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FUTURE TELLING 2050

D2.1 Report - Drivers for Change

13 November 2015

Elke DEN OUDEN & Rianne VALKENBURG, TU/e LightHouse

ROADMAPS FOR ENERGY®

FUTURE TELLING 2050

D2.1 Report - Drivers for Change

Work Package title: WP2, Vision Development

Task: 2.1, Future Telling

WP coordinator: TU/e LightHouse

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Abstract

This report (D2.1) describes the Drivers for Change that impact the future or sustainable energy in cities in 2050. The Future Telling interviews and the analysis to distil