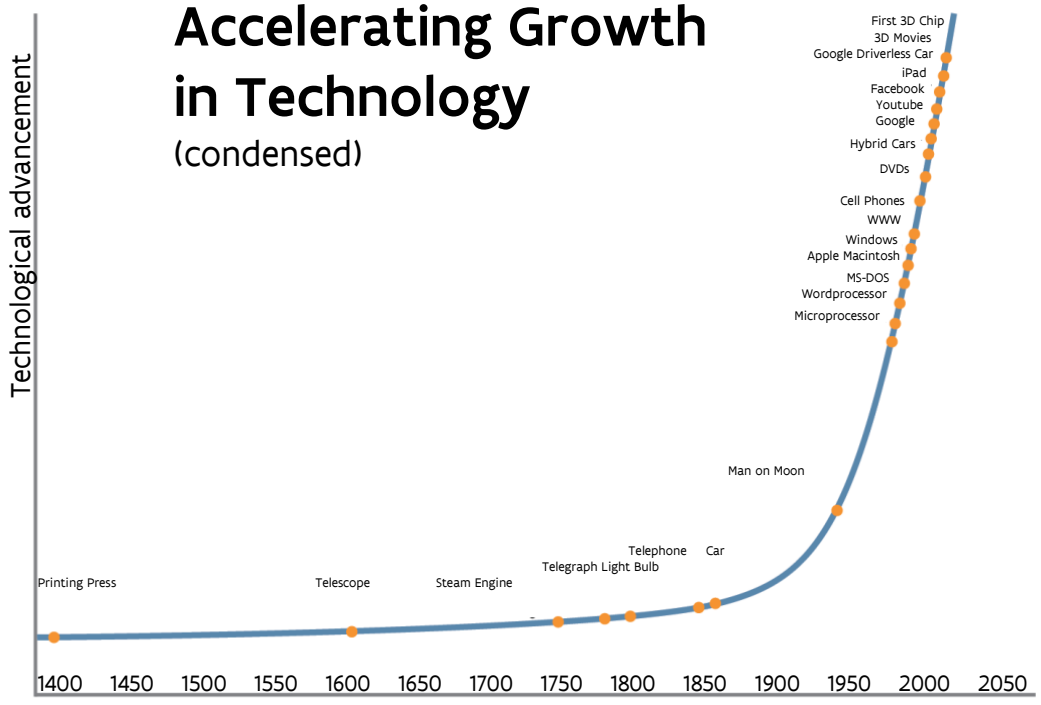
2.1 A WELL-THOUGHT-OUT AND COMPREHENSIVE VISION FOR THE FUTURE

The vision for the future outlines the Flanders that we wish to have in 2050: a social, open, resilient and internationally-connected Flanders, that creates prosperity and well-being in a smart, innovative and sustainable way, in which every individual counts.

> *"You've got to think about big things while you're doing small things, so that all the small things go in the right direction."*
> Alvin Toffler

We cannot predict Flanders' future for certain. After all, its future depends on complex and unpredictable changes and innovations that we do not know the impact and timing of today. Nor can we predict the pace of certain change processes. This unpredictability may mean that we will have to gradually adjust our vision for the future of Flanders.

We must take into account disruptive changes and radical transformations, e.g. due to new technologies or social-societal events that occur. These changes can profoundly disrupt our society and the social system. New markets and revenue models will be created, while existing jobs and companies disappear. Technological and social changes will pile up at an increasingly higher pace. Citizens will have to be flexible in this constantly changing society.



Exponential curve of technological changes
(source: Miovision Technologies, The Internet of Things and Transportation)

Flanders will already have achieved certain aspects of this vision for the future before 2050. We consider these achievements as achieved in the vision for 2050. The vision does not state when exactly we will achieve them. The vision does not contain any interim objectives.

The vision for 2050 aims to strike a balance between realism and progress optimism. It would be unrealistic to believe that all the problems that Flanders contends with today will have disappeared in 2050, nor can we believe that there will not be any new problems. We do however trust that we can solve these problems by working together and using human ingenuity.

The vision for the future is based on a 'shapeable' future. Flanders must not just passively undergo unpredictable changes, innovations and possible problems. Instead it can help shape the future. We achieve this by taking on a pioneering role in the innovations that have a positive impact on life on Earth. In so doing, we use the available tools and offer opportunities to all people and groups.
Courage and imagination are essential to be able to deal with the changes that will radically transform our social system. We must dare to break free from what exists today and from what we have always known and focus instead on innovative ideas and innovation.

The vision for the future must be an inspiration for all people in Flanders. We will work intensively with the whole population and all social actors to achieve this desired future for Flanders.

2.2 SUSTAINABILITY AS A GUIDING PRINCIPLE

Sustainability is an important guiding principle in the vision for Flanders' future. This Vision 2050 shall also be considered as the third Flemish Strategy for Sustainable Development (FSSD). The second strategy was all about innovation: It was the first time that a long-term vision until 2050 was established for a sustainable society in Flanders in which the transition approach took centre stage. As established by decree, the second FSSD must be evaluated in great detail before moving on to the creation of a new FSSD, which is contained in this vision paper. The insights of the evaluation of the second FSSD (see insert) will also be used as a starting point for developing this vision paper for 2050. The recommendations relate to the long-term vision, the transition approach, the actions and the position of FSSD 2.

The results of the evaluation for example inspired a long-term vision, based among other things on existing international and Flemish long-term visions and explorations of the future, such as the Vision 2050 of the second Flemish Strategy for Sustainable Development, the 2015 exploration of the future by the Flemish Council for Science and Innovation (transformed into the Flemish Advisory Council for Innovation and Enterprise since 1 January 2017), the visions of the ongoing transition processes and the SERV (Social and Economic Council of Flanders) platform text 2030.

The emphasis on the transition approach has also been maintained, but we make sure that there is a real link with sustainable development and that the most important objectives of a transition perspective are respected. On the other hand, we do respect the properties and speed of each individual transition process.

We do not add any specific actions to the 2050 vision paper (as we did in FSSD 2). Instead we have chosen to focus on a few larger transition priorities. By choosing to embed the FSSD 3 in this vision paper, sustainability is already taking a stronger position. This vision paper plays a complementary, connecting and guiding role among other policy plans and strategies.

Conclusions and recommendations from the evaluation of the FSSD 2

The Policy Research Centre for Transitions for Sustainable Development (TRADO) evaluated the FSSD 2 in the spring of 2014. Several stakeholders were involved and canvassed in this evaluation (including the Working Group on Sustainable Development, the Strategic Advisory Councils, the political level, the transition managers and the external and internal stakeholders that were involved in the FSSD's implementation). Throughout the evaluation, TRADO paid specific attention to the three major pillars of the strategy, namely the long-term vision until 2050, the transition approach and the actions designed to implement the vision and transitions.

Some major conclusions and recommendations from the evaluation:

Vision 2050: The choice to include a vision for 2050 in the FSSD 2 met with unanimous support. The challenges posed by sustainable development can only be tackled with a long-term approach. This also showed that the next FSSD should definitely also contain a long-term vision, after refinement, update and/or completion of this information, so the vision continues to be sufficiently sharp and accurate at all levels.

Focus and effect of the transitions: The focus on transitions as an approach to achieve this long-term vision met with a lot of support in Flanders. The transition framework was considered a good way to think about fundamental systemic changes and to try and steer systems towards sustainable development. It is to the Government of Flanders' merit that it created legitimacy for transition thinking in Flanders with the FSSD, making it visible and establishing a framework for it. It also created possibilities for working on a different policy culture within the Government of Flanders, to facilitate transitions. The most eye-catching effect was Flanders in Action (FiA). In 2011, the Government of Flanders decided to use the transition approach of the FSSD as inspiration to deepen and accelerate the implementation of FiA in thirteen transversal themes. The promotion of the transition approach was a step forward in the sustainable development policy. The assessors think it must certainly be maintained in the next FSSD/vision paper 2050.

Approach to the transition processes: Different initiatives have been undertaken in several existing transition arenas and progress has been made. But not all the transition processes were completed equally effortlessly. In many cases for example, maintaining a transversal approach proved difficult after launching a transition. The transition method promoted in the FSSD did not work for every system. Various ongoing transition processes, often in the context of FiA, moreover no longer had a real link with sustainable development. In future, when starting up and supporting specific transition projects, we must take greater pains to ensure that the link with sustainable development is maintained and we must respect the most important objectives of a transition perspective. A uniform approach is therefore not recommended, but the emphasis on a number of general sustainability principles is indispensable.

Specific actions in the FSSD: In contrast with the long-term vision and the transition approach, the formulation of specific actions in the FSSD 2 could not count on general support. The large number of actions was mainly limited to a comprehensive list of activities and ambitions which have already been formulated elsewhere, as part of Flemish policy. The assessors therefore suggested reviewing the addition of specific actions in the new FSSD and limiting it to a few priorities.

Position and connecting role of the FSSD: In principle, the FSSD plays a complementary,connecting and guiding role among other policy plans and strategies. During the evaluation, most of the parties involved considered this to be the ideal role of any FSSD. But all too often, the FSSD 2 did not have enough scope for action and political support. A new approach will therefore have to be sought when drafting the new FSSD - the need for which was emphasised by most external partners - to make sustainable development a guiding principle in Flemish policy. To achieve this, the FSSD 3 will have to be given a stronger position than the previous FSSD.

2.3 FLANDERS CONNECTED WITH THE WORLD

Flanders' future is connected to evolutions in the rest of the world. We cannot separate the challenges which face Flanders from those which face the world. We are connected with the rest of the world, not just at the economic level, e.g. through imports and exports of goods and services at competitive prices. At the environmental, political, cultural and other levels too, people, families and social organisations are increasingly connected with each other internationally. Large migration flows are also expected due to economic, environmental and geopolitical factors. Ethnic and cultural diversity is also strongly increasing. This creates new opportunities but also gives particularly large challenges.

> *"It is of course, almost inevitable that some new and disruptive social technology will emerge from a garage in Silicon Valley or even a shack in Kenya in coming decades to change completely the nature of online social interactions. But whatever happens to the underlying infrastructure of sharing, it is clear that the drive towards an ever more interconnected world will only accelerate."*
> The Economist, Megachange 2050

The vision for the future is aimed at Flanders, but Europe and the rest of the world are evolving in the same direction. Flanders is contributing to this by focusing on the United Nations Sustainable Development Goals for 2030 (SDGs), which outline the desired future for the world as a whole. Achieving these SDGs at the global level is a necessary condition for achieving the vision for Flanders by 2050. In this respect, it is important that Flanders focuses on SDG 17, namely "Strengthen the means of implementation and revitalize the global partnership for sustainable development". But obviously Flanders endorses all 17 SDGs of the United Nations, and their target date, namely 2030.

- SDG 1: end poverty in all its forms everywhere
- SDG 2: end hunger, achieve food security and improved nutrition and promote sustainable agriculture
- SDG 3: ensure healthy lives and promote well-being for all at all ages
- SDG 4: ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
- SDG 5: achieve gender equality and empower all women and girls
- SDG 6: ensure availability and sustainable management of water and sanitation for all
- SDG 7: ensure access to affordable, reliable, sustainable and modern energy for all

- SDG 8: promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
- SDG 9: build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
- SDG 10: reduce inequality within and among countries
- SDG 11: make cities and human settlements inclusive, safe, resilient and sustainable
- SDG 12: ensure sustainable consumption and production patterns
- SDG 13: take urgent action to combat climate change and its impacts
- SDG 14: conserve and sustainably use the oceans, seas and marine resources for sustainable development
- SDG 15: protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
- SDG 16: promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
- SDG 17: strengthen the means of implementation and revitalize the global partnership for sustainable development

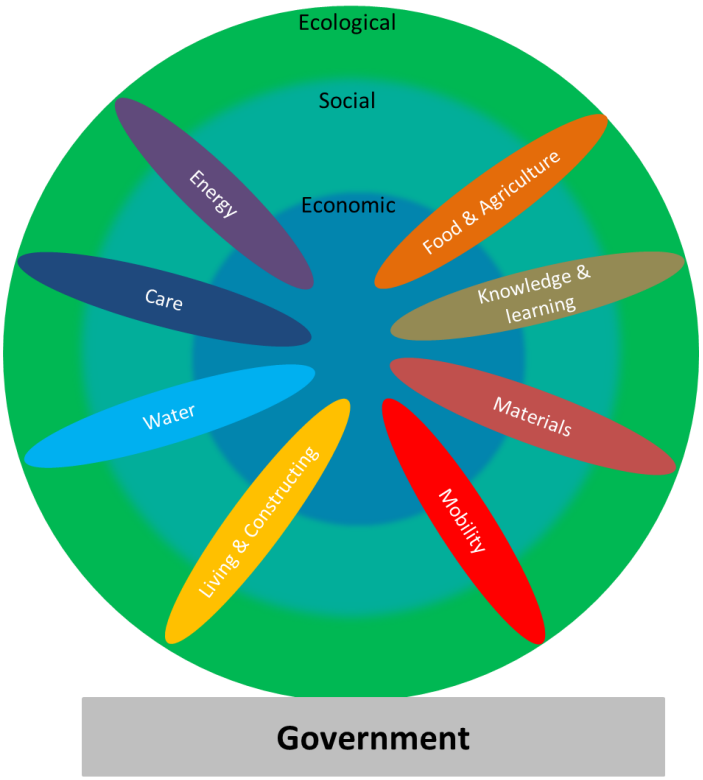
Sustainable Development Goals

In 2012, the United Nations Conference on Sustainable Development took place. Based on the outcome of this world conference, the 17 Sustainable Development Goals were drawn up. They combine the agendas for sustainable development, the environment, development cooperation, poverty, equal opportunities and labour in one uniform set of goals at world level. The Sustainable Development Goals are of a universal nature. They apply to all countries, so also to Belgium (including Flanders) and Europe. The United Nations General Assembly established the goals in September 2015. Every country will further specify these goals.

2.4 ACHIEVE FLANDERS' AMBITION FOR 2050...

Flanders' ambition for 2050 focuses on cleverly, innovatively and sustainably creating prosperity and welfare in a social, open, resilient and internationally-connected Flanders, in which every individual counts.

We want to achieve this ambition with a new economy, for an inclusive society and within the ecosystem boundaries of our planet. We therefore want to evolve towards sustainable production and consumption within the planetary and social boundaries. The model below aims to represent this, with the image of an economy that is embedded in the social and environmental system. This is how we continue to build on the international approach of sustainable development, with attention to people, planet and profit/prosperity.



Developing a vision for the future for Flanders in 2050

Below we translate the ambition into a vision for the future regarding the various themes, ranging from knowledge and learning to water and energy, starting from our opportunities and challenges.

The themes largely coincide with the needs of our society and are founded on the United Nations Sustainable Development Goals for 2030. The theme of the "agile government" is a precondition for the other themes.

The economic, socio-cultural and environmental dimensions are a common theme in the vision for Flanders' future and are referenced in every theme.

In each theme, we test the vision for 2050 against the environmental analysis. Based on this, we formulate a number of opportunities and challenges for Flanders. The opportunities indicate the aspects that are strengths for Flanders, where it is already evolving towards the desired vision for the future. The challenges describe which changes are needed to overcome the difficulties on the path to 2050.

2.4.1 … via a new economy

Vision 2050

In 2050, Flanders is a competitive region with a solid position in the international world trade. It owes this to the expertise and outstanding reputation of Flemish companies in new technologies and their participation in international business clusters that work and innovate together to achieve global value chains (from raw material to end product). The Flemish companies excel in a number of niches of these global value chains.

Flemish industry has undergone a major transformation. It uses new labour market models and an innovative labour organisation. An innovative labour organisation also implies facilitating the combination of work and family or other aspects of one's private life, to increase employees' quality of life. Full use is made of new developments in key enabling technologies such as industrial biotechnology*, nanotechnology* and advanced production techniques such as 3D printing.

Key Enabling Technologies (KETs)

Some technologies are not typical of producing one or a few products, but are crucial for an endless series of applications. The European Commission has defined six Key Enabling Technologies, in which European countries can play an important role and which can (or should) form the basis for an industrial Renaissance in the European Union. They are nanotechnology, micro and nanoelectronics, photonics, industrial biotechnology, advanced materials and advanced manufacturing technology. These technologies are necessary, often in combination, for developing a range of very diverse end applications. Flanders excels in many of these key enabling technologies.

The production takes place in factories of the future, in a sustainable, people-oriented and flexible environment. Finally, the industry has also evolved into a highly digitised Industry 4.0, in which, among others, the Internet of Things plays an important role. Thanks to these transformations, a reindustrialisation of Flanders and Europe takes place, and industry is once again a more important factor in prosperity and employment.

Industry 4.0

Industry 4.0 is the consequence of the fourth industrial revolution and in very general terms, refers to the far-reaching digitisation of industry that is currently taking place. Important components in this digitisation process are the robots and machines that can communicate with each other independently, during the production process, ensuring that specific actions automatically take place at the right time. This happens, among others, through the Internet of Things.
Industry 4.0 also often refers to other aspects of digitisation in the production process, such as the increased use of *big data* (the analysis of large data flows) or the virtual testing of new production processes and technologies such as 3D printing*.

Factories of the future

In the factory of the future, intensive digitisation is a fact, but that is not all.
Besides the omnipresence of ICT and the Internet, the factory of the future also belongs to a network with other players, using this network to constantly innovate and optimise the production process.

Every step of the production process is implemented as sustainably as possible, at the centre of the process is the employee as a human, the factory uses the most modern technologies, etc. We expect that production in the future will have to comply with this series of criteria to be competitive and fulfil social expectations.

Expected technological breakthroughs

The Internet of Things

Simply put, the Internet of Things is all about the wide range of new opportunities created when devices, machines and everyday objects are fitted with sensors and are connected with each other through a data network or the Internet. The sensors allow them to register useful information in their environment while the embedded network technology enables them to communicate with each other, use Internet services and interact with people.

The combination of more networks, interconnectivity with more computing power and sensor technology creates objects that generate and share huge amounts of data. These *big data* give information about how objects work, about users and/or about the environment in which an object is located. The opportunity of the Internet of Things is created by the use of these *big data* for completely new applications, designed to make our life more pleasant and easier. The Internet of Things is often seen as the next step in the information revolution.

3D printing

3D printing* is a new way of creating objects. A 3D printer can build up the object layer by layer using a digital 3D model. This can be done in all kinds of materials, from plastic to metal, from chocolate to concrete. 3D printing* can turn the production of goods and supply chains upside-down. It offers the possibility of producing in a more decentralised and thus more local manner and allows manufacturers to respond to consumers' specific needs with products that are more tailor-made. Originally 3D printing* was above all used to manufacture prototypes. Companies see this as an efficient method to first test and tweak new objects before actually producing them. 3D printers are becoming ever more advanced and can use an ever wider range of materials. The prices of the printers and the materials alike are continuing to drop. The possibilities are endless. For example, scientists have already been able to print organs, using human stem cells as a base.

Robotics

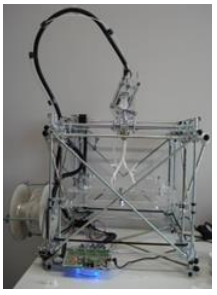
In the following years, robots will become significantly more effective with more powerful chips, sensor technology, adaptive software and the Internet of Things. These items make robots smarter, more flexible, easier to operate and relatively cheaper. Thanks to their improved sensors, skills and intelligence, robots will be able to carry out ever more complex tasks. Robotisation is a trend, in the widest sense of the word, for industrial and home use alike.

Next-generation genomics
Scientists can systematically test how they can bring about genetic variations in specific properties of diseases, for example, using fast sequencing and advanced computing. The next step is synthetic biology or the customised "writing" of DNA. This will have a huge impact on medicine and agriculture among other things.

Artificial intelligence
The computing power of chips is increasing, enabling computers to catch up and bypass humans when it comes to problem-solving skills. The challenge in this is to let computers function intelligently as well. Deep learning software must allow computers to recognise patterns in speech, imagery or other data. The constant cost reduction in the chip industry ensures that ever more devices can be fitted with embedded chips and sensors. With them, devices can conduct measurements about the environment, the use or their own operation. They can also adapt their operation, based on data and calculations.

Besides the industry, the services industry will also play an extremely important role in 2050. The boundary between services and materials goods is fading ever more, and many new product-service combinations will be created in the future. This means that a great many goods and materials will no longer be sold, but will merely be made available temporarily as a service. The first seeds of this development are already visible today, with the car sharing trend as the best-known example. Such new business models extend to all possible applications. The traditional economy, as it exists today, in 2050 will be interwoven with the sharing, bartering, exchange and *peer-to-peer* economy (further information under 2.3.2). These new economic models will create a new range of local services, but the distinction between consumers, producers and employees will also become less clear. They will all become *"prosumers"*.

Companies, individuals and citizens' groups will make use of digital sharing platforms more frequently to cut costs and avoid expensive purchases. New technologies such as 3D printing* moreover make it possible for material production to be organised in a more decentralised and local manner, with a bigger presence in daily life. The internationally renowned knowledge centres and researchers in Flanders work according to the *open science* model. Consequently their fundamental research is the driving force even more behind economic innovations, in Flanders and beyond.



A re-industrialisation thanks to new technologies on the one hand and new business models on the other constitute the basis for a new productivity leap in the real economy. This increased economic productivity is not a goal in and of itself, but must create more well-being and prosperity for Flemish citizens, providing the economic base for building our ideal vision of an "inclusive society", as described in 2.4.2. Neither is the use of technology a goal in and of itself, but it must offer added value for companies or individual users, while also responding to social needs.

Moreover, the innovation of the Flemish economy must also have an environmentally sustainable aspect (see 2.4.3) so this new economic base is sustainable, instead of undermining Flanders' own prosperity in the long term by exceeding environmental limits.

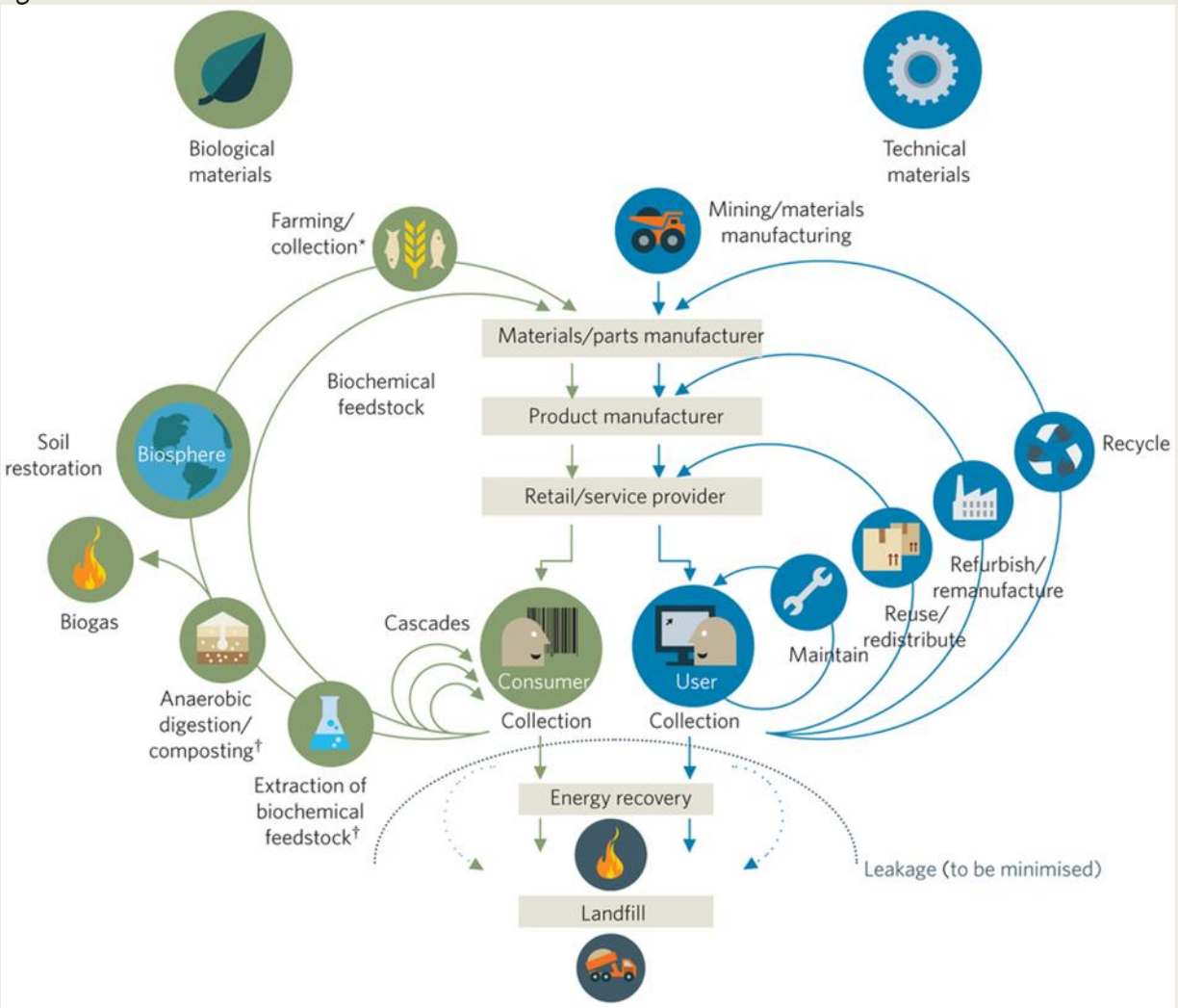
That is why the Flemish economy will be transformed into a low-carbon and circular economy in 2050. We will make smart use of raw materials, materials, energy, water, space and food and

close circuits as much as possible. The Flemish economy has also developed into a fully-fledged bioeconomy that sustainably produces biomass and uses and re-uses biomass flows and residual flows for food, animal feed, materials, products and energy.

The circular economy and the bio-economy

We must use natural resources intelligently and efficiently, given that we rely on them for our economic activities. The transition to a fully-fledged circular economy and bioeconomy can help us achieve this. These are two different concepts, which cannot be considered separately if we want to achieve a sustainable economy.

A circular economy is a model whereby we close the circuits of raw materials, materials, energy, water, space and food as much as possible. We re-use natural resources as much as possible and disconnect economic growth from the consumption of finite raw materials. We keep the value of product (components) and materials as high as possible in every stage of the life cycle. We distinguish between biological materials that were designed to safely flow back into the biosphere and technical (non-biological) materials that were designed and commercialised in such a way that we can re-use them at a high quality level. The circular economy creates new opportunities for innovation in product design, the manufacturing industry, services, business models, agriculture and food.



(source: McKinsey / Ellen MacArthur)

The bioeconomy includes all economic activities that are based on biomass. We can only achieve a sustainable circular economy by also paying attention to the start of the lifecyle and focusing on the use of renewable resources, such as biomass. This is where the bioeconomy comes in. Biomass is a very important, renewable and in principle CO2-neutral resource, which is still gaining strongly in importance and which can be deployed widely. Biomass flows, such as wood and grass from nature and forestry management, aquaculture, agricultural crops and residual flows are used according to the cascade principle, first for food, then for animal feed, materials and chemical products and finally for energy. Chemical basic components such as ethylene for example can be produced from starchy crops, whereas construction materials can be made from flax or hemp.

A sustainable bioeconomy must pay attention to the start of the lifecycle, by making sure that the biomass has sustainable origins, and its use is sustainable, in accordance with the cascade principle. Ideally, the circuits in the bioeconomy are also closed upstream in the lifecycle. For example this can be achieved by focusing on biodegradability, of solvents, for example, the re-use of bio-based materials such as bioplastics and the collection and re-use of waste gases from the combustion of fossil fuels and biofuels, which can be re-used as a raw material after fermentation.

Bioeconomy and the circular economy reinforce each other. In the last few years, there have been innovations aplenty in these fields, no least in Flanders. Our region is currently a frontrunner in both fields, and further developments in this area can contribute to making Flanders a major world player in this sustainability revolution.

A number of conditions are crucial for achieving this renewed, sustainable economy in 2050:

1 a properly functioning capital market will ensure its financing. Besides financial institutions, which will have been working transparently and sustainably for a long time in 2050, there are new or renewed forms of financing that business owners can rely on, including *crowdfunding*, cooperative enterprise, third party financing and so on. They increase the economy's resilience and help ensure we can avoid major financial crises;

2 Flanders' business climate attracts new starts-ups and is conducive to business growth. Flanders puts in place spatial assets for this, ensuring that the region continues to appeal to companies, foreign investors, visitors and inhabitants. The economic infrastructure is used and re-used efficiently and in a multifunctional manner and the economic networks are smartly embedded in cities, open space and logistics networks. The presence and proximity of retail and personal services contributes to viable and pleasant city and village centres. Cities are connected with other cities and regions in smart urban networks, including across national borders. Flanders pays attention to reconciling the various aspects of spatial use, such as agriculture, nature, economy, recreation, care and housing. The interweaving of functions in cities strengthens the establishment climate and innovative capacity, and helps overcome problems of congestion and pollution;

3 Flemish businesses and their employees are resilient and succeed in constantly adapting to new developments that have the potential to be disruptive. They do this, among others, by focusing on lifelong learning, workable careers and by constantly developing new competences on the workfloor, including skills that are important for preserving quality of life. Think for example of the coping mechanisms, needed to respond to disruptive

developments. A growing number of people in Flanders are working flexible working hours to improve their work-life balance. This is also a source of more well-being. Vice-versa, well-trained workers in innovative company environments are providing new social and technological breakthroughs. We strengthen our economy's productive potential and accelerate innovations by focusing on creative and social intelligence in education and on the labour market. In one fell swoop, this also strengthens our capacity as a society to cope better with disruption and automation, not merely become its suffering object;

4 Flanders capitalises on everyone's talents. We use all the available talent in Flanders to absorb the cost of ageing and to achieve our ambitions in every possible field. Everyone, including those with difficulties in the labour market/circuit due to personal and/or social reasons, will be given the opportunity to find tailor-made work in the labour market. An appropriate remuneration is linked to this. The pay grade gap, with both vertical and horizontal segregation, has been eliminated. The workfloor of Flemish companies is a true reflection of our diverse society;

5 we respond to human needs in technological developments. Technology is a means of improving people's lives and tackling social challenges, not a goal in and of itself. We always take into account the consequences of technological disruptions on people's lives and on employees' work. In policy, we try to transform these threats into opportunities that increase the quality of life at home and at work. The digital transformation assumes "technological readiness" among governments, businesses and the population and continued attention to e-inclusion.

Opportunities

Flanders has a unique position (both metaphorically and geographically) in Europe and the rest of the world. Consequently, Flanders is a logistics hub and the gateway to Europe for international knowledge, people and goods flows. The open character of the Flemish economy is an important asset in this regard.

Companies are located close to one another in the small region of Flanders. Moreover, Flanders has various internationally-renowned knowledge centres and researchers that form a driving force behind innovations in Flanders, in cooperation with the businesses and enterprises in non-profit sectors. This creates opportunities for cooperation between various sectors and integration into regional and international value chains. There are plenty of examples of new value chains and smart specialisations in which Flanders can distinguish itself from others at the international level.

Flemish strengths in an innovative industry

Value chains will become even more global in the industry of the future, and regions such as Flanders will excel in a number of niches of these value chains. Flanders will gain an insight into the smart specialisations in which we are international leaders or have the potential to be global players. The smart specialisation strategy that Flanders submitted to the European Commission features a number of examples of this:

- sustainable chemistry: e.g. bio-based materials such as bioplastics, biopolymers for textiles;
- specialised manufacturing solutions: e.g. smart textiles, urban mining, 3DP applications;

- personalised medicine and tailor-made care;
- logistics with added value;
- specialised agro-food: e.g. new niches in healthy and sustainable food, new packaging for less food loss, aquaculture, valorisation of regional products;
- various niches in construction, energy and the environment: e.g. smart cities, smart grids, including housing, recycling;
- ICT niches in hardware and software: e.g. smart, integrated electronic systems.

In terms of the European *Key Enabling Technologies**, Flanders is a strong performer in a number of niches that can be essential for the future of industry in Europe.

Our Flemish companies have a number of assets when it comes to competitiveness. The energy efficiency of the Flemish economy is a competitive advantage for example. Flemish employees are often highly skilled and are among the most productive of the European Union.
Finally, there are also important opportunities in terms of financing. Households in Belgium have high net assets (equity), which easily compensate for public debt. This in turn offers opportunities for the innovative financing of business activities and ambitions in other areas.

Challenges

A first economic challenge for Flanders consists of accelerating all changes: the transformation from an industrial production system to Industry 4.0 and factories of the future and the conversion into a low-carbon economy, circular economy, bioeconomy and sharing economy*. Regardless, the transformations are snowballing towards us. Adopting a pioneering role instead of being a follower is a necessary condition for assuring the competitiveness of the Flemish economy. By taking the lead, Flanders, in cooperation with other European countries, can carve out a new role for itself in the changing geopolitical and economic power relations. This allows us to remain competitive in a world with a growing number of emerging economies.

The transformations are necessary, but also very disruptive. The quicker they take place, the more important it is that we absorb the consequences. That is why we must prepare the Flemish economy and society for important changes, including in employment and in keeping with the required competences, location policy, logistics and trade. The consequences on the labour market, especially, are an important challenge. The transformation into an increasingly automated and digitised Industry 4.0 can suddenly threaten countless jobs and companies. On the other hand, new jobs are created as a result of these evolutions, with new competences expected from the current employees. As far as the labour market is concerned, it is also a challenge to develop new, more flexible forms of employment, which still guarantee sufficient job security. That is why it is important both in education and in the labour market to anticipate these shifts. We must already today provide an answer to the limited number of people who participate in the labour market and look for suitable measures for people who cannot or can no longer work within the regular or even protected labour circuits for personal and/or social reasons. The declining demand for certain workers as a result of robotics and other technologies makes this even more urgent. These changes in the labour context will have to be factored in to the monitoring of citizens' well-being. On the other hand, we can also try to anticipate the changing needs for competences in tomorrow's labour market with competence prognoses and flexible training programmes.

The growing flexibility of managers, employees and producers must ensure that job security becomes career security, with employees given the opportunity to develop ever further inside and outside the organisation for which they work. This must lead to more job security in Flanders, in which workers are better armed against the volatility of economic cycles. We must also bear in mind that an employee in the future will possibly have more than one employer and will see the benefits of the trend for *"prosumption"*.

If we wish to achieve our ambition of accelerating the transformations in our Flemish economy and industry, it is necessary to create sufficient public and private financing and investments. In particular, there is a need for funding for demo and pilot infrastructure to test new ideas. This is important for bridging the so-called *Valley of Death*, the very risky period for companies between the development stage of new ideas and the actual roll-out on the market of new products. We must better align the scientific and technological provision with market demand to increase the so-called innovation output. More talent and knowledge has to flow to Flemish companies from our universities and other knowledge-based organisations. Besides technological innovation, we must also pay attention to behavioural changes, to solve major social and societal problems. The link between technological and social innovation is necessary for achieving real system innovation*.

It is crucial for entrepreneurship in Flanders, including social entrepreneurship, to be boosted partly by policy but also through a change in mentality in society. New entrepreneurship can use new business models to respond maximally to local and global social issues, making more use of innovative models such as *crowdsourcing*. Professionals and experts by experience will create and share knowledge, information and ideas. In particular, companies in the services sector must invest more, or rather dare to invest more, in this type of new innovation.

Finally, the supporting framework for companies also poses a number of challenges. The current level of wage and energy costs is undermining the competitive position of Flemish companies. Flanders can also work even harder to create a more business-friendly climate, among others by further cutting the red tape for businesses and services and creating a more labour-friendly tax system, a clear, regulatory framework, legal certainty and fluent procedures. More measures are needed to limit the risks of entrepreneurship and create a safety net for when things go wrong.

New business models based on the *peer-to-peer* economy and the sharing economy

Business models originate in the transactions between stakeholders. In traditional business models, the transaction aims to create a profit, usually a financial one. So we can consider them to be revenue models. New business models in the sharing economy also create values other than money. This is known as shared and multiple value creation (Jan Jonkers, "Nieuwe businessmodellen", 2014). Besides the traditional stakeholders (businesses), other stakeholders also create value, e.g. consumers, who become producers or *"prosumers"* as a result. They usually do this in network-like structures and *communities*. People share, create, exchange and borrow knowledge, information, ideas, services, inspiration, care and production resources in these communities.

According to Michel Bauwens ("De Wereld Redden", 2013), we can further subdivide these business models, depending on the extent to which *profit* remains an important factor, alongside other social objectives. On Facebook, for example, the information is generated locally, by the community's members, but the control and profit are centrally organised. Only a few people stand to benefit from the profit that is made. This contrasts with other networks that are aimed at creating social values (for benefits). Bitcoin and AirBnB are also profit-driven to an important extent, but here the members and participants also stand to profit.

Some of the networks are active worldwide. They include networks like Linux, Wikipedia and Wikispeed, used to share knowledge from around the world. Some networks also have a local component. The high-performance Wikispeed car (in terms of environmental performance and lifespan) is being designed and improved in an *open source* system by over 1,000 experts around the world. But the vehicle itself is produced locally. Other initiatives operate and share at the local level and are mainly aimed at other social values (for benefit). Examples include local exchange and trading systems (LETS), community gardens or pick-your-own fields as well as car sharing. These local initiatives provide local resilience and an energetic society. Besides creating economic value, they also generate social (including togetherness) and environmental value (environmentally friendly, space-saving). People can increasingly rely on their own community for objects, services, mobility, food, care, gardens, housing, skills and much more. They no longer have to own everything themselves, even though the access to the above things remains the same. People also engage with each other more as a result. Sharing takes place in a person's own community but also increasingly through smart websites.

2.4.2 … for an inclusive society

Vision 2050

An innovative economy supports an inclusive society that invests in knowledge, social innovation, quality of life and social cohesion. In 2050, Flanders is a warm, resilient, innovative and investing society, founded on opportunities, creativity and more equality. We invest in the maximum development of everyone's talent to guarantee this, while never losing sight of the community-building force of all cultural aspects, including sport and media.

Flanders is an inclusive society. And everyone counts in this inclusive society, which is founded on respect for all, where everyone has the same rights and duties and where nobody will be confronted by mechanisms of deprivation*. As a result, we invest heavily in United Nations Sustainable Development Goal 5, "Achieve gender equality and empower all women and girls" and Sustainable Development Goal 10, "Reduce inequality within and among countries". Flanders has eliminated the structural causes of poverty and is free of discrimination. Diversity and cultural sensitivity go without saying and everyone can participate independently and fully in the various aspects of our society. The level of participation in our society and in the labour market of people of foreign origin is just as high as that of people with Flemish roots. That is why attention must be paid to the transfer of people of foreign origin to higher education and to a diversity policy with proportional labour participation as underlying aim. Physical and immaterial obstacles are eliminated for everyone so people can actively and autonomously participate in every aspect of social life. We focus on creating support for more diversity on the workfloor and tackling structural problems that prevent people from disadvantaged groups from carving out a good position for themselves in the labour market.

An efficient and effective social protection continues to play an important role in an inclusive society. Coherent social protection contributes to income security or income protection and an adapted and sufficient prevention, care and assistance provision.

People are more verbal and defend their own wishes and ideals as well as those of others. All the people in Flanders are responsible for their own lives and for one another. They control and help create the society they live in, from the bottom up, by participating in multiple associations, (digital) communities and crowdsourcing* platforms. That is how they contribute to the peer-to-peer economy or the sharing economy*. They assume various roles simultaneously in many networks, e.g. as consumers, producers, citizens, professionals, experts by experience or entrepreneurs. They exchange knowledge, information, ideas, services, inspiration, care and production resources. Together they create an energetic and open society that exudes unity and solidarity.

The people of Flanders have an open outlook on a changing world. They live in an internationally-connected society and are more global than ever. Their networks are international and multicultural.

Culture provides a connected society. It mobilises people, contributing to social capital and talent development. Culture promotes social awareness and imagination, but at the same time people also acquire knowledge and experience in various fields. Society therefore also offers guarantees for the social and cultural (basic) rights, and their deployment and activation for its members, while also striving for community building around common, shared values such as freedom, equality, solidarity, respect and citizenship.

There is margin for meaningfulness and a new dialogue about values that transcends cultural differences. An open and constructive dialogue is established between the various religions and people show respect for all beliefs and convictions and everyone's identity.

In 2050, different types of care relationships, cohabitations and associations are the cornerstone of society in Flanders. People live a healthy, active and sustainable lifestyle. This contributes to quality of life, which is an important key for every citizen.

There is equality, solidarity and respect between generations. The older generation stays dynamic, playing an active role in society well into old age. The younger generation is given every opportunity in our society. That is why we invest in developing their talents.

Opportunities

There are various assets in Flanders for achieving this vision. Belgium and Flanders have a long tradition of developing social protection, which defines our society of care and well-being. They can reinvent it based on changes and new challenges.

The position of the elderly is improved thanks to a higher level of education and longer careers, that do not endanger the quality of life of employees. Flanders has a growing population of elderly citizens, who can play a socially active role at the professional level, in associations and as volunteers. They can share their knowledge and life experience with the younger generation, so we can make optimum use of that knowledge and life experience in various aspects of society. In so doing, the older population contributes to a better society, as sustainable consumers, producers, coaches and citizens. But the knowledge exchange can also be reversed. The younger generation can inspire and support the elderly. Migration is an opportunity for exchanging knowledge and talent, and funding pensions and care for the growing population of elderly citizens.

Culture, the arts, heritage and the many associations in Flanders are already an asset today and will continue to play an important role in the future. They promote creativity and increase social capital, but also have an economic role, e.g. tourism.

The new, disruptive technology has a favourable influence on the Flemish people's comfort and freedom of choice. It also increases the ease of use among consumers. Examples include the automatic information throughput via the Internet of Things* and the innovative communication technology, giving everyone easy access to information and knowledge, and allowing them to make it available, share and create it. Another example is the availability of 3D printing, allowing everyone to be a producer.

Challenges

Compared with the rest of the world, the social cohesion in Flanders is still good. However 10 percent of the adult population has little to no contact with family or friends. Compared with the rest of Europe, people in Flanders suffer relatively highly from depression. While the trend for suicide is dropping, the figures still remain high. We must act pre-emptively to achieve a warm Flanders, that believes in solidarity, in which everyone participates and feels good. This will allow us to offer, if necessary, solutions to solitude, social pressure and other phenomena that lead to mental health problems. We must organise care and well-being in such a way that it corresponds with the needs and is high-quality and affordable for everyone. By 2030, on average men will live to 83.3 years, while women will live to 86.9 years. Ageing will increase in line with the increased life expectancy, to 24.4 percent in 2030 and 27.3% in 2050 (65 and over). The number of young people (0-14 years) will stagnate. This dual development means an ever smaller group will have to bear the burden (social security). The cost of ageing will have increased to 30% of GDP by 2030 if the policy remains unchanged (currently 26%). We must organise care, well-being and social protection in such a way that it meets the needs and is adequate, high-quality and affordable for everyone.

While the poverty risk is relatively low (15.4%), it is still higher than the Europe 2020 target (10.5%). Child poverty (0-17 years) figures are not high compared with the rest of Europe (12.1%) but the share of children in households with a very low level of employment continues to be a point for attention. Compared with the rest of Europe, the income gap in Flanders is small. Poverty has continued to exist in the past, even in times of economic prosperity. Eliminating poverty continues to be a priority in Flanders and we must continue to invest in this, with a view to achieving United Nations Sustainable Development Goal 1, namely "End poverty in all its forms everywhere".

Young people play an essential role in our society's future. Flanders must ensure that all young people get a good start in life and have the opportunity to develop their talent.

The changing family and work structures put the development of high-quality childcare under pressure.

The success of our society increasingly depends on the successful integration of newcomers. A rapid integration is important in a knowledge economy. Therefore, ensuring that people with an international background participate just as much in our society as people with a Flemish background is a major challenge. Speaking and understanding Dutch and participating in education and the labour market are key aspects in this development.

We must take into account the fact that disruptive change may pose a threat to our economy and society. We cannot afford to create a society with different speeds, e.g. because not everyone has access to the new technology or has the competences to use it, whether for personal and/or social reasons. Jobs may be lost because of robotics and digitisation can promote solitude and less privacy, e.g. because of big data*.

The general interest and more specifically the interest of individuals and groups who are socially vulnerable must be sufficiently defended and assured in a society of verbal and well-informed citizens, who defend their own interests, join forces and enforce their rights.

2.4.3 … within the environmental boundaries of the planet

Vision 2050

In 2050, our society will have evolved in such a way that the finiteness of resources and our planet's capacity are respected. Flanders makes efficient use of natural resources, with low CO2 emissions as a result. Flanders is a green, low-carbon society, with a low ecological footprint.

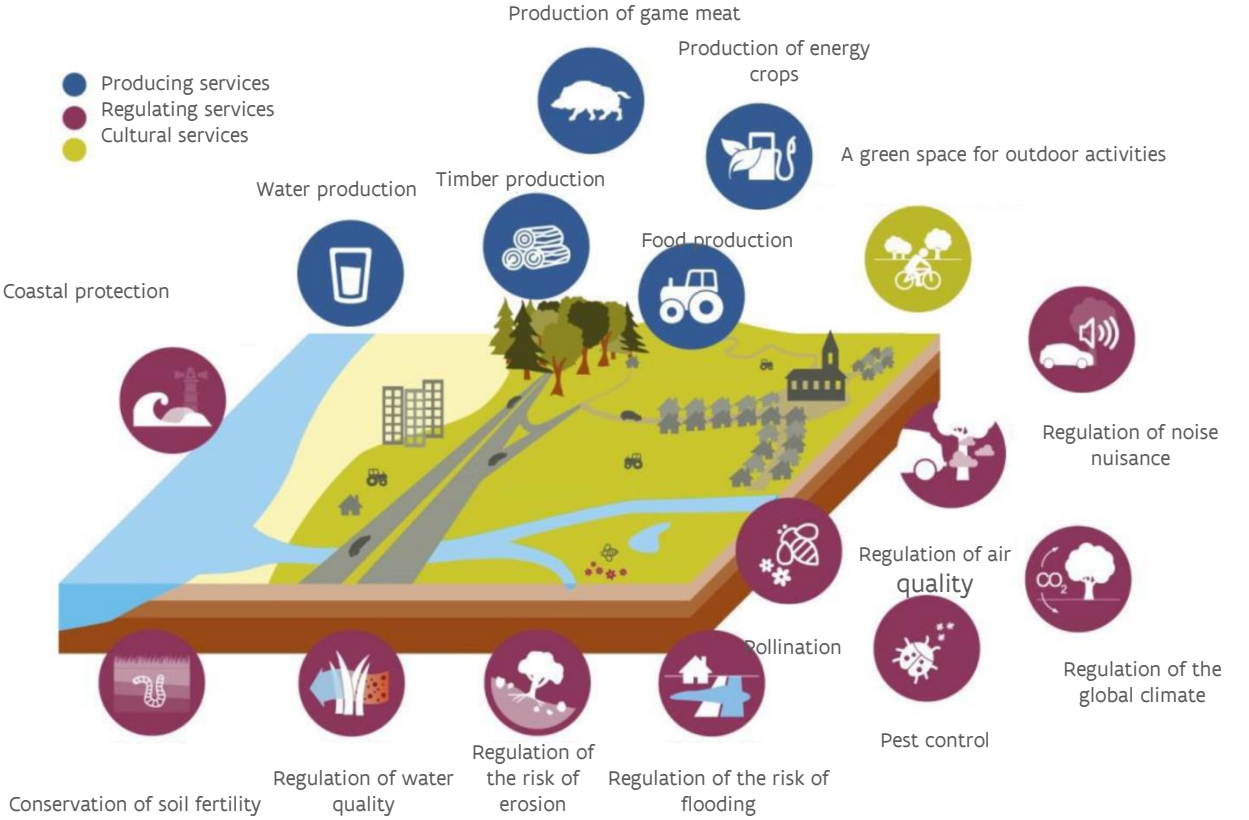
Flanders' economy has become a circular economy, which re-uses its natural resources as much as possible. It does this within (sometimes local) closed loops, using as little energy as possible for the purpose. Our society is a climate-friendly society, with a low-carbon energy system. The government, citizens and companies act to protect the environment.

> *"Around the world, climate change is an existential threat - but if we harness the opportunities inherent in addressing climate change, we can reap enormous economic benefits."* Ban Ki-Moon

Flanders stimulates the sustainable and thoughtful use of space, which has so many different functions. Open space is safeguarded, is robust in shape and the net space that is occupied does not increase in 2050. In 2050, we have a robust open space. The quality of the environment is outstanding. The space in Flanders has green-blue arteries: intersected by a network of natural and semi-natural elements and bodies of water.

Flanders' natural capital (biodiversity, land, air, water and soil) is restored and protected. Our society values land, soil and substrate just as much as the quality of air and water. Our rivers and streams meet the criteria of basic environmental quality everywhere. In urban and rural areas, water is respected as a structuring element, and the water system is given the space to fulfil its functions. Contaminated and physically affected land has been restored, remediated and upgraded. It has a function again, both at the environmental level and for its use as a space and for the economy. In 2050, the contamination of indoor and outdoor air is under control. It no longer has a negative impact on air quality. The critical loads for acid and nitrogen deposition are no longer exceeded. Air pollution by anthropogenic sources, such as industry, agriculture and transport, has been drastically reduced.

The strongly improved environmental quality has helped achieve nature values. Nitrogen deposition has dropped below the level of the critical loads, groundwater tables are adapted to the environmental functions of the nature network and the contamination of surface and groundwater is no longer an obstacle. Urban and rural areas pay attention to maintaining biodiversity. Biodiversity loss has been halted. In this way all Flemish people have a basic nature quality in their direct surroundings, which improves the nature and landscape experience. The high level of biodiversity, compounded by a robust green infrastructure, creates resilient ecosystems, which are resistant to major changes. As a result, Flanders is focusing fully on United Nations Sustainable Development Goal 15, namely "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss". Our natural ecosystems are resilient. They are also being valorised: They supply ecosystem services to our society (see image), which also makes sustainable use of them.



Ecosystem services: the relationship between nature and well-being
(Source: INBO report)

The environment in Flanders is green, tranquil and healthy. It does not negatively impact the inhabitants' health and promotes their well-being instead. The presence of visible and accessible green areas strongly contributes to the well-being of the Flemish people. The green areas are not only a calm place to recover from stress and mental fatigue but also directly contribute to better health. Flanders actively limits the environmental risks of human activities or natural processes to a minimum. This also applies to the environmental risks associated with certain products.

Opportunities

Scientific and technological innovations can help solve environmental problems. They include non-polluting cars, higher energy efficiency, nanotechnology and biotechnology for water purification and other applications. Flanders has plenty of environmental technology know-how, which can also be used worldwide.

Flanders also has a great deal of landscape elements that offer opportunities to improve the quality of life near or in the built environment.
If we succeed in restoring our ecosystems to a good state, they can provide a lot of services to our society, including renewable resources, leisure and tourism. They also help prevent costs (notably health-related costs), e.g. through cleaner air.

Challenges

All climate scenarios for Flanders indicate a rise in the environmental temperature, higher evaporation levels during winter and summer, and more precipitation during winter and extreme storms. Various sectors will have to come up with innovative solutions to deal with the consequences of climate change. All the sectors must drastically reduce CO2 emissions to make Flanders a low-carbon society and contribute to the European and global climate goals. This is also our way of implementing United Nations Sustainable Development Goal 13, "Take urgent action to combat climate change and its impacts". Moreover, the environment policy must be properly integrated with other policy areas.

Flanders must remediate the historic soil and water pollution and limit emissions to improve the quality of water, air and soil. In Flanders, people's life expectancy, on average, is reduced by one year because of exposure to environmental pollutants.

Europe wants to guarantee biodiversity by maintaining nature areas and the wild flora and fauna in the European territory of its Member States. Flanders is faced with biodiversity loss: only 15% of the animal and plant species of European relevance that occur in Flanders are doing well. More than half (58%) are doing very badly. The challenge for 2050 is to create enough space, where one million additional people in Flanders can live, work and relax while also safeguarding open space in Flanders.

After Malta, Flanders has the highest level of soil sealing in the European Union (12.9% compared with 1.8% in the EU). Rural areas, especially, are becoming more built-up. More than a quarter of all plots are built on. In large cities, this number even increases to more than half. Suburbanisation* and ribbon development have transformed the space in Flanders into an urban nebula. Suburbanisation leads to high costs of utilities, contributes to barrier formation and the fragmentation of public space, more commuting and also has consequences for our water balance (supply of aquifers, increased flood risk). It also increases the pressure on the economic, social and environmental functions of our open space.

2.5 THE ONGOING TRANSFORMATION OF FLEMISH SOCIETY

We have translated the ambition for Flanders into a vision for the future with nine themes. The themes largely overlap with the needs of our society and citizens' needs for a high-quality life, in line with the general vision for the future that was outlined above. The economic, socio-cultural and environmental dimensions, as described above, are the common theme.

The themes are:

- knowledge development as a driving force;
- smart use of materials;
- a low-carbon society;
- a robust water system;
- a sustainable food chain;
- a fluent and safe mobility system;
- living in attractive surroundings;
- accessible, high-quality care;
- an agile government.

2.5.1 Knowledge development as a driving force

Vision 2050

In 2050, talent and knowledge are more than ever the driving forces of progress and innovation. We take a holistic approach to knowledge and learning in Flanders. All Flemish people are given the chance to acquire knowledge and develop their talents throughout their life, and to learn, at the social and cultural level as well as develop new competences and attitudes. This is also our way of contributing to United Nations Sustainable Development Goal 4, "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all."

Flanders provides strong basic training programmes, in line with social needs, with attention to general training, skills and attitudes. The available training programmes are varied and the programmes offer personal learning pathways, that match the diversity in Flanders. The ambition is to ensure that every individual can build a personality and develop his or her talents. The approach also pays attention to resilience and learning to cope with loss, which in turn promotes more self-development and equal opportunities. Young people are trained to be self-confident, critical and creative citizens, who are prepared for a complex society that is founded on solidarity. Lifelong learning and lifelong self-development are crucial, allowing all the inhabitants of Flanders to participate in a society that is characterised by strong social cohesion, in which everyone assumes a place based on his or her own talent and competences.

We value teaching people flexibility and problem-solving skills, so they can respond to disruptive changes and challenges in society. People develop the right competences, based on formal and informal learning, to participate in the complex and changing Flemish society, which can be a source of stress at the economic, cultural and social levels. They learn to become resilient among other

things and use efficient coping methods, to deal with sources of stress and take control of their lives even more.

Teachers are well-supported coaches who have an insight into social trends, innovations in education and the results of scientific research. Teachers constantly update their knowledge and have the opportunity to further develop their professional skills. Teachers' workspaces also become a place to learn.

One aspect that supports this approach is the learning parks. These are places in the community and multifunctional buildings (which may be school buildings) where children, young people and adults meet virtually and physically, to learn with attention to a strong interaction, meeting and dialogue with all the social stakeholders.

Learning parks

Everyone can take part in education. That is why the school of the future is a learning park, where students, parents, teachers, companies and associations meet up virtually or physically and can learn. All the stakeholders can use the available facilities and each other's knowledge 24/7. After all, learning, whether formal or informal, can take place at any time of the day. That is why the learning park is the learning and living environment of the local community, in which leisure activities are combined with the curriculum.

Knowledge-based organisations, governments, companies, associations, digital and other networks and individual citizens all make a creative and innovative contribution to knowledge, education and research. Professionals and experts by experience can create and share knowledge, information and ideas through *crowdsourcing**. *Open science* is the standard in research and there is free movement of information. The knowledge centres and researchers in Flanders embrace this model and their fundamental research is the driving force behind exact, economic, and human scientific innovations, in Flanders and internationally.

Open Science

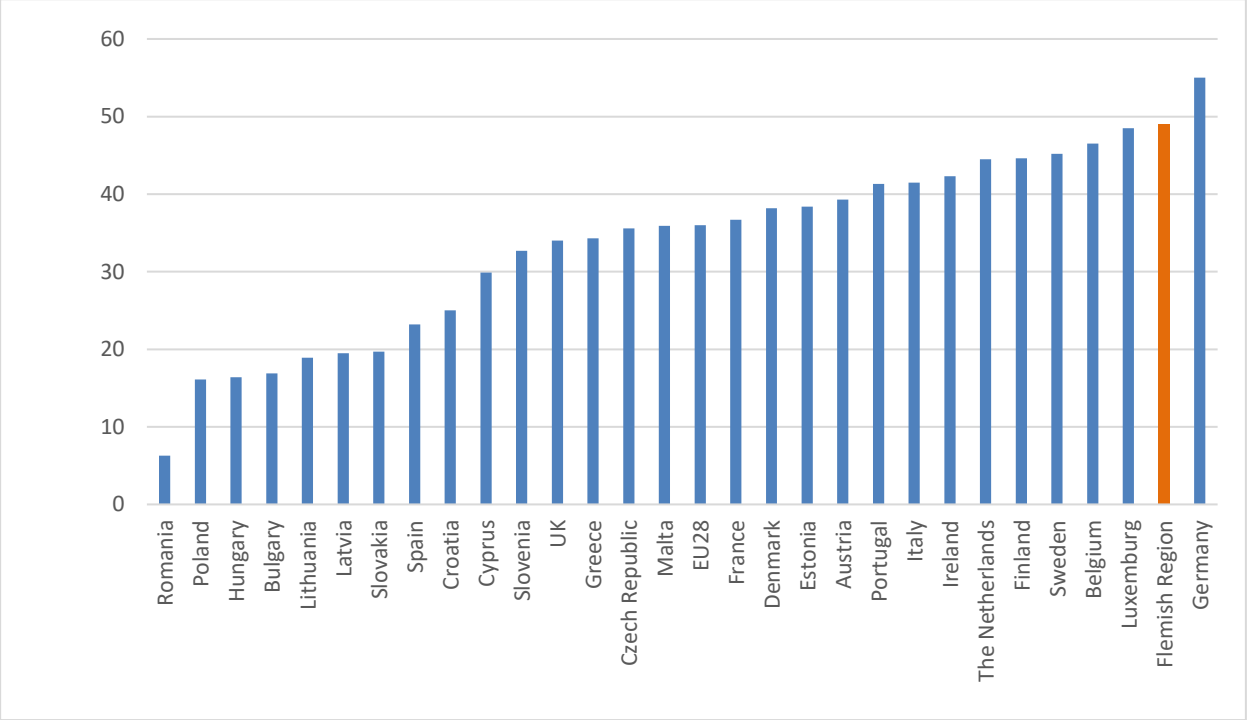
The *open science* movement makes available scientific research and information to various layers of society (amateur researchers or professionals). The digital evolution enables progress in terms of the organisation and implementation of scientific research. It is powered on the one hand by the internationalisation of the scientific community and the need to tackle the major social challenges of the time. This influences not only the entire research cycle, but also the way in which scientific innovation becomes part of the innovation chain. Open access and open data are also aspects of *open science*. *Open access* means publishing and making the results of scientific research available online to all, e.g. scientific articles as well as monographs and chapters thereof. Open data goes even further, including the sharing of research data. *Open science* is more than just *open access* and open data. It also concerns the way in which the research is conducted, and extends beyond the mere open publication of data.

Flanders is an internationally valued partner, thanks to its expertise in education, science and technology. The region also focuses on possible synergies to the maximum extent possible. Moreover, Flanders is a welcoming environment for international researchers and talent.

Opportunities

Flanders already has a number of assets to accelerate its transformation into an innovative knowledge society. We have a solid base, with high-quality education, committed teachers, renowned research institutions and talented researchers. They conduct fundamental and ground-breaking research. They operate outside Flanders and Europe and are reputed for their outstanding scientific specialisation in various disciplines, including in the exact sciences and the human sciences. The publication analyses by ECOOM demonstrate for example that Flanders has important scientific specialisations in *life sciences** among others, as well as in certain subdisciplines of mathematics and engineering, sports science, economics, linguistics, philosophy and certain aspects of information technology.

The quality of our education is an international asset. Flanders is ranked just below the top countries for literacy and has a high score for numeracy but scores less well when it comes to problem-solving skills. Our lead, in the international context, however, is becoming smaller. Flanders has a strongly-developed infrastructure in which new concepts can be tested (incubation infrastructure). It has a tradition of relatively high public and private investments in education, research, development and innovation. Flanders invests 2.5% of its GDP in R&D, which is significantly higher than the European average. The chart below demonstrates that Flemish companies excel in process and product innovation. The strategic research centres (iMinds, VIB[1], VITO[2], IMEC[3] and Flanders Make) are widely respected and occupy a unique position in the innovation landscape.



Share of companies developing new or improved products and services, the Flemish Region and EU28 countries, 2012, in %.
(Source: CIS-2013, ECOOM)

Digitisation will continue, creating many opportunities, such as *peer-to-peer learning*, *massive open online courses** (MOOC), *open source* and *crowdsourcing**. They contribute to the rapid spread of knowledge and to innovation and new forms of education and learning including remote learning.

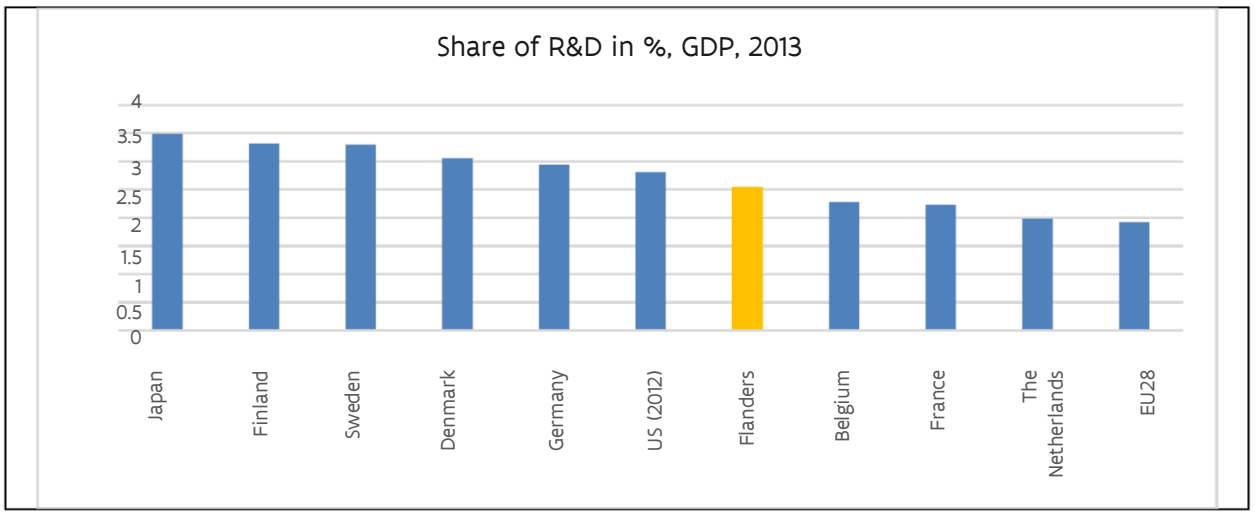
[1] Flanders Interuniversity Institute for Biotechnology
[2] Flemish Institute for Technological Research
[3] Interuniversity Micro-Electronics Centre (IMEC)

This will have an impact on how schools, universities, and knowledge-based organisations work. Flanders has already acquired a host of innovation experience on the workfloor.

The diversity in Flanders is an important asset and a source of learning and education. This is founded on respect for differences and similarities and promoting encounters between people with different identities, which in turn enriches the society in which we live.

Challenges

In 2050, Flanders wants to excel as an innovative knowledge society. Currently, Flanders already invests approximately 2.5% of its GDP in R&D (Europe 2020 target = 3%), putting it above the average of the 28 European Member States. But we need to make a further catch-up movement here.



(Source: EWI, ECOOM)

The available knowledge and expertise must also lead to innovative output. Bridging the so-called *valley of death* between the development phase of new ideas and the actual moment that a product or service is rolled out continues to be a point for attention. That is why we must eliminate any sticking points. To this end, we must link our scientific strengths to the economic strengths of international companies, knowledge-based organisations, social companies, personal services and governments, based on value chains and networks. In this way, (sustainable) technologies, new insights and applications can break through faster, with more commitment by small and medium sized enterprises, or companies from the non-profit sectors.

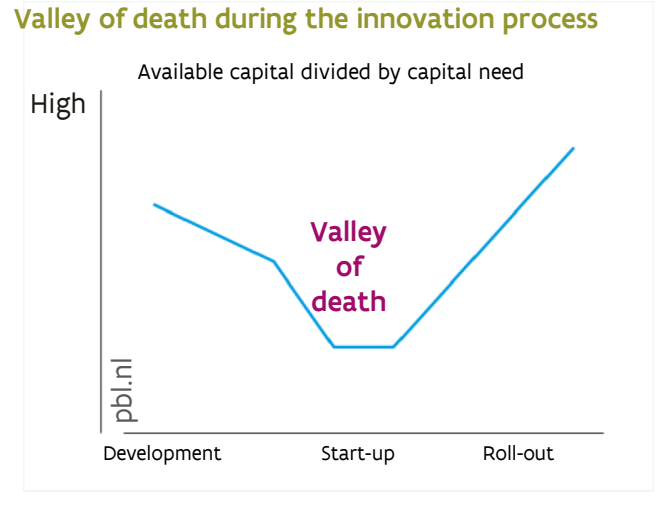
Valley of death

Roughly speaking, the innovation process has three phases. New ideas or concepts are examined and developed in the development phase. Then comes the start-up phase, in which an attempt is made to market the new invention for the first time. This is followed by the roll-out phase, in which the new product or new service is scaled and is (hopefully) a success in its market.

The risk of failure is high during the development phase. Usually, the need for capital is rather limited and public funding is available in most cases. A lot of capital is needed for the scaling during the roll-out phase, but the risks are low because the potential of the innovation has already been sufficiently proven. Companies like to invest in this phase, because you can expect a good *return on investment* from the upscaling.

But the problem lies in the intermediate phase, the start-up phase. During this period, the risks are still quite considerable, while a lot of capital is also needed. During this phase,demonstration and pilot infrastructure is necessary for testing the new invention. The government does not like to disrupt the market and usually withdraws when an innovation is too close to the market. Often that is why there is no public funding available any more during this period. At the same time, a lot of companies or socio-cultural enterprises do not dare to invest themselves during this period, because the risk is still too big that the innovation may never be successful on the market. That is why a lot of potentially good ideas die in this valley of death.

An additional explanation for the valley of death is that different competences are important during the three phases of the innovation process (development, start-up, roll-out). Scientists and inventors, who are examining or developing an idea or a concept are usually not that good at marketing their development and have difficulty assessing all the commercial potential of their invention beforehand. You need commercial and entrepreneurial skills for that. These competences are thus important during the start-up and roll-out phases. It is important that inventors, if they do not have the required entrepreneurial skills, step aside in time and pass on their knowledge to the entrepreneurs during this phase, to give their invention the right chance of success in the market.



(Source: Vooren, A. van der & A. Hanemaaijer (PBL) 2015)

The figure above by the Netherlands Environmental Assessment Agency neatly illustrates this. The horizontal axis shows the time frame of the innovation process, while the available capital is divided by the need for capital on the vertical axis. In the valley of death, the result of this division is (sometimes too) low, meaning there is (sometimes too) little capital available to get an idea to market.

Flanders scores well for the ownership and use of IT in companies. Citizens' ICT skills are developing rapidly but Flanders is not ranked among the top EU countries in this regard. A third of the population does not have the necessary skills to use the Internet to its full extent.

Knowledge development is founded on excellent education. That is why it is important that Flanders continues to focus on excellent educational performance and to strive for an absolute top position compared with other countries. We want to train young teachers, and make them more professional, by providing them with a better framework and working more closely with them. Teachers will then become coaches with the right skills for working in a rapidly changing society.

An education system that continues to improve itself offers an answer to disruptive changes and evolves in tune with the rapidly changing society and the new economy (Industry 4.0*, bioeconomy, circular economy, sharing economy*, etc.). For this reason, Flanders must focus on learning parks (see above), with sufficient and flexible capacity for all the pupils, on digitisation and on core competences that ensure that pupils are adaptive, resilient and stress-resistant, and have strong problem-solving skills. It is best if the foundation for this is already developed early on in pupils' school careers. Workplace learning must take a more central place in all forms of learning to bring companies or organisations and their needs closer to schools and offer a realistic, high-quality, labour market and society-oriented learning pathway.

It is necessary that knowledge-based organisations reorient themselves in this changing landscape, in which various social stakeholders conduct research and knowledge is massively shared. To prevent academic talent from moving abroad, the academic environment in Flanders must remain appealing to Flemish researchers.

Parents' jobs and origin still determine whether their children move on to higher education and the labour market. Lifelong learning is also not yet commonplace. We need a wide and sustainable training provision that also guarantees a match with the needs of our society and the labour market. This will allow young people and adults to always receive up-to-date training. Education must focus more on the knowledge and skills that make (young) people capable of coping with the changes in society and the economy. This allows them to make a contribution to sustainable solutions for problems in society. Education therefore must promote citizenship, creativity and entrepreneurship and continue to focus on STEM programmes *(Science, Technology, Engineering, Mathematics)*. The mentality in education, of citizens and companies must change to achieve a breakthrough for lifelong learning and further training.

The number of high-skilled workers in Flanders (45.3%) is currently very high and is on the increase but the pace of growth is lower than in our neighbouring countries and the rest of the EU. The number of low-skilled workers and early school leavers (7.5%) is declining. According to the OECD, in no other Member State is the outflow from the universities as low as it is in Flanders. In tomorrow's knowledge society, all young people must excel. To avoid wasting talent, we need an integrated, multidisciplinary and preventative approach.

The knowledge society involves much more than developing new technologies and knowledge in exact science. We also fully support innovative concepts in human science. After all, our society needs social innovation and social cohesion to be innovative. Moreover, Flanders wants to involve all the population groups in social innovation and lifelong learning, making access to education for everyone a self-evidence, among others by automatically granting people rights. The gap between pupils, in terms of their socio-economic status and migrant background (language spoken at home), must be closed. Nowhere is the gap between the strongest and the weakest pupils as large as in Flanders. Inclusive education can contribute to creating better perspectives for the future of all young people. It is also an important link for creating an inclusive labour market, as part of an inclusive society.

The transition to and from training programmes can also be better developed in Flanders. Too few Flemish people remain lifelong learners and the recent trend is downwards. This can lead to an erosion of skills and knowledge, which constitutes a major social risk. Currently Flanders, where only 6.8% of the population participates in lifelong learning (2014), is still a long way off from achieving the target of 15% - and not much progress is being made.

2.5.2 Smart use of materials

Vision 2050

In 2050, Flanders is doing very well in terms of the circular economy. We ensure prosperity and welfare with a significantly lower number of resources and materials than we do today and we ensure that everyone worldwide has access to affordable and sustainable resources.

In this economic system, raw materials, materials and products or product components are biodegradable or re-usable, as far as possible, while quality is maintained. The conversion of products that have come to their end of life into new raw materials ensures that the materials continue to be part of the circuit. An important example is the sustainable production of biomass, which we continue to use, along with the secondary flows, for food and animal feed, and for the production of (fine) chemicals, new materials and energy. This is a radical break from the linear model, in which raw materials are processed into products and destroyed after use.

We distinguish between biological materials that were designed to safely flow back into the biosphere and technical (non-biological) materials, where products and product components are designed and commercialised in such a way that they can be re-used at a high level of quality (see 2.4.1).

Products have higher performance. We use products more efficiently by extending their lifecycle via maintenance and repair. They produce the lowest possible amount of waste and emissions during the lifecycle (from production to end of life). We make the production and usage processes more efficient with *big data** and sensors and re-use products until they have reached the end of their technical life span. Smart product design with attention to re-use, repair and recycling is the standard.

The circular economy also owes its success to the watchful and active consumers and producers who are concerned about the transparency and integrity throughout the entire material chain, of the product they buy/produce.

In 2050, Flanders is ranked among the top of the world in terms of the development of sustainable and advanced materials and innovative technologies that contribute to the circular economy. Examples include materials that are lightweight, nano-reinforced or biobased and technologies such as *clean technology**, *industrial biotechnology**, *3D printing** and *high-tech recycling*. We are able to valorise Flemish technology and expertise internationally, and are known for exporting high-grade recycled raw materials.

Closing the material circuits reduces our dependence on materials imports, and therefore has a potential positive impact on the growth of the transport flows. This offers opportunities for the development of new activities in the major existing sectors in Flanders, such as *life sciences**, bio-based chemistry and plastics and the recovery and development of critical and valuable metals.

Materials often constitute an essential link for tackling social challenges. The circular economy helps Flemish industry to work in a less material and energy-intensive manner, which benefits our competitiveness. A lot of materials, for example, are crucial in the further development of medical equipment or renewable energy applications.

Where possible, we share products with different users. This is an innovative sharing and services economy, which is as local as possible, in which many products and materials are no longer sold, but are instead made available temporarily as a product or service. Citizens, companies and the government develop new business models, whereby customers pay for using products instead of owning them. The use of raw materials has also dropped because products and services are made available virtually, such as the digital provision of literature and music.

The circular economy creates economic growth and employment in Flanders, by offering opportunities for innovation in knowledge and research centres and companies. These innovations and specialisations are also integrated into education and in the STEM approach.

The circular economy allows our region to also strongly focus on three priority United Nations Sustainable Development Goals, i.e. SDG 8 "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all", SDG 9: "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation" and SDG 12: "Ensure sustainable consumption and production patterns".

Opportunities

Flanders is a densely populated and prosperous region that invests heavily in selective waste collection. This offers enormous opportunities for recovering raw materials from waste. We constantly develop experience in terms of industrial symbiosis and work to create the best possible conditions for exchanging industrial residual flows.
Flanders has excellent academic knowledge, high-quality material and biotech research and world-renowned companies that process complex waste, biomass and material flows into new raw materials.

Flanders is the frontrunner for waste management and has the potential for conversion into closed circuits. Seventy-one percent of all our household waste goes toward material recovery. Almost three quarters of our total primary company waste was given a new lease on life through re-use, recycling, composting or use as a secondary material or new material. This share is increasing. These waste flows are becoming increasingly important for fulfilling our need for raw materials. During the past few decades, the recycling sector in Flanders has experienced a stable growth of 5%. Taking account of the growth of the international market, this sector can continue to grow strongly in Flanders, on condition that we stimulate innovation in the sector. Research shows that an even more far-reaching conversion into a circular economy in Flanders can create 27,000 new jobs in Flanders (VITO, University of Leuven).

We can increasingly valorise knowledge and research, converting it into new economic activities. We can turn the circular economy into our hallmark and market our knowledge and technology around the world. There are various smart specialisations in the circular economy, for which we can use the strengths present in Flanders.

Thanks to remediation, the availability and re-use of land also increases. Half of all land to be remediated in Flanders has indeed already been remediated.

Strengths of Flanders in terms of smart specialisations in the circular economy

- A strong 3D printing* sector that focuses on product design with less consumption of materials and the local printing of spare parts.
- Innovative designers with a growing knowledge of ecodesign* and attention to the re-use, recovery and recycling of products.
- Targeted and innovative material development, such as the development of sustainable, lightweight materials.
- Unique and mature expertise in terms of the mechanical and chemical recycling of increasingly complex and smaller products.
- Economic initiatives for recovery and redevelopment. The emphasis is on the re-use of products by repairing or transforming them. This leads to new job profiles and initiatives such as *repair cafés*, where people repair things together.
- Enhanced landfill mining or mining valuable materials from landfills and the temporary storage of products containing valuable materials until recycling is economically viable.
- Blue economy: all the economic activities that depend on the sea. Flanders can focus on this, thanks to our marine expertise and our renowned dredging technology, which is increasingly being used at sea.
- Bioeconomy, with pilot infrastructure and biorefineries that not only produce food and animal feed but also convert biomass into chemicals and materials. There is plenty of potential for the use of secondary flows of biomass, the production of aromatics using biomass and the conversion of synthetic gases into fuel and other chemicals (syngas fermentation).

Knowledge and Innovation Community (KIC) – Raw Materials

Nowadays Europe is heavily dependent on raw materials. The European *Knowledge and Innovation Community* (KIC) - *Raw Materials* aims to turn this into a strategic force and optimally link academic research, entrepreneurship and education with each other. One of the six regional expertise centres of the new KIC *Raw Materials* will be established in Leuven. Flanders can further develop into a European breeding ground for new economic activities on condition of targeted investment. The KIC, among others, will specialise in recycling and *urban mining*, which involves the recovery of metals and minerals from industrial residues. It invests in lightweight and sustainable multi-dimensional material design, *sea floor mining* and the circular economy.

The central location, the world ports and the strong logistics sector are major assets for transforming Flanders into an important link in the circular economy. Here, material flows from around the world are combined for re-use, recovery and recycling. We can position ourselves even more as an import country for the processing of (complex) waste flows and as an export country for high-grade, recycled raw materials.

Finally, Flanders contributes to the local transition into a circular economy, and also helps other countries to achieve this sustainable production and consumption model with fewer resources and facilities.

Challenges

Global population growth and the growing middle class mean consumption is on the rise and the demand for materials is increasing. Certain stocks of crucial raw materials are becoming exhausted however and a number of raw materials are only available in geopolitically unstable countries. This scarcity does not necessarily lead to higher raw materials prices: the raw materials prices are volatile because of unexpected events, new technologies (e.g. shale gas and fracking), innovation, speculation and so on. The global scarcity of raw materials leads to protectionism and restrictions on raw materials exports, mainly in the emerging economic powers.

Flanders consumes a lot of raw materials (37 tonnes/inhabitant), well above the EU average (15 tonnes/inhabitant). Only 10% of this consumption is covered by the mining of our own raw materials. The majority of these raw materials are used for construction. We do not mine the majority of our industrial raw materials ourselves. Flanders has almost no raw materials stocks and is largely dependent on imports. In comparison with the neighbouring countries, Flemish industry is rather material-intensive. The material costs of an average SME in Flanders can amount to up to 40% of its total costs, which exceeds the cost of energy or personnel. Flemish companies are therefore extra-vulnerable when it comes to rising raw materials prices and supply insecurity.

Urban mining in Flanders offers huge opportunities for the recovery of materials through re-use or recycling, after which these materials can be marketed as new materials. However, the complexity of new products is increasing exponentially: products are becoming smaller and the number of materials used per product is increasing. Certain materials are very scarce and valuable, but are only used in small quantities. Recycling processes are also becoming increasingly complex as a result. Investments in high-tech recycling infrastructure also have long payback periods. In today's economic context, this is not an option for many companies. This may pose an obstacle to cost-efficient re-use, repair and recycling. Evolutions in robotics may contribute to making recycling processes more cost-efficient, generating purer fractions, by combining manual labour with automation. The automation of certain process steps offers unique possibilities for strengthening the competitive position of Flemish industry. Countless factors, however, make recycling processes difficult to automate, such as the fragility and diversity of shapes and materials.

Guaranteeing the sustainability of imported and locally produced biomass is a specific challenge in the transformation into a circular economy. Ideally Flanders, where possible, would use secondary flows of biomass as much as possible.

2.5.3 Efficient use of renewable energy

Vision 2050

In 2050, Flanders has transformed its energy system into a low-carbon, sustainable, reliable and affordable energy system. Energy consumption across all social sectors is significantly limited without having to compromise on welfare or well-being thanks to a smart chain approach and far-reaching efficient use of energy. By limiting energy consumption and making massive use of renewable energy sources, Flanders has helped reduce greenhouse gas emissions in Europe by 80% to 95% compared with 1990.

Energy consumption in the transport sector is limited by responding to the demand for motorised transport, by increasing energy efficiency and by using alternative, reusable and less environmentally damaging materials and drive systems such as electricity, hydrogen and liquid natural gas (LNG). This substantially reduces the ecological footprint of the transport system, allowing a fluent and safe transport system to guarantee optimum quality of life and an optimum environment (see fluent and safe mobility system).

The building stock becomes much more energy-efficient and is better used. The new buildings and neighbourhoods are energy-neutral or even energy-generating and the existing building stock is thoroughly and radically renovated. A collective approach such as neighbourhood renovation will ensure energy consumption in Flanders becomes more efficient in a shorter time. The existing housing stock is transformed. This is both to have more high-quality and sustainable buildings (in terms of energy and residential quality) and to respond to changing needs (as a result of ageing and the reduction in family size).

In 2050, people in Flanders are energy-conscious and they will adapt their behaviour accordingly in their living, housing and working environment. Companies, public and semi-public organisations also focus fully on the potential for making their energy profile more sustainable.

It is essential that Flanders becomes less dependent on energy imports (90% of the energy is imported). The global demand for energy continues to rise and is causing scarcity or strongly fluctuating (fossil) energy prices for countries and regions like Flanders that are dependent on imports. In 2050, Flanders will generate the energy it needs locally where possible, with those methods of generation being renewable wherever possible (wind and solar energy, biomass, geothermal energy, wave and tidal energy, etc.). As far as biomass is concerned, Flanders will strive to use biomass flows as much as possible, taking into account the cascade principle of materials policy (use or re-use for food, animal feed, materials, products and energy), while striving to assure security of supply and affordable energy. Large-scale biomass plants will no longer have a place in the energy mix as a result of sustainability criteria. We tap into the potential of cogeneration* as much as possible. By collectively tackling energy production and focusing on heat networks*, synergies between households, companies and sectors arise.

The energy system is smart, flexible, robust and reliable. We need more flexibility to cope with more non-continuous, renewable energy generation (e.g. based on wind and solar energy). Flexible production installations, smart networks and *demand side management* are needed to align energy demand and energy supply. We also need modern storage and conversion technologies such as the home battery system, the conversion of surplus electricity into heat (power to heat applications), power-to-gas* and the use of heat buffers. The energy system is optimally integrated with other systems and infrastructure (mobility, ICT, housing) and with the European energy networks. Consequently, the energy system can incorporate the various forms of decentralised energy generation in such a way that it is always in balance.

In 2050, Flemish households can use energy for heating, lighting and transportation at an affordable price. The industry also has competitive energy prices. Everyone has the option of living in a properly insulated home, operate energy-efficient appliances and use low energy transportation. We pay special attention to vulnerable families: in a warm society, the energy needed to live in human dignity is a basic right. All the external costs of products and services are incorporated in the prices in an international context. The Flemish economy has made the transition to a green economy.

Opportunities

There is a great need for new housing and the renovation of existing homes. This offers opportunities to develop forward-looking new neighbourhoods that are energy neutral or even generate energy thanks to the use of renewable energy sources. This also provides opportunities for tackling the energy aspect of renovations in a far-reaching manner. The renovation of the building stock can also boost local employment. The adapted houses and buildings also ensure a better quality of our living environment.

The outdated energy infrastructure, such as power stations and networks, must also be renewed. This offers opportunities for developing forward-looking infrastructure. Moreover, Flanders is also conveniently centrally located in the heart of the European energy network, and is a North Sea hub for the storage and distribution of electricity and liquid natural gas. There are plenty of opportunities to exchange (renewable) energy and residual heat streams and use them, and achieve efficiency gains through collective facilities (e.g. efficient neighbourhood heating) thanks to the high spatial density of industry, greenhouses and buildings.

New technologies are emerging for the storage of (renewable) energy, the coupling of the energy network to the Internet (internet of energy), the use of geothermal heat (geothermal energy is Flemish expertise) and the use of energy-efficient vehicles, machines and appliances. Flanders has a great deal of available expertise about certain niches in energy technology and related fields, such as the energy-efficient renovation of buildings, communication technology (smart grids and meters), applications based on the use of biomass and dredging activities (among other things for offshore wind farms). The Flemish knowledge and research institutions can supply the technology for the future, which can also generate positive local spin-off effects.
Besides top-down initiatives, there are also a lot of intensive local bottom-up energy initiatives, that have a special dynamic and that can help get people on board, to support the energy transition.

Bottom-up energy initiatives

Thanks to the Covenant of Mayors, which more than 6,000 cities and municipalities in Europe have signed, Sustainable Energy Action Plans (or SEAPs) are being implemented. The covenant has provided unseen leverage. The collective - voluntary - objectives of the signatories exceed those of the European Union. On average, they strive to reduce CO2 emissions by 25% by 2020.
Thanks to the active commitment of provinces, regions and other stakeholders that support cities in their efforts, the Covenant of Mayors commits all the stakeholders around a common goal. The consistent growth of the number of signatories and their convincing results to date have transformed the Covenant of Mayors into a key political instrument for achieving the EU's climate and energy objectives through a bottom-up approach.

Flanders is one of the frontrunners at the European level. Almost three quarters of the municipalities (218 in October 2015) already signed the covenant. They have the support of the provinces, intermunicipal companies, the Government of Flanders, knowledge-based organisations, etc. Action plans are drawn up and implemented in consultation with local citizens, businesses and organisations.

http://www.burgemeestersconvenant.eu/

Challenges

Flanders faces the challenge of making its energy system a low-carbon system, mainly through more efficient energy generation and energy consumption and the use of renewable energy sources. This requires changes in the energy supply (e.g. more green power, green heat, CHPs*, biofuels, etc.), the energy demand (reduction of the demand and alignment with what is available), the network infrastructure (e.g. increased interconnection capacity, smart grids), energy system management (creating more flexibility), the market models (e.g. changed product-service combinations), the regulatory environment, policy instruments (e.g. connecting better with what stakeholders are really interested in), governance (other energy policy, other administration, other management, participation, etc.).

Major investments are needed in the generation capacity of energy, in power grids, such as electricity networks, heating networks, pipelines and energy-efficient buildings. These must be financed and built on time. At the same time, companies must be able to work with competitive energy costs, whereas Flemish households must be able to use energy at an affordable price, as stated in UN Sustainable Development Goal 7: "Ensure access to affordable, reliable, sustainable and modern energy for all." Creating the space for renewable energy and energy infrastructure is necessary and a particular challenge in a densely populated and built-up region like Flanders.

It is essential for our society to become less dependent on cars that are powered by fossil fuels if we want to have a mobility without emissions. Linking passenger transport to a smart low-carbon energy system offers the perfect solution.

The energy transition requires a change in the energy behaviour of consumers, companies and governments. Alternative energy services and new service models must support the transition to more sustainable energy systems.

An integrated approach and policy can have positive side-effects, among other things on economic activities, employment, innovation, etc. As a result Flanders can capitalise on its innovation assets, strengthening them in specific niches (e.g. in terms of renewable energy, smart grids and energy-efficient buildings and businesses). An integrated approach can also prevent and tackle energy poverty.

We can ensure that interconnection and energy dependence do not compromise security of supply with a clear and internationally coordinated framework (agreements, regulations, market organisation, etc.).

We need to sustainably use the scarce biomass (residual) streams for renewable energy. Biobased production must also be scaled up. After food and animal feed, the sector of materials and chemical applications, which still relies on fossil fuels for non-energetic applications, must also move towards biobased production.

2.5.4 A robust water system

Vision 2050

In 2050, Flanders will have a robust water system that is capable of absorbing (climate) shocks. It protects the ecosystems, while also having many functions and offering services. The water system protects against flooding, offers water storage, drinking water, process and cooling water. It provides for irrigation and drainage. It offers opportunities for recreation and experience, in addition to connections for goods transport and soft mobility. Flanders will rely on a combination of smart technology, robust infrastructure and sufficient space for this. That is how we contribute to Sustainable Development Goal 6, "Ensure availability and sustainable management of water and sanitation for all".

Every water consumer will receive optimum access at a transparent and reasonable price. A combination of infiltration and storage, smart networks, rational water use, water re-use, cost charging and the user-pays principle ensures availability.

The cornerstone of the water system is good water quality. A system that is founded on good water quality is most suited for keeping risks and costs under control, in terms of water supply (drinking water, agriculture, industry, etc.) and flooding. Good water quality also generates added value at other levels. It offers more opportunities for recreation and tourism and is part of the environmental quality.

Flanders will therefore prevent pollution as much as possible, by closing circuits and using environment-friendly materials and production methods. Flanders has a developed remediation infrastructure and takes measures for a targeted and efficient management thereof.

Opportunities

Water is an international top priority, linked to other priorities, such as food, energy and health. Flanders can take advantage of this in two ways: on the one hand by controlling the risks and costs for its own population and businesses with a well-managed own water system, and on the other hand by capitalising on the international demand for knowledge and expertise.

Water purification offers opportunities for the re-use of water, the production of biomass and the recovery of raw materials and energy, thus greatly improving the cost-benefit ratio.

International valorisation of Flemish expertise

Various niches that were recently launched or scaled up in Flanders offer opportunities for the international valorisation of our expertise:

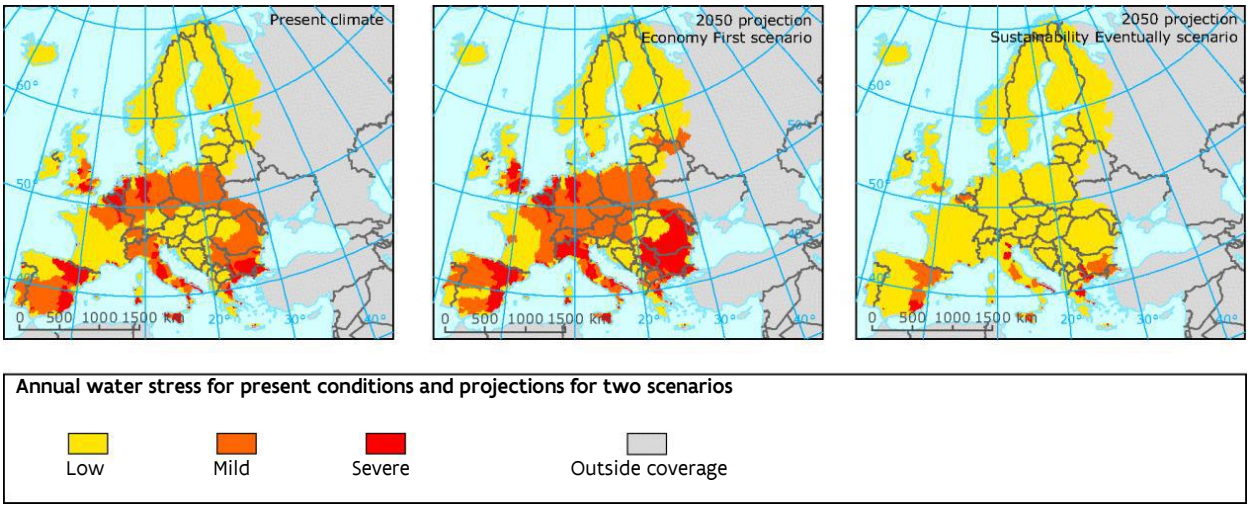
- (small-scale) water purification;
- smart (water) networks and their management;
- forecast models and warning systems;
- knowledge and techniques for water treatment, conditioning or re-use (including bio and nanotechnology, rainwater and grey water, recovery of raw materials and energy);
- (urban) development projects.

Researchers, entrepreneurs and the government work together in Flanders in the Flanders Knowledge Center Water. We are at the top of the international field for research and the development of environmental technology, working around the world. Water technology suppliers are also very well known internationally. The growing need for customisation, which simultaneously delivers multiple functions and fulfils multiple needs, offers perspectives for the development and valorisation, in part internationally, of such expertise.

Challenges

The demand for water is increasing around the world. The general demand for water will increase by 55% by
2050. Without intervention, 1.4 billion people will have no access to basic sanitation and safe drinking water. This will also have consequences (security of supply, cost) for the materials and products with a large "water footprint", that Flanders needs and imports to maintain the production and exports of the Flemish economy.

In Flanders too, there is a growing risk of water shortages, because we have less precipitation in summer and more water evaporates because of the rising temperatures. And Flanders already has very little available water per capita, compared with other countries. That is why we are partly dependent on other regions for our water supply. Currently there is no sense of urgency for water supply in Flanders, unlike for flooding. It is therefore important that Flanders continues to change its behaviour: avoid structural waste, save water in times of abundance and protect the groundwater supplies.



(Source: EEA, 2012)

We need sufficient space for water to safeguard our water supply. That space is also needed to control the increased risk of flooding because of the consequences of climate change. But the available space in Flanders is limited and densely occupied. We are increasingly forced to develop bespoke solutions. These will have to fulfil multiple demands and functions simultaneously.

Managing the water system and the water chain (rivers and waterways, drinking water, waste water) requires major investments and maintenance, even more so because of the fragmented spatial planning in Flanders.

Flanders must further develop its own integrated water policy, both vertically (local, supralocal, international) and horizontally (other policy areas and problems). For example, the competition for water is increasing with neighbouring countries and regions with which we share rivers (the Netherlands, France, Wallonia). As a result, the chances of conflicts in case of water shortages or flooding are also growing. At the internal level, Flanders shall have to set priorities for the use and distribution of the available water. This distribution reflects the balance between our society's economic, environmental and social needs.

2.5.5 A sustainable food chain

Vision 2050

In 2050, the food system ensures that everyone has sufficient, safe, balanced, healthy and affordable food. The food system comprises all food production (agriculture and horticulture and supply), processing (food industry), distribution (retail and wholesale) and consumption. It helps maintain natural resources such as water, land and biodiversity. The raw materials for the production, processing, trading and consumption of food are used optimally and consumption is limited. Food production and consumption are in balance with the limited environmental space that is available and respect animal welfare. As a result, we also anticipate on UN Sustainable Development Goal 2, namely "End hunger, achieve food security and improved nutrition and promote sustainable agriculture".

The Flemish food system distinguishes itself from that of other countries and regions by focusing on innovation and on high-quality and sustainably-produced food. The food system significantly strengthens regional economic development, spatial quality and the landscape.

The relations between the various links in the food system are clear to everyone and are characterised by a respectful cooperation. The participants in the food system work together, based on the conviction that they can strengthen their common interests together. The food system is organised in such a way that it can cope with developments and disruptive events from outside and inside the system.

The consumer plays an important role in the food system. They know how food contributes to good physical and mental health. They adapt their eating habits and consume according to a pattern that factors in the environment. This causes fewer illnesses that are related to our food patterns, thus reducing the cost of healthcare and welfare care.

Stable fishing will be possible because of the sustainable management of fish stocks. The fishing fleet has a minimum impact on the ecosystem because of the sustainable fishing methods they use. Sustainable aquaculture guarantees adequate fish supplies. As a result, we are also responding to UN Sustainable Development Goal 14, namely "Conserve and sustainably use the oceans, seas and marine resources for sustainable development."

Opportunities

Flanders has a strong and export-oriented agro-food industry. The food system offers healthy, high-quality, safe and sustainable food. It also invests in innovative technologies and processes, e.g. with breakthroughs in precision agriculture*, aquaculture, hydroponics and aeroponics. The food system also focuses on agro-environmental, more sustainable production processes in agriculture, with attention to an ecosystem approach and soil and water management. A better knowledge of *genomics** allows us to influence disease susceptibility and other characteristics of crops.

Agro-ecology

The modernisation of the food system resulted in sufficient food being produced at a low price, but it also brought a great many negative side-effects to the environment, for human beings and specifically for the farmer.

Agro-ecological innovation aims to make agricultural and food systems less dependent on external resources. This can be achieved by integrating and re-integrating natural and social processes into the food system. Possible synergies between plants, animals and micro-organisms can be better utilised in terms of natural processes. This can be achieved in the field and in the environment, by closing circuits, minimising nutrient and energy leaks, and so on. At the socio-economic level, this means striving for favourable interactions between stakeholders in the food system, e.g. with shorter chains, reducing the distance between producers and consumers, by exchanging knowledge and expanding activities. Agro-ecology clearly states that environmental and socio-economic problems are related and must be examined together. To achieve this, we need research and innovation, which is jointly defined by scientific and socio-economic stakeholders.

We make production processes in the food industry even more sustainable by using water, nutrients*, the soil and energy more efficiently. Smarter logistics and distribution systems also contribute to efficiency gains throughout the system. Research institutions, food system stakeholders and other parties will increasingly create knowledge together, to make the food system more sustainable. Increasing transparency throughout the chain by sharing information *(big data)* and with more cooperation will distribute value more sustainably and lead to consumers being better informed, allowing them to make more informed choices, also in the interest of their quality of life. We avoid food losses by better mapping the losses and secondary flows*, identifying opportunities and developing innovative applications.

Local food strategies and alternative farming systems, such as short chains, urban farming and allotment gardens, will ensure that consumers are more closely in touch with their food production. Besides this, we expect that objectively and interactively informing consumers about sustainable and healthy food and food patterns will also change their behaviour. We can also expect a lot from functional food: offering food that is tailored to individual needs, depending on the stage of life and health of the individual, offers new perspectives for consumers.

Other important Flemish assets are the strong, export-oriented Flemish agro-food sector and Flemish gastronomy and food culture, which pays a lot of attention to taste, craftsmanship, quality and authenticity.

Challenges

Starting from the system approach, Flanders must find integrated solutions, innovative value chains and system innovations* in the food system. All the stakeholders in the food chain, in Flanders and in the world, must be paid a correct price for their products, under decent labour conditions. The emphasis is on the relation between food, health and sustainability. That is why our consumption pattern must change. We can stimulate this by adapting food patterns and the food supply. To reduce famine around the world, we must guarantee food security and support sustainable farming systems.

Flanders must develop an assessment framework, with the social choices that influence the food system (space management, (bio)energy production, etc.) to valorise the efforts of the system and clarify everyone's responsibilities.

The system approach must also reduce the ecological footprint of our food production. To this end, we shall reduce the dependence on the use of raw materials, develop the production of alternative forms of proteins in Europe (plants, algae, etc.) and increase efficiency in the various links of the chain. The closing of circuits and a multifunctional use of space can also help reduce this footprint.

2.5.6 Developing a fluent and safe mobility system

Vision 2050

Robust and safe transport networks within Flanders and between Flanders and metropolitan cities inside and outside Europe confirm Flanders' position in 2050 as a gateway to Europe and a logistics hub. International hubs such as ports, airports and high-speed train stations, where domestic networks of various transport systems connect with these networks, are the cornerstone of this mobility system. Flanders has tackled its structural congestion.

Good, comfortable, accessible, (socially) safe and affordable mobility is the standard, including for people who are now struggling with reduced mobility. Smart and fluent logistics systems promote combined mobility* and synchronised modality*, allowing people to make smart choices and combine several modes of transportation. This does require far-reaching integration of the various traffic and transportation networks and of new transportation systems (made possible by a number of disruptive developments - see 1.1.1), as well as the integrated management of these systems.

A smart connection of all these modes of transport and real-time data streams supports the transportation of people and goods. This allows us to proactively respond to changing circumstances and choose the most appropriate mode of transport at any given time. To achieve this, the modes of transport must be connected with each other, with road infrastructure and with the Internet. The vehicles will share information with their environment and will become a source of information themselves.

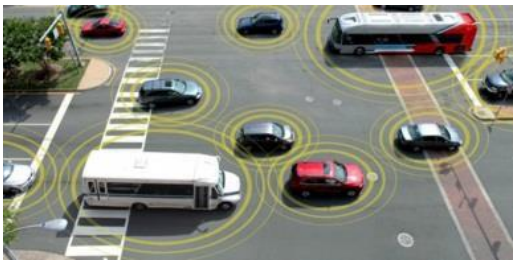
Vehicles will (gradually) take over drivers' tasks. As a result, they are accessible to anyone and help develop an inclusive society. Not only do these autonomous vehicles drive closer together, they are also safer and more energy-efficient. The risk of accidents or fatal or serious injuries is limited to the minimum, in combination with safe infrastructure. Vision Zero, i.e., zero road traffic casualties, is achieved in 2050.

Autonomous or self-driving vehicles

Self-driving vehicles must be the cars of the future. Their autonomous control system can take the car from point A to point B without human intervention. The cars process geographical information and information from sensors to define their surroundings. In this way, with sensors and software, these cars are capable of observing points for attention on the road, such as road markings, pedestrians, cyclists and other vehicles, and safely drive around them.

There are various advantages associated with the concept of self-driving vehicles. They have major inclusive and participatory added value for people who today are unable or not permitted to drive a car due to a disability. Self-driving vehicles can drive closer together and avoid congestion more easily thanks to new communication technology. They can also drive slower when the road is slippery and brake in good time. It is expected that the number of accidents will be reduced as a result. Moreover, their efficient driving is more environment-friendly (reducing emissions). Gradually drivers will have more time for other things because the car will take over most if not all the driver's tasks. In other words, we will also save time.

It is not just the traditional car manufacturers that will produce these self-driving vehicles. Various innovative governments, businesses and entrepreneurs such as Google, Tesla, or the Dutch 2getthere project are currently developing specific concepts and models of self-driving vehicles. The question is not if but when this technology will become a generalised trend. At the same time, autonomous vehicles pose plenty of challenges for the employment and re-training of professional drivers.



The mobility system, which is characterised by the excellent combination of the modes of transport, respects our planet's ecosystem limits, is a low-carbon system and has a minimum impact on the environment and health. A fluent and safe mobility system can therefore be associated with optimum quality of life and an optimum residential environment. Besides controlling the demand for transportation and the shift to more environment-friendly, energy-efficient and space-saving modes of transport, vehicles and vessels in 2050 are more environment-friendly, quieter and more energy-efficient thanks to alternative drive systems and renewable fuels that provide for environment-friendly, quiet and energy-efficient vehicles. In passenger transport, among other things we are looking at electric-powered and hydrogen-powered vehicles, in goods transport also at CNG and synthetic fuels for example. Rail transport is fully electrified and ships can tank LNG in all Flemish ports. Proximity and accessibility are the guiding spatial design principles in and around the urban centres.

Collective transport has been strongly expanded in the cities and in urbanised centres, the sharing systems of collective transport and new transport systems have been integrated and we also use bicycle routes and highways. (Basic) amenities are only a short walk or bicycle ride away and can be easily reached with collective transport. In and around the city centres, there is no longer any place for means of transport that are powered by fossil fuels. There is a network of slow roads in and around the city centres. The sustainable and economically profitable delivery of goods results in largely low-carbon distribution in urban areas as well as a reduction in traffic pressure. A balanced clustering of human, logistics and industrial activities around railway and waterway networks ensures that rail transport and inland waterways can fully play their role as a sustainable means of transport.

Opportunities

A number of disruptive developments, i.e., the Internet of Things, artificial intelligence (cf. autonomous vehicles) and 3D printing present major opportunities for mobility, to improve the mobility system.

Indeed, these technological developments (e.g. smart transport systems, ICT, etc.), *big data**, open data and the development of super-high-speed networks (4G and 5G) ensure that users can receive real-time information, which facilitates connected mobility, car sharing, the development of a multimodal transport system and the development of autonomous systems. The logistics sector will focus on far-reaching and real-time data links. Logistics chains become visible as a result, which enables mixed loading.

The use of autonomous and connected vehicles offers opportunities for a safe and sustainable transport system that is accessible to everyone. Energy consumption and the operational costs become lower and the need to own one's own car is reduced.

Developments in terms of electromobility, the improved energy and environmental performance of vehicles and infrastructural interventions have resulted in lower emissions, less noise pollution and a reduced dependence on fossil fuels.

Certain developments in society, such as the sharing economy* and autonomous vehicles, promote a shared, inclusive mobility and a varied use of vehicles. The spatial densification around public transport nodes and corridors, as well as cycling networks can help reduce car traffic, but also develop a more cohesive collective transport system and contribute to more quality gains in terms of living, working, commerce and recreation.

Electric bicycles increase the cyclable distance and promote the use of bicycles, instead of other modes of transport. This active form of mobility also has health benefits. The internalisation of external costs and the charging of usage costs depending on time and distance offers perspectives for making the transport system more robust and using it more efficiently. It also generates the required resources for a high-quality development and systematic maintenance of transport systems.

Challenges

The challenges for achieving a safer, more fluent and more environment-friendly transport system are considerable. Flemish economic centres are difficult to reach and the roads are saturated. Road safety is improving but we can still do better, compared with the rest of Europe. Traffic emissions are also reduced, but not enough to achieve the health standards. The transport system is still largely dependent on fossil fuels. Most scenario calculations (draft mobility plan for Flanders) point to a further growth of mobility, with goods mobility growing faster than passenger mobility (if policies remain unchanged). The modal share does not change anything substantial in this regard.

The dependence on trucks and cars must be reduced. This requires a major change in travel and transport needs, a customised and improved transport provision (mobility as a "service") and a changed mentality among users (mental shift). Controlling measures such as taxation and pricing can also contribute to bringing about this change in attitude.

The transport system must become more robust. To achieve this, we must invest in a system that has more spare capacity, that is less susceptible to disruption and strives for more resilience and flexibility. Demand-management measures (cf. price measures) and better interconnection of the networks are also required to increase the road network's robustness. A major point for attention is the attention to a modern policy process with shorter throughput times, to make these investments without losing social support.

We need modes of transport that generate fewer emissions, increased transport efficiency and the option to be able to choose modes and routes that are situation-dependent, to make smarter use of the transport system. Greener transport methods and logistics systems must contribute to a better environment as well as the time-efficient and cost-efficient organisation of mobility and the use of a transition to the development of integrated mobility and transport services.

We also must manage mobility development and ensure much greener transport fleets to achieve the European climate ambitions and evolve towards a low-carbon society. At the European level, the emissions standards will have to become stricter to achieve more far-reaching greening of the transport fleets. The emergence of the circular economy and e-commerce also brings a number of challenges with it, in terms of achieving more sustainable flows. Several experiments are ongoing.

It is a major challenge to ensure the entire system's good cohesion and the strengthening of the spatial networks: the infrastructure and logistics networks, the green-blue networks and the urban networks. We also need a good location policy (see living in attractive surroundings) to align mobility with space well.

To meet new developments, such as the use of autonomous vehicles or drones, it is essential that any legislation pertaining to mobility and traffic does not become an obstacle to innovation and is adapted on time. Technological developments such as autonomous vehicles can help us achieve our ambitions for a mobility without road traffic casualties. On the other hand, they also give rise to questions about cyber security and the protection of privacy. The development of autonomous vehicles can also have a possible negative impact on the automotive industry and on employment in a number of sectors.

Traffic mortality is decreasing but is still relatively high compared with the rest of Europe. This continues to be a point for attention. Smart vehicles can help achieve our ambitions, as well as good traffic education and safe drivers.

2.5.7 Living in attractive surroundings

Vision 2050

In 2050, Flanders has strong small and large urban and rural centres. They efficiently combine functions such as housing, employment and other basic amenities near the main public transport axes *(transit oriented development)* and also respect the environment.

Our cities and centres fulfil UN Sustainable Development Goal 11, namely "Make cities and human settlements inclusive, safe, resilient and sustainable". They derive quality from a strong spatial

structure of green areas and water, are resilient, sustainable, inclusive and resistant to the effects of climate change. To this end, our spatial networks need to be strengthened and have better cohesion (see safe and fluent mobility system).

Flemish cities are sustainable smart cities that use digital technology to connect needs and functions and assure high-quality public services.

Smart cities

Sustainable smart cities use data and digitisation to connect various needs and functions according to their service provision. Applications include public administrations, transport and traffic, water and waste, energy, health and well-being, and the promotion of social cohesion. The digital approach offers opportunities for providing real-time information to users (connected mobility, car sharing, tourist information, information for residents and information about energy consumption), the management of traffic flows, communication with and among citizens (sharing economy* and the development of a multimodal transport system).

In this way, smart cities succeed in increasing the quality and performance of their services, to reduce the costs and use of natural resources and involve their inhabitants more, increasing their engagement. The perspectives for job creation and the market for smart urban systems are assessed as being very high.

Flanders' spatial yield is high. We do this by avoiding long-term vacancy of buildings, living more compactly, by building vertically and by making smarter joint use of our open space. We always re-use existing buildings, constructions and infrastructures for building and development projects and we focus on adaptable building and reversible use of space. The new building and development projects in Flanders take into account all aspects of sustainability* across the entire lifecycle. The existing buildings are expanded as little as possible, focusing instead on infill to safeguard public space in Flanders.

Flexible and demountable building

Flexible building and living epitomises creativity and has several applications. One possibility consists of the interweaving of functions, with functions shared or combined in a temporary manner. Some examples: after school hours, schools make available their sports infrastructure and large spaces to sport clubs or as a community centre for local residents, stations are designed in such a way that they can also be used as offices or housing, car parks are used as party rooms on the weekends, etc. Flexibility is also possible with the re-use of existing buildings, the use value of which has greatly diminished. Examples: empty churches and old stations are transformed into restaurants.

Other options include forms of adaptable building. This means buildings' functions must become increasingly neutral. A building must be easily adapted to various functions, e.g. by using walls that can be repositioned flexibly. For example, offices can be refactored as flats thanks to a smart design. Another example of adaptable building is the extensibility of residential units, depending on the needs of the inhabitants. The flexible use of sleeping accommodation, for example, by

adjacent homes, is an example of this. Reversible use of space means that the space can be returned to its original state after its function has ended. This can be achieved, for example, with demountable steel construction and/or timber frames, while always maintaining the required housing quality. Modular building means the building often consists of modular entities, that can be easily expanded or removed, for re-use elsewhere.

Flexible and demountable living and construction requires a great deal of creativity, cooperation and adapted legislation.

While building, we close the water, energy and material circuits. Buildings and neighbourhoods are sustainable, water and energy-neutral and heat-resistant. Some even generate energy and are therefore energy-positive.

Everyone, including those who have difficulties in our society, because of personal or social reasons, is entitled to an adapted home or form of housing. There are various forms of housing available in Flanders, which are affordable and physically accessible. Consequently everyone can live in sustainable housing, that is also adapted to one's life phase.

We live in lively communities and cities, with good social cohesion. They are breeding grounds for social innovation, new business models and sharing systems.

Opportunities

The comfort of Flemish people is increased with the spatial transformation of cities around collective transport hubs, with most amenities within walking distance. The spatial transformation offers interesting opportunities for urban development in Flanders.

We must already now respond to the consequences of major social and economic innovations by creating innovative workspaces for the factories of the future and the sharing economy (hubs) and offering space for self-driving vehicles and home factories.

Flanders has already started its transformation into smart cities. Smart cities offer plenty of opportunities, including less traffic congestion and pollution. They also create more efficiency, greater ease of use, the creation of new jobs and a better quality of life.

Various niches in the construction industry may possibly constitute smart specialisations for Flanders (KET (Key Enabling Technologies) roadmaps)*, e.g. smart cities, smart grids, inclusive living and recycling). Knowledge-based organisations are conducting research into smart and sustainable energy solutions (smart grids, microgrids, heat networks, geothermal heating, etc.). They are thus paving the way for new industrial applications.

In the past few years, the construction industry in Flanders has invested heavily in innovative construction techniques and new, sustainable materials and concepts. The quest for flexible and space-saving buildings leads to new economic activities. The prefabrication of housing modules, modular building, multipurpose use, the development of sustainable neighbourhoods and new models of cohabitation are examples of this.

The population growth in cities creates opportunities. The costs for collective transport and other public services are declining, the retail industry is revitalised, there are environmental benefits and all this creates an ideal breeding ground for creativity. The quality of life and time savings thanks to urban living near work places or teleworking stations will become important factors for people when they choose where to live. The elimination of the disadvantages of city living, i.e., traffic congestion and the lack of green space, can strengthen this still further.

The housing quality is high in Flanders and people in Flanders are prepared to invest in their homes.

"Our struggle for global sustainability will be won or lost in cities." Ban Ki-moon

Challenges

Flanders faces the large challenge of providing affordable, high-quality housing to about 500,000 extra households by 2050. Because families are becoming smaller, the number of private households is growing faster than the population growth. In 2030, we expect 3 million households, and in 2050 3.2 million (currently: 2.7 million). At the same time, people need the space to work and they require basic amenities and leisure facilities. If we want to safeguard the space for food production and want to maintain the environmental quality, we must do this without burdening the available open space. Besides availability, another major challenge is accessibility and affordability. This will also remain a challenge in 2050 specifically for the target audience with socio-economic deprivation or other problems. Concerns include the problem of living in poverty or being homeless in 2050, or the sufficient availability of affordable high-quality owned or rented housing.

Flanders must adapt its housing stock to higher requirements in terms of health, well-being, the environment and energy. Where possible, we must take the heritage quality of these buildings into account and the identity and quality of the living environment.

Since its inception, spatial planning in Flanders has aimed at separating functions, with a strong spatial distribution as a result. We must adapt our building culture to the new insights, with mixed, temporary or multiple functions in one place, making optimum use of space (smart densification). These new concepts must penetrate even deeper into the planning tools, in development practice and in the professional construction industry. A spatial organisation that is based on proximity and which is founded on collective systems also has implications for the further development of the mobility system (see 2.5.6 Developing a fluent and safe mobility system) and requires a good location policy.

Ensuring lively cities and municipalities is essential. Today the retailers in city and village centres are under pressure, resulting in vacancy. This is caused by the growing number of strip shops and large-scale shopping centres, which, moreover are difficult to reach from a mobility perspective.

Even if we stop fragmented building and ribbon development today, this will continue to be a problem for several generations because of the long lifecycle of buildings. We face the challenge of keeping the higher cost of fragmented building and ribbon development under control, especially in terms of road maintenance, utilities and services and to prevent it from growing even more. Ribbon development is also a problem in environmental terms (impact on the landscape and energy consumption).

Another challenge is finding sustainable alternatives for the income that municipalities currently derive from new subdivisions and business parks.

New housing ideas are required to achieve better housing density. This can be achieved by demonstrating the social and individual advantages of such a new trend.

We facilitate new forms of housing and cohabitation and new financing methods such as CLT *(community land trust)*. As a result, we make good quality housing affordable.

2.5.8 Accessible, high-quality care

Vision 2050

In 2050, Flemish health, welfare and family care is high-quality and accessible to all, with sustainable funding. There is a socially acceptable balance between solidarity, with equal basic care, and affordability based on collective and own means. The emphasis is on everyone's general welfare and the quality of life, at both physical and mental level. That is why healthcare and welfare care are inextricably linked. In 2050, Flanders is known around the world for its high-quality, innovative and integrated welfare care and healthcare, according to the principle of *health in all policies*.

Health in all policies

The government objectives are best achieved when all policy areas include healthcare and welfare as key components in their policy development. The causes of health and welfare problems are shaped socially and economically, to a great extent. That is why a new way of governing is necessary, with all sectors checking how policy decisions can have an impact on the population's health and welfare in general, and on the individual more specifically.

Flanders is a caring society, that primarily focuses on social cohesion, prevention and health and welfare promotion.

Everyone in our society is connected with each other more than ever, but also with care providers thanks to technological advances. We take advantage of the technological opportunities for creating new forms of networks so vulnerable groups also have the opportunity to combat isolation. People with care needs, care providers, informal caregivers, family and friends form a network together. Self-management in this network is an important innovation in how care is organised. People in need of care help co-direct the package of stepped care and support they need. They monitor, make the decisions along with the team and can be held accountable for their choices and behaviour. They are taught behavioural skills, allowing them to assure their own care at home. When clients/patients manage their care, this implies a demand-driven care model with integrated customised care. An adapted approach will be developed for people who need care who have a harder time self-managing their care. We will develop an integrated, chronic care and support model, in which cooperation between various sectors and organisations and between professionals and the individual who needs care is a self-evidence.

Flanders ensures the emancipation of and support to people who need care and their network. It activates, supports and increases the informal care and support potential that is present in society.

To this end, our society needs sufficiently dedicated and independent professionals, who have received multidisciplinary training. They are technologically multilingual and constantly refresh their knowledge and skills. This results in professionals who have specialist expertise, but who can above all combine this with a more generalist approach. This combination will be essential for successfully responding to the increasingly complex requests for care and support, which are unique for everyone. It is important that our care professionals receive sufficient appreciation and are dealt with in a high-quality way.

In 2050, we make general use in Flanders of the electronic patient (client) file, which facilitates efficient and justified data sharing and which thus forms the cornerstone of lifelong, integrated care. An internationally accepted framework for privacy and access rights helps make this possible. Individuals requiring care can receive tailored treatment thanks to a combination of data analysis and artificial intelligence. The importance of personalised prevention, which takes into account the specific environmental context and the personal genetic predisposition, is also growing.

Technological progress also gives rise to ethical issues, raising the question of whether everything that is possible is also desirable. That is why Flanders is actively contributing to the drawing up of a *Universal Code of Conduct*. This code of conduct creates a framework for bio-ethical challenges, resulting from new technologies and processes in an appropriate manner in a globalised world.

In 2050, Flanders will continue to make available its high-quality expertise in the care sector around the world, to improve healthcare and welfare care, also in the least developed countries. That is why we will contribute to achieving UN Sustainable Development Goal 3, inside and outside Flanders, namely: "Ensure healthy lives and promote well-being for all at all ages."

Opportunities

In the future, we expect to see a variety of scientific breakthroughs, e.g. in how the brain works, the structure of the genome and the fight against AIDS, Alzheimer's and cancer, tropical diseases and antibiotic resistance. This offers opportunities for making treatments more effective. But stimulating active forms of mobility and making the transport system safer (see safe and fluent mobility system and living in attractive surroundings) also comes with a number of health benefits.

Besides this, we expect an explosion of new technologies, which will be very useful in the care sector, which will lead to disruptive changes and new opportunities. Lab-on-chip technology allows doctors to formulate diagnoses outside labs and hospitals for several diseases, avoiding movements. The existing care infrastructure can be used flexibly. Combined with AI and medical consultation (remotely or otherwise), this will lead to effective drug administration and treatment. Nanorobotics* and nanoassembly mean we can produce on an extremely small scale, with several opportunities for application in the brain and for neurodegenerative disorders. The pharmaceutical industry will also be able to shorten the lead time of clinical trials through the smart use of *big data**, with targeted control checks through social media.

Flanders is today already a frontrunner for the use of the electronic patient (client) file, that allows for the efficient and justified use of data sharing while also facilitating the central role of the patient/client in health and care management. Thanks to the breakthrough of personalised prevention, we will be able to better prevent diseases and disorders and offer tailored care. This applies to physical and mental health disorders. Like in other areas of society, Flanders can prevent under-protection among people who need care by simplifying administrative procedures and making them more accessible and through the introduction of automatic entitlement to care.

Flanders already has a strong tradition in informal care and voluntary work. This contributes to creating an inclusive policy for disadvantaged groups and the development of strong networks in which individuals can receive support. This helps combat loneliness in our society and guarantee a better quality of life.

The cross-pollination between knowledge centres, entrepreneurs and care stakeholders means Flanders can take maximum advantage of and implement innovation in the care and welfare sector. This innovation leads to more quality and ensures that we can live autonomously longer, while guaranteeing maximum quality of life.

The excellent international reputation of Flemish research and training centres, local companies, welfare and healthcare stakeholders and independent care providers has a favourable effect on international cooperation. This supports the valorisation of innovation, research results, health practices and institutions from Flanders in networks at the Flemish, European and international level.

We can permanently make available our experience in healthcare and welfare in Flanders to the population in other countries. In this way we help to solve global health problems.

Challenges

The combination of chronic care, ageing and the explosion of new technologies requires sustainable financing of the healthcare and welfare system with clear agreements about basic funding and solidarity.

Another challenge for Flanders consists of the investment in a new care model, centred around the patient/client with a care provision that is in tune with the needs of our society. Flanders must support patients and their network and ensure that everyone has access to care. Stepped and shared integrated care is the starting point for this. Self-care, informal care and family care take priority. If necessary, more specialised care and support will follow from this, but no longer than necessary for the recovery of the person who needs care.

Special attention must be paid to the healthcare and welfare of our older population. The Flemish care system must evolve from institution-oriented financing towards individualised financing, to offer care that is tailored to the individual at their request. The participatory development of care and health, both in practice and at the policy level, is crucial in this regard.

The new care model also requires a bespoke training provision for care professionals, in which the acquisition of technological multilingualism, during basic training and further training, is essential. Only then will we be able to ensure that the explosion of new technologies in other fields will maximally benefit the care sector. Besides this, we must also focus on skills and strong training for other, not so highly specialised professions. Care providers and doctors must continue to play their role for assuring a high-quality, humane and personalised approach. The relationship between the

individual who needs care and the professional must be founded on equality so they can together achieve good care, whether in a negotiated, participatory and supporting manner. The individual who needs care keeps control and makes the ultimate decisions about his or her care. Professionals have been trained and their awareness has been raised for dealing with the autonomy of the individual who needs care, and for providing personal support to him/her in this regard. Special attention must be paid to individuals who do not want to be or who cannot be an active participant in their own care process, for certain reasons.

Another crucial element consists of choosing a holistic approach and maintaining a healthy balance between generalist and specialist welfare care and healthcare.
This care model sets high expectations for the knowledge and skills of care professionals. These must be workable, with a healthy balance between their capacity and burden. An efficient organisation of care must play a facilitating role in this.
It is essential that everyone has access to the Internet and also knows how to use it, to be able to roll out the electronic patient (client) file properly. It is estimated that 30% of the population in Flanders currently does not have that. This digital divide requires a suitable solution. The introduction of automatic rights entitlement is another challenge for Flanders.

The disruptive developments in the care sector require system innovation and the development of new business models. Flanders must therefore stimulate entrepreneurship and open innovation in the care sector, e.g. by networks between care users, businesses, care providers and knowledge-based organisations.

We need an innovative approach to research processes, innovation processes and training programmes, which is founded on interdisciplinary cooperation.

Finally, the growing diversity of our society is reflected in the healthcare, the welfare and family policy, both for people who need care and for personnel. Dealing with this diversity - in a culturally sensitive manner - is a challenge. A respectful and sustainable dialogue between cultures and religions is therefore essential in the care sector too.

2.5.9 An agile government

Vision 2050

Social value creation is a "shared value" in 2050, a joint and shared responsibility of everybody. The government, the business community, knowledge-based organisations, the financial sector, civil society and citizens together create economic, environmental and social added value and take care of political decision-making together. They provide answers to major social challenges in co-creation and in a continuous dialogue. They develop a visionary long-term policy, achieving it with actions in the field.

In 2050, the system approach is fully integrated into policy and the Government of Flanders is flexibly responding to megatrends and ongoing transitions. It operates across the boundaries of policy areas, governments and sectors, taking into account local bottom-up initiatives as well as European and international programmes and networks.

> *"A growing number of people at ever more levels of society are realising that society has reached a tipping point and are actively contributing to this. Society has tipped from a centrally managed, top-down controlled society to a decentralised, bottom-up society."* Jan Rotmans, 2014

The government creates a climate for system innovation*, in which active cooperation with partners has a central role. Scientifically underpinned sustainability parameters and a well-thought-out accompanying policy provide support. Examples of accompanying policy are education and training policy, labour market policy, entrepreneurship policy, optimum regulations with margin for experimentation and zones that are not so burdensome with regard to rules.

Small-scale "delivery units" test new policy initiatives in practice, in living labs that are less burdensome with regard to rules, which can then lead to larger-scale realisations and projects.

Delivery Unit

McKinsey describes a delivery unit as follows: "A delivery unit is a small group of dedicated individuals focused exclusively on achieving impact and improving outcomes. The delivery unit constantly challenges performance and asks difficult questions, taking any excuses off the table. While a delivery unit should acknowledge competing priorities and unexpected situations it should also consistently push for faster progress, knowing full well that the tendency of any system is towards inertia."

According to McKinsey, the properties of such a delivery unit are respected leadership, top talent, limited size, nonhierarchical relation with the line-management hierarchy, specific & time-bound targets.

The government stimulates sustainable and innovative solutions. It plays an exemplary role in its own operation, while also using the right criteria when implementing policy, for tenders, financing or investments. It stimulates sustainability and innovation, also with regulations, and thus supports UN Sustainable Development Goal 16, namely "Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels".

The government is efficient and effective, focuses on core tasks, sets clear priorities and creates stability in the long-term vision, policy and regulations. At the same time, the government is a learning and agile organisation. It constantly reinvents its content and processes, flexibly adapting rules and services to the needs of society. It invests in a transparent policy process, at the lowest possible level (subsidiarity), with maximum involvement of stakeholders. The local authorities play an important role in this. The political system is transparent and founded on dialogue and cooperation.

The Government of Flanders has the required tools and levers to achieve its ambitions and fulfil expectations.

Opportunities

Adequately and flexibly responding to challenges and achieving system innovation* require a creative, problem-solving approach. The government can play a connecting role in the complex social fabric, stimulating innovation and transition in dialogue and co-creation with all stakeholders.

In terms of transition thinking and working, Flanders has already developed experience and is known internationally for its innovative (transition) approach in certain systems. Transition processes, such as the Flanders' Materials Programme and Plan C, Sustainable Living and Building (DuWoBo), the Flemish bioeconomy strategy and Flanders' Care encourage partners to regularly meet. They stimulate them to explore experimental paths, share new insights and develop and monitor innovative experiments and learning pathways.

The experience with transition management allows to integrate the interdependence of systems even more into cross-domain and cross-sectoral work approaches.

The government also plays a role when it comes to bringing together stakeholders from one or more sectors. For example, a large concentration of companies from various sectors in a fairly small geographic area creates opportunities for intersectoral cooperation. The high OECD score for cooperation between knowledge-based organisations and the business community demonstrates that Flanders is already a fruitful breeding ground. The government must develop it further. A point for attention in this framework is the interdisciplinary cooperation between strategic research centres.

Citizen participation based on social media, the sharing economy*, the energetic society, etc. create a new "power" from the bottom up. The government must take optimum advantage of these initiatives, without resorting to ad-hoc policies.

The increasing digitisation within the government has several advantages, on condition that this digitisation is tackled in a smart manner. The automatic exchange of data between various government departments is key to this. The digitisation of interactions with businesses and citizens also offers plenty of opportunities.

Challenges

A government that invests in cooperation between partners with different interests, intensive cross-policy area and cross-sectoral operation and an internationally integrated approach must be not become compartmentalised. Breaking through the compartmentalisation in the government's administration is a challenge. However it is necessary to work in a maximally results-oriented manner, in and between the systems, to make cohesive use of government instruments and engage in targeted, innovative forms of public-private partnerships, albeit while maintaining specialisation and expertise.

The support for the government's role as a broker and social facilitator in disruptive change processes must be maintained.

Drawing up a long-term policy with a legally certain investment climate is a key objective. To this end, we must evolve from a five-year plan to a long-term approach, across government terms of office, with realistic interim goals, onto which short-term action plans are grafted.

We must scale up successful pilot projects to the system level where impact is intended. Zones that are low on rules to test the legal framework and adapt it where necessary can be enriching.

Investments in the development and linking of reliable (open) data sets are needed to gain a better insight into systems, to measure progress and support the drawing up of forecasts in economic, social and environmental policy issues.

Administrative simplification and digitisation continue to be essential points for attention in the government's operation. The efficiency and effectiveness measurements of governments (Government at a Glance, OECD) indicates that things are improving. However, Flanders scores low for performance (22%), compared with model countries (>50%), such as the Netherlands, the United Kingdom and Finland.

We need creative problem-solvers, who are free to act and have a clear mandate, to tackle all the challenges (ageing and migration, internationalisation, disruptive changes, etc.). Employees of the Government of Flanders must be given the room to work intensively together in that manner, inside and outside the administration.

3 A FLANDERS THAT IS READY FOR THE FUTURE: FOCUSING ON TRANSITIONS

3.1 BACKGROUND AND CRITERIA

In the previous chapters, we outlined the vision for 2050. The vision represents the future that we wish for Flanders. Major change is necessary to achieve this vision. It is important to make the right choices and focus on the priorities that are crucial for this transformation. The Government of Flanders has therefore defined seven transition priorities, that have an impact on each other and are interwoven. These transition priorities are discussed in the next part of this chapter. Chapter 4 discusses an adapted governance model, in the form of a transition policy needed to achieve the transition priorities.

> *"The greater danger for most of us lies not in setting our aim too high and falling short; but in setting our aim too low, and achieving our mark".* Michelangelo

By focusing on transition priorities, we want to contribute to achieving the vision for Flanders in 2050. In so doing, we also wish to anticipate disruptive changes and major social challenges, e.g. the increasing digitisation, ageing and internationalisation with which Flanders is confronted. We can only provide a response to social problems with profound and radical change. Moreover, we create new opportunities by thinking and acting in a new and different way. That is why the Government of Flanders is fully focusing on transitions. These are structural changes with a great impact on society. They are the outcome of developments that reinforce each other at the economic, cultural, ethical, technological, environmental, social and institutional level. Transitions need time, because they are such radical changes.

Working on transitions means looking at ways to rethink the current models and systems in our society. That is how we can evolve to the vision we aspire to for Flanders, as set out in this paper. To achieve these transitions we need an adapted mentality and approach which are aimed at innovation and avoid pigeonholing. Governments, businesses, knowledge-based organisations, socio-cultural organisations, environmental agencies and individual citizens each have a role to play in this.

On 27 May 2015 and 3 June 2015, we organised two stakeholder consultation sessions. Based on the input obtained from the consultation sessions, we defined 10 transition priorities. The Government of Flanders then selected 7 transition priorities, based on political priorities and taking into account the criteria below.

- "The priority must have the right scale level."

  We are searching for the right balance, whereby the transition priority is formulated at a strategic level.

- "The priority is a long term process and contributes to achieving the long-term vision."

  We search for priorities that need a long-term process, are achieved across multiple government terms of office and tie in with the vision for the future.

- ”A system innovation* is necessary.”

  We start from an innovation of the entire system, and not just from minor changes. These changes affect our way of living, working and relaxing, consuming, producing, etc.

- ”The priority creates economic, social and environmental (added) value and provides increased resilience, so our society can deal with any possible future shocks.”

- ”The priority requires synergy and cooperation with various stakeholders and individuals.”

  Far-reaching cooperation between various stakeholders in our government and our society as well as new cooperation models (new business models) are necessary.

- ”The priority applies to multiple themes.”

  The transition priority runs through various themes like a common thread. It regularly resurfaces in the opportunities and challenges for Flanders in the long term.

- ”Appeal/marketability.”

  The transition is palpable in our society. It is essential for the future project of Flanders and puts Flanders on the map.

The transition priorities will be developed transversally, at the political and civil service level, and where possible, links will be established between the transition priorities. In addition, we will take into account a number of social challenges, that run through most of the transition processes like a common thread. Here we target among other things the demographic challenge (ageing, migration, etc.), globalisation and internationalisation, the spatial aspect, aspects of sustainability and technological and social changes that can lead to disruption.

It is essential that we think in terms of chances and opportunities rather than in terms of problems and limitations. That is why Flanders will think creatively about the uncertainties and challenges of the future and - where possible - will instigate disruptive innovations itself and then reap the rewards of them afterwards.

3.2 SEVEN TRANSITION PRIORITIES FOR FLANDERS

3.2.1 Continuing the transition towards the circular economy

In the circular economy, we will use raw materials and materials, energy, water, space and food more efficiently by closing circuits smartly. Natural resources are re-used as much as possible.

We distinguish between biological materials that were designed to safely flow back into the biosphere and technical (non-biological) materials that were designed and commercialised in such a way that they can be re-used at a high level of quality. We are the international frontrunner when it comes to collecting, sorting and recycling waste and closing material circuits. Consequently

Flanders is ahead of the rest of the pack in the transition to a circular economy, allowing it to help define the playing field. The current, strongly developed and high-tech industrial network and strong recycling cluster provide plenty of opportunities for this. By focusing on local production, new business models and replacing primary raw materials with materials that are available in Flanders where possible, the circular economy can make Flanders more flexible and therefore better resistant to disruptions in the global economy. Here too, we see strong links with the transition to Industry 4.0, allowing us to make maximum use of technological innovations and concepts. A close cooperation between these transitions will have a far-reaching and long-term impact.

We can only achieve a sustainable, circular economy if we also use renewable resources, such as biomass. That is why we will focus on developing the Flemish economy into a competitive bioeconomy that sustainably produces biomass and uses and re-uses biomass flows and residual flows for food, animal feed, materials, products and energy. The circular economy provides new opportunities for innovation, including in the product design, manfacturing, services and the business models, as well as in agriculture and food and the water-intensive sectors. It offers many opportunities for entrepreneurs through more chain cooperation, less raw materials use and waste, access to new raw materials from waste and the international valorisation of Flemish expertise. The circular economy, however, will also strengthen the spatial and social fabric. Local customised production, sharing initiatives and the spatial interconnectedness of working, living and recreation are just a few examples of how Flanders can also become stronger socially, within Europe, by focusing on the circular economy. That is why strong links can be established with the transition priority "Industry 4.0".

A circular economy also includes the circular use of raw materials for generating energy and thus a transition to an increased use of renewable energy (see the McKinsey/Ellen Mcarthur diagram under 2.4.1. among others). So the circular economy is also closely connected to the energy transition. That is why we will closely work with the transition priorities for energy and Industry 4.0 when developing this transition priority.

3.2.2 Smart living and housing

Pleasant living is facilitated by grouping 80% of what people need daily within walking and cycling distance. Proximity and the interconnectedness of functions maximise comfort and ease of use, while also minimising lost time and the use of motorised transport. We are clustering living, working, amenities and services, embedding them in a network of (collective, shared, near car-free) transport systems and/or near their nodes, in pleasant green surroundings (interconnectedness). To achieve this, the existing, outdated housing stock must undergo a radical transformation. New developments and building projects must also devise innovative, flexible and intelligent solutions that combine this interconnectedness, densification (high spatial yield), ease of use and sustainability. Solutions that come to mind include adaptable building or even reversible use of space, multipurpose buildings (schools, offices, sport centres, etc.), vertical use of space, smart shared use, new types of housing, the re-use of existing built-up elements (e.g. churches, etc.).

We are responding to new, forward-looking challenges and disruptions by already now building adapted housing and infrastructure (shared work environment, factories of the future, sharing economy (hubs), autonomous vehicles and "Home Factories". We are working on integrated, sustainable urban neighbourhoods, that are hotbeds of creativity, entrepreneurship and social

cohesion, where all people participate in social life as much as possible. We use digital technology when developing smart buildings that are sustainable and energy-efficient, connected with other buildings and infrastructure and embedded in their surroundings. Smart neighbourhoods and cities make optimum use of ICT and big data for connecting various needs and functions. We are responding to the growing and increasingly diverse population, which will result in a greater need for housing by 2050. We are also paying special attention to new forms of housing, with and for the elderly, singles and people who require care and to services that allow people to live at home for longer, given the ageing population, the declining size of families and the growing number of people who require (temporary or permanent) care. Flanders already has pilot projects that are internationally admired (adapted forms of co-housing, intergenerational homes where multiple generations live together, care at home, online care, community care, etc.). Smart buildings also provide optimal housing comfort, helping to allow people who need care to live independently for longer. We also take into account the social aspects, guaranteeing access to affordable, high-quality and lifetime housing, access to public space, and access to new technology for everyone in the future.

This transition priority is strongly linked to the transition priority "A fluent and safe mobility system", because of the aspects of proximity and "transit oriented development". A close cooperation with the "energy transition" and the transition priority "Circular economy", meanwhile, is important for the smart and energy-efficient sustainable buildings, neighbourhoods and cities. There is also a link with the transition priority "Working to achieve care and welfare 4.0" because of the special attention to new types of housing with and for the elderly, singles and people who need care and to services that allow people to live at home longer.

Across the various transition priorities, special attention will also be paid to the development, sharing and multifunctional use of modern top-class infrastructure, for multimodal transport, telecom, energy, business premises, research infrastructure and buildings, among others through an integrated planning of the various infrastructure investments.

3.2.3 Making the leap towards Industry 4.0

Industrial activity is a prerequisite for being a prosperous region in 2050, as also outlined in the New Industrial Policy. That is why Flanders must make the leap towards Industry 4.0*. Industry 4.0 is a common denominator for new technologies and concepts in the knowledge and manufacturing economy. It also specifically refers to the far-reaching digitisation of the industry that is currently taking place. By fully participating in this transition, Flanders can assume a strong position in the new global economy, as a specialised knowledge and manufacturing economy. We must strive to become the frontrunner in new production technologies and concepts. This will allow us to achieve a new productivity leap in the existing manufacturing industry. At the same time and above all, new industrial activities can be deployed, developing new products with new functionality, as well as creating more workable work. Moreover, these developments can give rise to a more efficient use of materials and energy, with all the benefits you can imagine in terms of sustainability and cost savings. This is necessary to maintain our competitiveness and prosperity in a world that is changing with the speed of lightning.

The transition to Industry 4.0 will also have major consequences for the availability and nature of jobs. We must prepare for these disruptions, among others by responding to the new competences that will be required from employees. Industry 4.0 also requires an innovative organisation of labour and the transition to a new and flexible labour model, which will be achieved thanks to the transition

"Lifelong learning and the dynamic life career". We are also paying attention to the jobs that will disappear and to the problem of whether a sufficient number of new jobs will be created for low-skilled workers and people who cannot keep up fully with all the latest developments. This Industry 4.0 is also inspired by the transition to a circular economy. Vice versa, the new technologies and concepts that are developed in the Industry 4.0 will also contribute to closing the material circuits. Both these transitions strengthen and deepen each other.

To make the leap to Industry 4.0 Flanders will each time have to explore the economic opportunities (explore promising niches, develop exportable solutions to certain problems, etc.) as well as strengthen new industrial entrepreneurship when solving social problems. The conversion of the results of scientific research into economic applications and competitive wage and energy costs are of crucial importance here.

It is also essential for investments to be made by all stakeholders in the further development of these new production methods and technologies and for our industrial companies to be guided and supported during the transition. Intersectoral partnerships must also be promoted, in the business community (inter-cluster-cooperation) and in research. Breaking through the traditional sectoral divisions leads to innovative cross-pollination. Flemish economic policy and Flemish companies should also ideally radically focus on internationalisation. At the EU level especially, we can capitalise on opportunities by making (even more) use of European support measures for research and innovation, but also and above all by working together more with other European countries, regions and companies at the policy level and in the business community. Flemish companies can find their niches in international (European in particular) value chains and clusters.

Finally, the transition priority "Industry 4.0" is especially linked to the transition priorities "Circular Economy" and "Bringing about an energy transition". The industry will also play an important role in achieving this circular economy, and new technologies will lead to breakthroughs. Energy is also a major production cost for Flemish companies, which must be kept under control to ensure competitiveness. Lasting attention to energy efficiency is crucial. On the other hand, new technology is being developed in this field (to save energy and generate more local energy in Flanders), which can create growing economic added value. These interrelations with the transition priorities for energy and circular economy are explicitly expressed in the development of the transition priority "Industry 4.0".

3.2.4 Lifelong learning and the dynamic life career

In 2050, Flanders is a region with a learning culture, in which strong personalities are formed and everyone is maximally prepared for the continuously changing labour market. Here work is rewarding and entrepreneurship is encouraged and valued. All this is supported by labour-friendly taxes and workfloors with engaged employees in workable careers, where creativity and innovation are encouraged.

In 2050, talent and knowledge are also the driving forces of progress and innovation. Every innovation starts with well-educated people, innovative learning centres and workplaces, that incite people to be creative and have a sense of entrepreneurship. That is why we will focus on competence and talent development, so every child can become an active citizen. We teach people to innovate.

Our super-diverse society will use all the available talent. In this way we create resilient, active citizens who have everything it takes to cope with disruptive changes in our society and deal with them in a better and more though-out manner. Education and the labour market will target new competences and new forms of work. Partnerships between companies, knowledge-based organisations, education, training providers, etc. are dynamic, flexible and strengthen one another. Employees and companies will have to better understand the disruptions of today and tomorrow and respond to them if they want to survive in the 21st century. The government will also have to adapt to these developments.

The education and training landscape is an active learning and living environment, where experience-oriented work and combinations of learning and work and social commitment all play a fully-fledged role. The school, education institution or training provider of the future is also an innovative place, where education, training, social associations and the business world come into contact with each other, working together to develop exact and human scientific expertise. This in turn must be converted into more competitiveness, sustainable careers, resilient citizens and a better society that offers a good quality of life. We align study programmes and training programmes with the current and future developments in society, paying attention to the needs of the labour market, without compromising on the quality of life of citizens. We focus on a range of science, technology, engineering and mathematics study programmes and professions (STEM training programmes), which use the environmental and social challenges as a starting point. Combined with the digitisation in education, we thus ensure a smooth transition to higher education or the labour market. We value teaching people flexibility, problem-solving skills, resilience and how to cope with stress, so they can respond to changes and challenges in society. Education is characterised in this regard by innovative and socially relevant working methods, so that the course material remains current and reaches as many learners as possible.

Education is the bridge *par excellence* between talent and competence development. Strong basic education, with attention to general learning, skills and attitudes, will ensure good self-development while also promoting equal opportunities. Young people are trained to be critical, creative and social citizens, who are prepared for a complex and diverse society that is founded on solidarity. Lifelong learning and lifelong self-development are crucial, allowing all the inhabitants of Flanders to participate in a society that is characterised by strong social cohesion, in which everyone assumes a place based on his or her own talent and competences.

Personal pathways that tie in with the diversity of Flanders ensure that citizens can play an active role in society during their lifetime, at both the social and economic level. A constantly changing society requires a competitive economy and education, that constantly reinvent themselves to respond early on to the shifting jobs and required competences. Continuous training of employees to become deployable workers in the new economy is therefore necessary. Competence and talent development is a key aspect in a person's (life) career. This makes lifelong learning possible and achievable for everyone.

The traditional compartments of education, labour market and business world will have to be broken open to ensure lifelong learning, thus enhancing our economy's production capacity. People will learn differently and they will learn different things, in a labour market that requires new competences and new forms of work.

The growing flexibility as a result of our changing society also requires increased flexibility on behalf of people and their careers. Dynamic (life) careers contribute to a balance between people's work, private life, family life and social life, and to prosperity and welfare, in a social, innovative and resilient Flanders.

3.2.5 Working to achieve care and welfare 4.0

Flanders is a warm society, founded on solidarity, where nobody is left behind. We offer everyone the best possible start. It starts with childcare that is accessible for all families that need it. We also are committed to "health in all policies".

More generally, we focus on support for children and young people, systematically taking advantage of the existing opportunities and potential they have. This approach offers the best guarantees for the maximum return on the potential of young people for our society.

The increase in life expectancy means that in future there will be more elderly people in Flanders than there are today. The average age will also be higher than it is today. So the 65+ age group will be larger, as will the 85+ group too. All elderly people are given the opportunity to remain active at every level. If their condition no longer allows this, they have access to affordable and high-quality care.

Flanders is dedicated to preventing mental health problems. Firstly, because good mental health is a prerequisite for developing a society in which creativity, curiosity, entrepreneurial spirit and entrepreneurship are the competences of the future. The high social cost associated with mental health problems - because people can no longer work or their quality of life deteriorates - is also an incentive for investing in prevention.

Where preventive care falls short, we offer all citizens high-quality healthcare and welfare care, from the cradle to the grave, regardless of the nature of the care they need.

And to cope with the growing number of - increasingly complex - demands for care, we focus on innovation across all forms of care. Thanks to diagnostics and remote care, and with the assistance of robotics, we ensure that every person who requires care, even in very old age, can be offered tailored support and thus live at home until the end of their lives, if so desired. We focus on change-oriented building and a better spatial interweaving of care and other aspects of daily life to increase the self-sufficiency and independence of people who need care.

Innovative care and welfare means investing in the basic attitude of the professional. The genuine and sincere involvement of the care provider in the lives of people who need care will continue to be indispensable for providing high-quality care.

Finally, the power of innovation must be used to optimise care solutions, but also make them affordable for everyone. The aim is to ensure that the right innovation finds its way to the right person who requires care or their environment at the right time in their life. We work closely together with the following transitions, namely "Industry 4.0", "Circular Economy" and "Smart living and housing" for the aforementioned technology and social developments.

3.2.6 Developing a fluent and safe mobility system

We are focusing on a more fluent, safer and more environment-friendly transport system. We need a trend change for this. To achieve this, we need a modal and mental shift, innovation in the logistics systems (the fleets of vehicles and vessels and rail). In line with European environmental and climate policy, we are focusing on a low-carbon and environment-friendly transport system (also see the transition priority "Bringing about an energy transition").

We do not just look at technological innovations: innovative logistics concepts for example can also provide better synchromodality, infostructures* can provide us with real-time information and are part of the innovations in the operation of the various transport networks.

As far as the transportation of people and goods is concerned, we can increase viability and accessibility by using digital data, better combined mobility and distribution solutions. A number of disruptive developments (the Internet of Things*, AI, autonomous vehicles, drones and 3D printing*) offer perspectives for achieving a connected mobility and evolving towards a situation whereby "mobility as a service" is offered. Such a development offers perspectives for maintaining the mobility of an ageing population. It also contributes to a more efficient use of our space (less space for parking and garaging of vehicles) and is an incentive for more varied movements. Autonomous vehicles are also important for achieving a casualty-free transport system.

We thus combine a fluent and safe mobility system with an optimum quality of living and housing, thanks to the minimal impact on our environment and health. In line with this, we are also striving to develop spatial, mobility-friendly systems (see transition priority "Smart living and housing" - transit-oriented development). We are also focusing on the sustainable organisation of urban logistics and the necessary measures that influence people's behaviour, to achieve sustainable and safe mobility and transportation behaviour.

3.2.7 Bringing about an energy transition

We are focusing on the transition to a low-carbon energy system, that is renewable as much as possible and provides for a realistic energy mix. It is sustainable and provides affordable and competitive energy, with security of supply.

In this regard we are striving to achieve maximum energy efficiency in all sectors. In 2050, the energy system is also smart, flexible, robust and reliable. To this end, we need innovative breakthroughs, among others in the storage of renewable energy, energy-demand side management and clean transport fuels.

Energy efficiency is commonplace at every level of our society. This involves improved energy efficiency in new and existing buildings, for products, devices and industrial processes and making transportation more efficient. As indicated in the transition priorities "Industry 4.0" and "Circular Economy", there are several important links with this energy transition. The three transition processes are therefore closely linked to each other in the further development.

To achieve this, we must develop forward-looking infrastructure. We are focusing on making our existing infrastructure more energy-efficient and on the efficient development of new infrastructure. We are building high-performance, smart and interconnected energy networks, which integrate the

electricity and gas networks with the heat/cooling network, which increases each other's efficiency. Our energy is supplied by progressive, decentralised energy generation systems and the maximum integration of renewable energy into the energy mix. There is a continuous balance between the generation and use of energy, be it by adjusting demand, supply or smart storage.
We evolve from a demand-driven to a more supply-driven energy model. Thanks to its flexible operation, the energy system in 2050 is robust and reliable. Positive impulses are given for making available flexibility and capacity. This allows the market players to make flexible use of the economically most optimal techniques, ensuring security of supply as a result.

The government provides for a policy-based integrated framework that is embedded in European policy. The market can thus innovate and invest in technologies for achieving a low-carbon energy system. International rules and agreements must allow for cooperation in a European Energy Union and to introduce coordinated price mechanisms (carbon price), allowing us to drastically reduce CO2 emissions.

4 AN ADAPTED GOVERNANCE MODEL

4.1 INTRODUCTION

The Chairman's Board has developed a governance model for the seven transition priorities. Several departments as well as the group of writers who drew up "Vision 2050" were involved in this. This governance model does not discuss the content of the transition priorities. The further creation of the content of each transition priority and the specific approach for every transition priority will be defined after "Vision 2050" is approved.

To achieve the transition priorities, we need an adapted governance model in the form of a transition policy that assures the long-term approach and promotes cooperation across various borders. In accordance with the coalition agreement: *"We implement a long-term policy to accelerate the necessary transitions in our society. This requires system innovations in which we valorise the input of social stakeholders (social partners, business community, innovative players, the wider civil society and so on). This also requires cooperation between Ministers across the policy areas and levels, allocated resources and vigorous transition management. We will also allocate a separate budget for the selected transitions and a Minister responsible for each transition."*

For this governance model, we will base ourselves on the experiences regarding transition management as set up in the framework of Flanders in Action. We will take into account the evaluation and recommendations of the FiA Council of Elders, as formulated in the memorandum entitled "Proposed strategy for strengthening the FiA Transitions".

A transition approach will be developed for each priority. The respective government services will have to work together, and the administration and the government must also intensify their cooperation. After all, the coalition agreement states that "*We will tackle important, major projects with temporary project organisations, with the participation of experts from the various entities concerned, clear steering guidelines and adequate project resources. We will steer major challenges that transcend ministerial authority areas using political-civil service project groups supervised by ministerial committees."*

The 7 transition priorities will serve as a guideline for taking forward-looking policy action today. The drafting of these priorities, both in terms of governance in the coming months and in terms of content in the next few years, will be crucial for making "Vision 2050" a success story. An important step has already been taken by pushing these seven priorities to the fore.

A positive thing about choosing these seven transition priorities is that we do not have to start from zero again. The social changes associated with them are already evident at several levels, with several stakeholders, on several different scales. Transition processes are by definition long-term processes. They naturally extend across several government terms of office (albeit with some differences in emphasis). They do, however, allow for an enhanced action perspective at the term of office level because of transition management. There are similarities between the currently selected transition priorities and the FiA transitions of the previous coalition(s). It is therefore essential that we effectively take into account past experiences with these FiA transitions, both in the drafting of the governance and for formulating the content of the transition priorities. Successful recipes must be continued, but we must also learn from what went wrong in previous years, and adapt and/or rethink where necessary. In other words, we must establish a balance between continuity and innovation for the further drafting.

4.2 CONTEXT: A TRANSITIONARY APPROACH FOR THE TRANSITION PRIORITIES

We must draw up a specific action plan for every transition priority. The idea is not, however, to impose a detailed blueprint. Every transition process is different, involves different stakeholders, different challenges and so on. An overly rigid format will only become an obstacle given the complex and often uncertain challenges for which transitions create policy. The past has also shown that less rigid, more organic structures can also be very effective, with the necessary expert guidance. No blueprint, however, should not be taken to mean that everything is allowed, or recovery of everyday matters. We must take into account the main characteristics with which a transition process must comply (see below).

The basic principles of a transition process must be safeguarded regardless of the stage of the transition process and its progress. *The objective of this part of the paper is to identify some broad outlines that a transition project must fulfil to still have a "transition". These are generally accepted principles, without going into detail. The details, how the approach can be translated into practice for every specific transition priority, can be different and is discussed in part 4.6.*

Important characteristics of a transition process:

- *system innovation and system approach:* We must understand the problems not only on the surface but also at the underlying level;
- *partnership and co-creation:* The problems are complex and occur at many different scale levels. Without cooperation, by focusing on partnership and co-creation, one stakeholder can hardly solve the problems;
- *long term to short term:* We must think in a time perspective, in which a proper solution can become a standard that is effectively applied. We are referring to the necessary transition from short term to long term, which is needed if you want to implement policy from the system perspective. We must act in the short term without losing sight of the long term. This refers to innovative practices and innovative projects that are devised based on a long-term perspective. They allow us to learn in the long term but are already making significant and inspiring changes in the short term;
- *policy integration and an agile government:* We must adapt the organisational structure so it can cope with systemic policy. Systemic problems always extend *de facto* across domains and sectors. A policy that offers a response to this cannot conceal itself within policy areas. The core task debate must also take this into account. Policy integration is needed, and coordination between the social, environmental and economic pillars;
- *learning process:* Every transition process requires us to constantly learn and adapt.

These elements will be discussed below (4.2.1-4.2.5).

4.2.1 System innovation and system approach

We will focus on system innovation: changes at the system level.

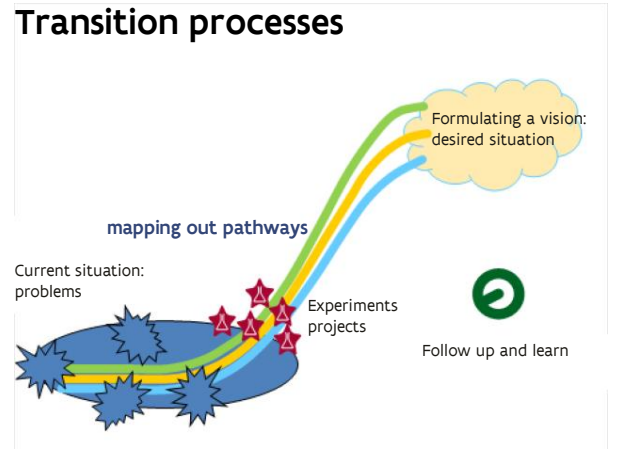
Transitions and system innovation

We can only solve persistent social problems, respond to disruptive changes and focus on the future that we desire if we act based on a thorough understanding of transitions and how far-reaching changes are achieved.

"The best way to predict the future is to create it." Robert Costanza

Transitions are the outcome of developments that reinforce each other at the economic, cultural, ethical, technological, environmental, social and institutional level and also become engrained in our lifestyles. Therefore, the necessary changes also intervene in our way of life, in how we work and relax, how we consume and produce, etc. An important example of this was the transition from coal to oil. It was reinforced by the transition from bicycles to motorised transport, and thus became part of the way we live, work, feed ourselves and so on. We can stimulate and accelerate the transitions to a new system. The innovations needed for this can come from inside the system (e.g. policy innovation) or from outside the system (innovative, local practices that define new policy areas, explore other policy options and so on). The real fundamental changes are however given shape and clout at the system level, and are called system innovations. This involves a thorough innovation of the entire system, and not just small, incremental changes in the margin. We thoroughly rethink the current models and systems in our society.

System innovation involves the combination of technological and scientific breakthroughs with changes in how citizens, consumers and companies behave, with changes in policy and adaptations in the social institutions that form the cornerstone of our society. This system innovation involves taking risks and is also necessary for making this transitional leap. As a government, we can stimulate this by implementing a transitional approach.



4.2.2 Partnership and co-creation

As a government, we cannot achieve the transition policy alone. System innovation is only possible in partnership with and with the support of the stakeholders. It is important that all the stakeholders in the social pentagon (companies, governments, knowledge-based organisations, financial institutions and citizens and associations) assume their responsibility. That is why multi-stakeholder governance with shared ownership is crucial for achieving the transition priorities for Flanders. A high level of engagement, transparency, participation, co-creation and interaction between public and private stakeholders is crucial. The social pentagon must support the transition process. It is important that the business community, the knowledge-based organisations, civil society and the financial world are not only involved in these transition processes but are also offered the chance to take ownership and transcend their own, possible short-term interests and develop a shared vision for the future. Open innovation, cooperation, and shared and fully-fledged ownership play an important role in this. A balance between frontrunners and bridge-builders is essential in this regard.

4.2.3 Long term to short term

Vision 2050 sets the direction for these transition priorities. We start from the current situation and the opportunities and challenges, and then define actions and innovative, entrepreneurial initiatives and experiments. They can be public, private or social, or a combination of all three. We pay special attention to the most innovative initiatives and experiments, as they really introduce innovative ideas in the transition process and can bring about change. It is important that we foresee margin for experimentation and the required resources for this, both among our partners and within the government. The transition experiments can tie in with any roadmaps, long-term plans or transition pathways that were established in the past. Ultimately, the experiments and initiatives must give rise to new policy, adapted regulation and frameworks, innovative products and services and other values and behaviour among citizens and organisations. This interaction of innovations must ensure that the old system evolves to a new system that is closer to our vision for the future. Possible specific approaches for a transition process will be discussed later (see chapter 4.6).

4.2.4 Policy integration and an agile government

To help achieve this transition policy, we also need an agile and innovative government that can assess the impact of disruptive changes and can take appropriate action. The government must be able to link challenges to the available strengths and opportunities, breaking through compartmentalisation, stimulating connections and adapting regulations. We will thus work across the boundaries of policy areas for the transition priorities. We will integrate social, environmental and economic aspects related to the transition priority. This will lead to new insights and solutions which were previously impossible because of sectoral thinking. This, in turn, will increase policy effectiveness. At the same time, any possible overprogramming will become visible faster, also increasing policy efficiency.

4.2.5 Learning process

We will learn what works and what does not through experiments and innovative initiatives. Above all, however, we will learn how these successes and failures relate to system changes and how and if they contribute to this. We can also learn a lot from "failures". They are often caused by obstacles in the system, or by insufficient staffing and so on. They thus lead to new insights that pave the way for making a success of new experiments and initiatives. This means they start to change the system's core. This requires adapted learning infrastructures as well as an adapted process monitoring method, which is highly reflexive in transition management. We do not just review what we did, or how we did it (how the governance and the cooperation with the partners took place, for example) but also which relation exists between the "how" and the "what", by thinking about the "why". The transition approach will thus be developed, and constant learning will thus edge this approach increasingly closer to the specific policy needs created by system change. We must and want to continue learning more about transition approaches.

4.3 CONTROL OF TRANSITION PRIORITIES

4.3.1 Transition space

We will develop a transition space for every transition priority to develop a minimum of organisation for the multitude of stakeholders and initiatives. The transition spaces are partnerships, platforms (both offline and online), learning communities and spaces for experimentation, which are developed around the transition priorities. The right stakeholders are gathered here around the right themes. We also examine which stakeholders (political, public and private) are best involved at which level (local to European). We examine where innovation is necessary and where we must create space for experimentation.

New connections are established between partners in these transition spaces, and we collect and share knowledge, experiences, inspiration and resources. The government helps initiate and inspire, stimulates entrepreneurship rather than controlling things. The transition spaces also contribute to a learning government: by participating in these platforms and interacting with other stakeholders, the government can develop new ideas and insights.

There is no structural blueprint for this transition space. Nor do we want to develop a uniform structure for all the transitions. But we can continue to build on the experiences with various existing transition processes, such as the Flanders' Materials Programme, Flanders' Care, Duwobo, etc.

The existing transition projects each have a different structure and approach. In terms of structure, some have a core team, others have a controlling body, a coordination group, a transition arena, learning communities, etc. Sometimes online tools (idea enrichment systems) are also available. These structures, however, always serve the same purpose, namely to co-create to achieve the transition.

4.3.2 Representative of the transition space

It is important that every transition priority has (a) leader(s) on the governmental side (transition managers, see 4.3.4) as well as (a) fully-fledged counterpart(s) on the partner side. Someone who takes the lead on the side of the partner organisations in the transition process, as the representative of the transition space. Depending on the specific structure, this may be a representative of the strategic working group or of the transition arena itself. It is important that the representative is the right person, with sufficient knowledge of system innovations and transition management, but who also has maximum support from the stakeholders. A crucial, social stakeholder, who underpins the transition priority, without the urge to position himself. The social pentagon can select a representative and he or she can count on their support. The division of tasks between the transition manager and the representative must be properly defined. Moreover, the representative fulfils a bridging role between the responsible Ministers and vice-versa.

4.3.3 Responsible Ministers

The Government of Flanders will designate one or more responsible Ministers for each transition priority. At the same time, the government ensures the engagement of the entire government, which offers a framework and support. At the same time, it is important that transversality is maintained. Where there are links with competences of other Ministers, these Ministers should be involved in the relevant transition priority. The responsible (and participating) Minister(s) are closely involved in the development of the transition priority. This can be achieved through periodical consultation with the transition managers, the senior official(s) of the policy area(s) and/or the representative of the transition space. Specific problems and opportunities that are inherent to the transition process can be discussed during these periodical consultations. If coordination is necessary with other policy areas for specific problems, the transition manager will first discuss this within the transition platform (see 4.3.6).

4.3.4 Transition managers and delivery units

One or more transition managers will be appointed per transition priority to implement the transition priority. This team of transition managers is a team of innovators, who are sufficiently free to take action and thus have the mandate to gather all the stakeholders together on an ad-hoc basis. The transition managers are the operational leaders of the transition priority. They co-define the specific approach and the operational bodies that are necessary per transition (which may be different depending on the transition (see 4.6)). They coordinate with the partners within their specific transition space. They also actively participate in and help to coordinate the transition space. The transition managers have the support of their own policy area and all the other policy areas involved. The transition managers are appointed after joint consultation by the responsible Minister(s) and the senior officials of the relevant entities.

They provide annual input to the transition platform about progress. This is then checked within the transition platform and included in the reflection document to prepare the (joint) Chairman's Board (+) (see 4.3.5). The transition managers have sufficient space and mandate. They work together in a "delivery unit" (see 2.5.9).

It is essential that a relatively limited project group of motivated and results-oriented Flemish officials from various policy areas take ownership of the transition process along with committed stakeholders. A clear framework of agreements/contracting is important in this respect. In this regard they would receive more space than is customary from the hierarchy, to transcend the short-term interests of their own policy area and possibly also not assume traditional roles in projects and initiatives. This will indeed largely have to be achieved with a culture of trust, and with sufficient courage to take innovative action. There are a number of organisational elements that can be useful in this framework to achieve this ideal of "flexible delivery units":

- the senior officials commit to seconding people with a profile that matches this type of work when selecting the members of these units. This means that a choice is made for motivated and committed people, with broad vision and knowledge and a strong profile;
- the employees who participate in such a process are explicitly exempted at least partially, so they can spend sufficient time working on the process in a serious manner. They will also receive a clear mandate and support and guidance. Experience has taught us that a transition process has very few chances of success if not enough people are effectively delegated to help move the process forward. A sufficient number of employees must commit to the transition process and the transition process must therefore be the most important element in their evaluation;
- we will explicitly take into account employees' efforts for the transversal transition process in their evaluation. We will not merely look at how they helped achieve the specific goals of their own entity within the process, but also at their impact on the transition process as a whole or at their contribution to other transition processes.

4.3.5 Chairman's Board (+)

The Chairman's Board reflects on the content and global progress of the transition priorities, their consistency with the long-term vision, the coherence between the transition priorities and the remedial actions for constantly recurrent sticking points and opportunities. The Chairman's Board prepares possible government decisions.

The Chairman's Board commits to playing an active role and reflecting on the content and implementation of the transition priorities and ways of breaking through compartmentalisation. All the transition priorities will be put on the agenda, to be discussed in an open and constructive manner, by the Chairman's Board during the first phase. The idea is to exchange ideas about the content and support for the transition priorities, regardless of the existing structures. The Chairman's Board can also put transition priorities on the agenda, while transitions are being implemented, on their own initiative or at the request of the responsible Ministers or of the transition platform (see below).

The Chairman's Board will organise a joint consultation at least once a year, with the representatives of the transition spaces (partners) of the various transition priorities. This is in the first place an umbrella platform, where the individual transition priorities are monitored and discussed in an open, reflective dialogue, by the government and partners. This **Chairman's Board (+)** meets at least once a year. The dialogue will take place based on a reflective document that is prepared by the transition platform. A number of points for attention are prepared and included in this reflective document.

More specifically, the following points are discussed:

- the **progress of the transition priorities;**
- **constantly recurring problems and opportunities,** both within the government and in society, which require taking action at a higher level. These are common sticking points and opportunities, which get in the way of system innovation and the proper implementation of the transition priorities, e.g. financing, problems relating to regulation, adaptations of the content of tools within the government (e.g. sustainable government procurement and purchasing), problems relating to the coordination and cooperation between policy areas, opportunities regarding new financing lines at the European level, etc.;
- the **coherence between the transition priorities:** it is important to discover any synergies between the transition processes and reap the benefits of this as well as establish links between the transition priorities. There are important aspects of content within the seven transition priorities, which must be coordinated with each other. An example is how the development of new competence and talent (the main question of the priority of "Lifelong learning and the dynamic life career") is linked to new developments in the field of circular economy or Industry 4.0. Another example relates to how the energy transition is linked to the circular economy, e.g. in terms of the cascading use of biomass or energy generation through waste incineration. It is therefore essential that we avoid and resolve contradictions in terms of content as much as possible;
- **long-term coordination**: testing the coherence of the progress of the transitions in relation to the long-term vision for 2050.

Based on the meeting, a report will be sent to the Government of Flanders. Where applicable, the **Chairman's Board (+)** will point out gaps or obstacles in certain transition priorities to the Government of Flanders. The Chairman's Board can then prepare the decisions for the Government of Flanders, with possible remedial actions for specific sticking points. The Government of Flanders takes note of the progress made with the transition priorities and takes any necessary decisions for adapted actions.

4.3.6 Transition platform

The transition platform offers support to the Chairman's Board for any reflections on content and is also responsible for knowledge sharing, knowledge building and support for the ongoing transition priorities. The transition platform consists of:

- the transition managers who can coordinate the transition processes with each other, through the platform, who formulate reflections and contribute and share their experience and knowledge;
- the transition experts of the Department of Public Governance and the Chancellery, supplemented by transition experts from other policy areas, who primarily stimulate and support knowledge sharing and knowledge building about the transition approach and who monitor the coherence of the reflection; the transition experts have solid experience and methodological knowledge when it comes to overseeing and executing transition processes;
- sustainable development experts from the Flemish working group on sustainable development, who check the progress of the transition priorities against the transversal aspects: sustainability, gender and poverty and against the long-term vision for 2050.

The transition platform's mission is:

- **creation of an (annual) reflection document:** the platform prepares the reflection document for the Chairman's Board (+). Every year, a number of points for attention are prepared and included in this document. The transition platform will go in search of interesting and innovative monitoring processes, such as reflexive monitoring, for this. This will not be a bureaucratic process. Instead a way that involves the least possible administration is sought;
- **long-term coordination**: Vision 2050 is also the Flemish Sustainable Development Strategy. The Flemish Working Group on Sustainable Development was appointed to monitor and implement it. The Flemish Working Group on Sustainable Development will join the transition platform once a year and is tasked with monitoring the transversal aspects of the annual reflection as well as examine the coherence of the progress of the transitions in relation to the long-term vision for 2050. This will be done in a separate test. The results will be discussed in a reflective manner in the transition platform;
- **knowledge sharing and support for transition processes:** the transition platform also regularly meets to learn more about the transition approach. Experiences, insights and approaches are shared as a result. Everyone can thus learn from each other, which can also help people as they assume and implement transition priorities. Among other things, it offers the transition managers the opportunity to try out and test out other methods and approaches in the implementation of their transition priority. The transition experts within the platform can also go in search of new transition approach experiences at the national and international level, making these available to the transition managers. Where necessary and upon request, the transition experts can also provide support. Knowledge (including experience knowledge) is also shared in relation to opportunities and sticking points. Certain problems can easily be discussed through consultation within the transition platform or within the departments involved. Other, more difficult, sticking points must be discussed at the level of the Chairman's Board. The transition platform will prepare and further substantiate the input for these discussions. The platform can also formulate recommendations to the Chairman's Board.

Support for the transition priorities, in cooperation with the Research Centre of the Government of Flanders and the Policy Research Centre on Governance Innovation:

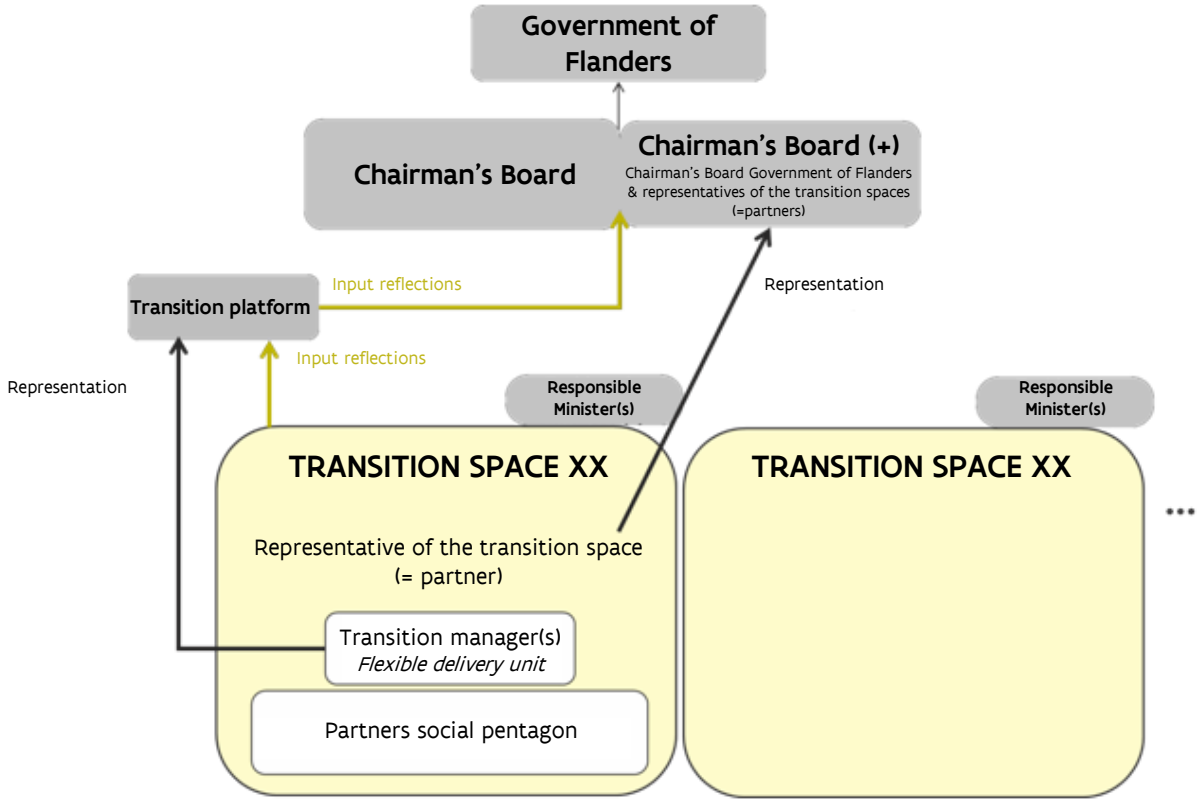
The transition platform can call on the Research Centre of the Government of Flanders and the new Policy Research Centre on Governance Innovation within the policy area of Chancellery & Public Governance to support the transition priorities. The Research Centre's role is to be available to transition managers and bridge the gap with international institutions, scientific institutions, the research centres of other entities, etc. and monitor the Vision's continuing relevance. Possible points where the Research Centre and the Policy Research Centre can play a role include:

- developing a *framework for zones with few regulations and procedures* (e.g. the Soil Decree). Zones with few regulations are geographically or virtually defined areas in which stakeholders can set up experiments, where specific regulations do not apply (possibly temporarily) or in which some administrative requirements are not enforced. These zones with few regulations demand a careful approach. We must decide on a case by case basis whether this is necessary for the experiment and then develop a tailored, well-founded approach, with support. The aspect of having few regulations must be linked to building knowledge about the design of areas with different regulations, enabling a phasing out of old practices;
- conducting research into *new forms of financing* and checking specifically for different transition processes how certain experiments, projects, etc. can become financially viable in an innovative way;

- conducting research into *experiments and scaling up* of these experiments and offer specific tools for specific projects within the transition processes;
- building knowledge about how your behaviour and lifestyles play a much more central role in social change, e.g. so that technological developments become much more effective in generating impact. The value of "nudging" and other insights from behavioural sciences can be examined as they may be essential for influencing the behaviour of stakeholders in a comprehensive and integrative perspective;
- filling workable *toolboxes* on the themes of financing, experiments, scaling up and behavioural insights, online communities, dealing with disruptions in the transition processes, the importance of the sharing economy in the transitions so the transition managers, flexible units and transition arenas can set to work in practice with them;
- developing a *methodology* so *the assessment against the long-term vision* becomes an integral part of the processes that are grafted onto the priorities and of how they work;
- all this starting from the research that has already been done and the experience that is available within TRADO, the governments and knowledge-based organisations.

4.3.7 Organisational chart

The organisational chart below aims to outline how the aforementioned bodies relate to each other. It represents the relationship between the various bodies.



4.4 CRITICAL SUCCESS FACTORS ON THE GOVERNMENT SIDE

The creation of an optimum climate for the transition priorities is essential for the successful development of the transition priorities. This requires a fundamental cultural shift within the Government of Flanders, i.e., an evolution towards a culture of cooperation and courage to opt for innovation and experiments; a culture of questioning one's own regulations. It is important that support is also developed within the Government of Flanders. This must be developed from the bottom-up instead of artificially imposing it. Besides this, a clear mandate for the transition managers and sufficient support from the Government of Flanders, one's own entity (department/agency) and the Flemish administration as a whole is also important. In addition to this, sufficient resources must be freed up (specifically focused on the uniqueness of the transition priorities).

4.4.1 A cultural shift

More so than regular policy, transition processes are founded on a culture of cooperation: cooperation between the Ministers, between the senior officials, between government employees, with other stakeholders, about how to use the financial resources. Cooperation is essential for the success of all the transition priorities.

Besides this the Government of Flanders must also work together with stakeholders as equal partners. And this goes beyond "involving" the stakeholders in the transition priority. It is about co-ownership of the process. Within the Government of Flanders, the collective responsibility and culture of cooperation must be integrated into its operation and organisation.

A cultural shift about raising questions about one's own regulation and the courage to experiment is also necessary. This also means putting an end to the taboo about failure. Spaces for experimentation or with few regulations in the legal and financial framework are essential for the success of a transition process and the government must opt in favour of this. The government must also take efficient and structural action to adapt recurrent sticking points (among others in coordination and regulation) that are an obstacle to the proper implementation of the transitions. This also requires a new culture within the government.

4.4.2 A sufficient mandate for the transition managers

The transition managers play an essential role in the implementation of the transition priorities. They must have a broad mandate to be able to fully play their role (see 4.3.4). In this regard they should receive more space than is customary from the hierarchy, to transcend the short-term interests of their own policy area and possibly also not assume traditional roles in projects and initiatives. This will largely have to be achieved with a culture of trust, and with sufficient courage to take innovative action. Of essential importance: selected transition managers are motivated and committed people with a broad mindset and knowledge and a strong profile. The transition managers are sufficiently exempted for this job and are given the freedom to work together without always having to check with the hierarchy. Finally, they will also include the transversal policy effects (positive effects in other policy areas) in their evaluation. Some budgetary autonomy is recommended.

4.4.3 Financing of transition priorities

The transition priorities must be able to rely on resources from the government and the partners. In terms of financing, Vision 2050 stipulates that the selected transition priorities should have their own budget. An essential requirement in this regard is having their own operating budget (this was about 150,000 to 200,000 euros per transition per year for previous transition projects). In addition to this, budgets are required for supporting and setting up innovative projects and experiments.

These depend on the content of the transition priorities. Once the content of every transition priority has been determined, the transition managers must draw up a realistic investment plan and include it in the budget discussions. This investment plan contains an estimate of the overall resources needed, and also explain how this overall requirement can be covered, with which generic, existing and new government tools. The resources for the specific transition can be earmarked. Various different instruments can be used for the transition priorities: the cluster policy, demonstration projects, living lab projects, etc. Some innovative initiatives and experiments currently do not however match the traditional criteria for receiving subsidies. They tend rather to have an impact on the value chain as a whole, the integration of multiple objectives or consist of innovative partnerships. In that case, a new, separate subsidy line or support must be developed. It is important that the transition managers can have access to these (existing and new) resources.

4.5 CRITICAL SUCCESS FACTORS ON THE PARTNER SIDE

Stakeholders become co-owner of the process under the new governance model. The partners must therefore also co-assume this responsibility when implementing the transition processes. The roles and responsibilities of each partner are written down in a joint declaration of commitment.

The partners' commitment is also essential to achieve joint funding for every transition. As far the co-financing of the other partners in the transition process is concerned, the memorandum of the Council of Elders may provide some inspiration. We quote:

> *"One point that could be used strongly is the creation of joint funding (a collective pot) per transition. Without joint funding, there is no common thinking, no co-ownership, no transition. It therefore seems desirable for all partners to combine their available resources so that they can be used in a strategic manner for the transition. When bundling their resources, the partners can also clarify what they wish to use them for. An action plan for every transition can offer a foothold when allocating the available resources.*
>
> *This does not mean that all the partners necessarily have to contribute financially to the transition. Their input can also consist of assuming certain tasks, making available their personnel or infrastructure, etc. The partners' capacity must also be taken into account. It goes without saying that not all partners can invest equally in their transition. Depending on their capacity and their specific characteristics, partners should therefore contribute resources or manpower."*

The "collective pot" mentioned above is indeed an ideal, but it may also be more feasible for the partners to reassess existing projects and resources, so that they are better geared towards the transition priorities. This will be all the more the case if the government also focuses its subsidy channels and other instruments on the transition priorities. The various partners can also develop new projects together, calling on European channels and innovative financing (see below for examples of innovative financing).

4.6 METHODOLOGICAL APPROACH PER TRANSITION PRIORITY: POSSIBLE INSTRUMENTS AND METHODS

There is no blueprint being imposed for the transition approach. We do not want to develop a uniform structure for all the transitions. It is important that we base ourselves on the existing experience with transition processes in the past, such as the Flanders' Materials Programme, Flanders' Care, Duwobo, etc.

The transition projects of the past have a different structure and approach. The structures are not uniform across the transitions. Some have a core team, others have a controlling body, a coordination group, a transition arena, learning communities, etc. Sometimes online communities are also available.

With regard to the approach as well, the transition projects differ: whether or not they start with a system analysis or by formulating a vision, whether or not they determine transitional paths or roadmaps, whether or not they focus on experiments (with support) or coaching of experiments, whether or not they use tools such as idea enrichment systems. The examples of the earlier FiA transitions reveal the diversity in terms of approach and methods, and can serve as inspiration for the new transition processes that must be launched. It is after all important that the instruments and methods used support the characteristics and general premises of a transition process: system innovation, from the long term to short term, cooperation with stakeholders and other policy areas and learning from experience (see 4.2).

The seven current transition priorities are different from each other in several respects. And none of them start from the same initial situation. Several transition priorities already existed as a transition under FiA. Some transitions currently have a transition manager and a structure that is developed to a greater or lesser extent. Below we give some possible approaches for the future transition projects. A number of instruments and steps are also formulated:

Signing of the transition priorities by the partners and definition of the commitments

The draft paper states that the commitment of the partners would be checked while establishing Vision 2050, initially in the months of July/August 2015. We think it is important that the content of every transition priority is defined first with the partners, before requesting a clear, defined and operational commitment. This can culminate in a signed declaration of commitment for every transition. The roles and tasks of all the parties are also established during this process. It is important that the underlying values are recognised in this declaration of commitment. Open innovation, cooperation, and shared and fully-fledged ownership play an important role in this.

Working with a system analysis, vision, roadmaps, experiments

Below a number of instruments are listed that are usually included in a traditional transition approach: system analysis, formulating a vision, roadmaps and experiments. These instruments or transitional steps, however, are not applied in several transition processes. It is perfectly possible to set up a transition process without these steps. Instead a system analysis can be created (if this has not yet been done): the definition of the system and the mapping of the stakeholders. The vision for

the transition priorities has already been defined and can be further substantiated for the transition priorities. Together with the various stakeholders, we can then formulate various long-term objectives that are priorities and which tie in with Vision 2050. Starting from the vision for the future and the ambitions, the various parties involved can then examine what the most important pathways or directions are for achieving the objective. We do this with transition pathways, which could be described as transition-oriented roadmaps. They allow everyone to examine the objectives and intermediary steps in a broad time frame. The roadmaps are iterative: they can constantly be adapted by looking back and thinking ahead. This allows us to respond to the rapidly changing environment and adapt the vision for the future and the approach. Where roadmaps are available, these can be further implemented, or adapted where necessary.

Setting up experiments and entrepreneurial initiatives

The roadmaps link the future picture to innovative, entrepreneurial initiatives and experiments. They can be public, private or social, or a combination of all three. They often involve a higher risk. We pay special attention to the most innovative initiatives and experiments, as they really introduce innovative ideas in the transition process and can bring about change. It is important that we foresee margin for experimentation and the required resources for this, both among our partners and within the government. Ultimately, the experiments and initiatives must give rise to new policy, adapted regulation and frameworks, innovative products and services and other values and behaviour among citizens and organisations. This interaction of innovations must ensure that the old system evolves to a new system that is closer to our vision for the future.

We refer to the relevance of instruments like *demo projects*, *pilot projects*, and the *Vanguard Initiative* for scaling up initiatives and experiments. The latter aims to achieve scaling-up by cooperating with various regions at the European level to achieve demo projects for specific smart specialisations and combining public and private resources from the various regions.

Working with experimental forms of financing

Transition processes are an excellent opportunity to examine innovative forms of financing. There is plenty of cash available in our society that is not always used equally efficiently or sustainably and which can be given a better destination. The following approaches are just a few examples worth investigating when launching specific projects starting from the transition space:

- joint financing or pooling of resources (also see below);
- involve banks, insurance companies, pension funds and other financial institutions in the transition process and develop an investment portfolio together;
- motivate citizens to buy project bonds as part of transition processes, with a better yield than the "dormant" capital in savings accounts;
- stimulate crowdfunding for specific projects or innovations;
- reorient and streamline existing financing within the Government (of Flanders). Various entities lend their support with the same or comparable objectives in mind. A first step towards a more streamlined approach is to establish an inventory per transition of these different support mechanisms;

- establishment of an investment fund for transitions, in line with existing investment funds for sustainable innovation in Germany and France;
- stimulate innovative forms of private-public partnerships;
- coordination with European policy is also necessary. European resources, programmes (cf. EIT KICs, Vanguard RIS3, etc.) and structural funds (e.g. ERDF) can be used to finance and scale up business-oriented initiatives and experiments that arise from the transition policy. On the other hand, the insights of the transition processes can help feed and renew European policy. The result is an interaction between top-down policy and bottom-up policy. Cooperation with other European regions in the framework of the new "European Fund for Strategic Investments", "Important projects of common European interest" and other new or traditional European financing channels. The pilot projects within the Vanguard Initiative can also offer inspiration in this framework;
- generally achieve better coordination between Flemish and European financing instruments, to respond to the maximum possible extent to all possible European opportunities.

The root cause of many problems is fragmentation of the resources. That is why a smart reorientation of resources and manpower is necessary. One point that could be used strongly is the creation of joint funding (a collective pot) per transition. It therefore seems appropriate for all partners to combine their available resources so that they can be used in a strategic manner according to the transition.

Building up expertise about such new forms of financing and if necessary developing specific solutions on request can be one of the tasks of the Transition Platform.

Monitoring

Certain impact indicators can be formulated to measure progress and adapt transitions. We can check with the Research Centre whether these impact indicators are already monitored and whether it is possible to monitor them in the future. Transition processes are long-term processes, however. In the short term, they will not immediately be able to have an economic or social impact.

Communication

No new information channel and brand (like Flanders in Action) will be launched for Vision 2050 and the seven transition priorities. The available information will be bundled online at www.vlaanderen.be. Communication will take place for every transition priority separately. Agreements will be made within the Transition Platform about how to communicate. All communication about the transition priorities will also be streamlined.

4.7 ROADMAP

In summary, we propose to take the next steps to operationalise the implementation of the transition priorities:

- appoint (a) responsible Minister(s) per transition;
- appoint transition managers and delivery units;
- setting up the initial transition space and mapping the stakeholders for every transition priority is an important first task. After drawing up the initial memoranda (see below) the full scope of the transition space is determined and the representative appointed;
- set up the transition platform that provides the required guidance;
- based on Vision 2050, an initial memorandum (action plan) is created per transition priority, in which the commitments of all the partners, the timing and the resources provided are also included. These memoranda are formally approved by the Chairman's Board and the Government of Flanders. In concrete terms this means that seven memoranda must be drawn up before the end of December 2016, which the Government of Flanders can then discuss in a phased manner. It is necessary for stakeholders to be fully involved in the process of drawing up these memoranda and for the necessary links with other policy plans to be made;
- determining the (rolling) investment plan for every transition (to be determined by the transition managers) and discussion within the transition platform and the Chairman's Board;
- the Ministers indicate how much budget can be freed up from every credit line for all the transition priorities;
- commitment of the government about the budget;
- declaration of commitment by the partners;
- development of an (annual) reflection document by the transition platform.

This is best developed in a gradual and iterative manner. In this regard, quick wins (albeit in a long-term perspective) can contribute to a systematic expansion of support and impact.

GLOSSARY

3D printing (see insert p. 33): you can use 3D printing to make objects in all kinds of materials. A 3D printer can build up the object layer by layer using a digital 3D model.

Discriminatory mechanisms: an example of a discriminatory mechanism is the overrepresentation of women in the care sector or of young people of foreign origin in vocational education.

Sustainability aspects in housing and construction: sustainability criteria and references are used to score the sustainability of building projects and developments (e.g. neighbourhood developments, commercial centres), with multiple criteria being combined to give an overall sustainability score. The following sustainability criteria are evaluated depending on the type of building: location, health, accessibility, affordability, energy, mobility, building materials used, water, biodiversity, thermal resistance, social cohesion, interdependence, child-friendliness, safety, etc.

Aquaculture is the cultivation of aquatic organisms, such as fish, molluscs (e.g. mussels), crustaceans (e.g. shrimp, crabs and lobsters) and aquatic plants (e.g. algae). Animal and plant organisms are kept in ponds and basins during the cultivation process, after which they are sold. Aquaculture also includes the cultivation at sea of sea fish and shellfish in breeding installations.
(http://www.aquacultuurvlaanderen.be/wat-aquacultuur).

Aeroponics is a method for growing plants without using (potting) soil. The roots are suspended in a mist in which the nutrients have been dissolved. In so doing, the Government of Flanders endorses the vision formulated by the Flemish Council for Science and Innovation (Flanders in Transition, http://www.vrwi.be/pdf/VlaanderenTransitie_def_web.pdf).

Big data: the analysis of large data streams

Biotechnology: technology based on biology, using animals, plants, bacteria or other living organisms for the development of medicines, food or new substances. Applications in food and the industry are called white biotechnology. Examples include food, medicines, plastics and fuels. Often micro-organisms (bacteria or yeasts) are used that have been genetically modified to create new substances or to produce enzymes that accelerate the industrial reaction.

Clean technologies: set of technologies that contribute to a cleaner environment and/or help save energy. These are products, processes and services that improve operational performance by increasing productivity and efficiency with the most sustainable possible use of raw materials and renewable energy.

Combined mobility means that people move around using a variety of transport means, ranging from electric bicycles to electric cars (among other things through car or bicycle sharing) and collective transport.

Community Land Trusts (CLTs) are innovative and democratically managed non-profit organisations that build housing on community land for people with low incomes. The trust continues to own the land. The residents receive an emphyteutic lease or obtain a leasehold estate and become the owners of the home. When the owner sells his home, he or she receives a share of any added value. The remainder flows back to the trust. There is active community development by organising residents' consultations, participation in the construction of the house and fitting communal facilities in the housing project. There is stewardship by the CLT, guiding and supporting the residents in their climb up the social ladder and their development in various aspects of life (education, health, social life, employment).

Crowdsourcing: professionals and experts by experience create and share knowledge, information and ideas. This is done by putting assignments and questions (for knowledge, financing) "on the market".

Sharing economy (see insert p. 29-30): a socio-economic system in which sharing and collective consumption take centre stage. It involves the joint creation, production, distribution, trade and consumption of goods and services.

Disruptions (see insert p. 5 -6): disruptions are breakthroughs that serve a consumer or the market in a new way, through the combination of technological innovation and global integration.

Ecodesign can be described as an integral design activity. The designer considers the environmental consequences when taking design decisions and takes into account all the links in the lifecycle, from the extraction of the raw materials until the product is disposed of. A product's environmental impact can be reduced through the application of ecodesign principles.
(http://www.agentschapondernemen.be/artikel/ecodesign-bij- productontwikkeling)

Genomics is the study of genomes. A genome is a (sub)set of genes of a cell or organism. It can involve the study of the genes of humans, animals, plants and micro-organisms. See insert on p. 34

Hydroponics is the cultivation of plants in water, to which the necessary nutrients have been added (https://nl.wikipedia.org/wiki/Hydrocultuur).

Industry 4.0 (see insert on p. 32-33): industry 4.0 refers to the far-reaching digitisation of industry that is currently taking place.

Infostructures: services and products based on information collection and processing that jointly contribute in structures to many social activities
(https://www.tno.nl/media/5018/thema_htsm-ict_2014.pdf).

Internet of Things (see insert on p. 33): refers to a network of semi-intelligent devices that are connected with each other. As a result, everyday objects become an entity on the Internet, which can communicate with people and other objects and can take autonomous decisions based on this.

Key Enabling Technologies (see insert on p. 23): some technologies are not typical of producing one or a few products, but are crucial for an endless series of applications. The European Commission has defined six Key Enabling Technologies, in which European countries can play an important role and which can (or should) form the basis for an industrial Renaissance in the European Union**. Life sciences:** The term life sciences or biosciences refers to the collection of research fields which study living organisms and life processes. The life sciences originated in biology and have been further expanded to interdisciplinary fields of research, including ecology, biotechnology, agricultural sciences and medicine. Life sciences help improve the quality of life, e.g. through the production of biofuels, the development of new medicines or the production of renewable, bio-based raw materials for the chemical or food industry.

Massive open online course (MOOC) is a course designed for mass participation, with course materials distributed online, via the Internet. Participants are therefore not tied to a location. Students and lecturers can interact with each other through online discussion platforms.

Mechatronics is a technical discipline that combines the following engineering disciplines: electrical engineering, mechanical engineering, process control engineering, control technology.

Nanotechnology: a set of techniques with which particles the size of a billionth of a metre are produced and used for applications in among other things materials, food, electronics and medicines.
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Secondary flows: often only a limited part of the high-quality output product is valorised with contemporary production and processing methods. The secondary flows and residual flows or waste streams that arise in this regard usually have a low-grade application in the form of animal feed or as fuel for incinerating. Many of these residual fractions could be used in higher grade applications. (http://www.ilvo.vlaanderen.be/language/nl-BE/NL/Pers-en-media/Nieuwsbrief/Nieuwsoverzicht/articleType/ArticleView/articleId/760/Voedselproductie-met-het-oog-op-de-toekomst-Nevenstromen-uit-de-voedingsindustrie-valoriseren-herintroductie-in-de-voedingsketen#.Vb96puFDXeI

Nutrient or foodstuff: a natural component that is indispensable for an organism's growth and development (https://nl.wikipedia.org/wiki/Voedingsstof)

Power-to-Gas (P2G, PtG or Wind gas) is an energy storage technology that transforms electrical energy into chemical energy in the form of gas. (https://nl.wikipedia.org/wiki/Power-to-gas)

Precision agriculture is a form of agriculture whereby the treatment that plants and animals need is administered in a very accurate manner. The big difference with conventional agriculture is that conventional agriculture determines what happens per field, while in precision agriculture the need can be determined approximately per square metre.
(https://nl.wikipedia.org/wiki/Precisielandbouw)

Zone with few regulations: in zones with few regulations, you can experiment within a specific framework with another application of existing laws and regulations (for example to promote economic growth).

Suburbanisation is the migration of people from the city to the surrounding rural areas. The surrounding countryside thus faces increased urbanisation.

Synchromodality is the controlled use of coordinated transport modes, alongside and/or after each other, so users are always offered a wide range of different transport modes, depending on their needs, in terms of speed, reliability, journey times, quality, sustainability and costs. (http://www.vrwi.be/pdf/Uittreksel%20TV2025%20Urban%20Planning.pdf)

System innovation (see insert p. 78-79): a thorough innovation of the entire system (e.g. food system, transport system, etc.) and not just small changes in the margin. In this way we rethink the current models and systems in our society.

Combined heat and power or CHP is the simultaneous conversion of energy into power (usually used to generate electricity) and useful heat. CHP installations make better use of primary energy sources and reduce the emissions compared with the separate generation of electricity and heat. (source: http://aps.vlaanderen.be/sgml/largereeksen/2630.htm). The Decree on general provisions about energy policy refers to the "simultaneous generation in a single process of thermal heat and electrical or mechanical energy".

Heating network is an energy concept which uses residual heat, for example from a factory or combustion plant, or geothermal heat from deep underground, for the central heating of water. A network of well-insulated underground pipelines brings that water to nearby homes and businesses, for heating and sanitary hot water. Energy that is otherwise lost is thus sustainably re-used.

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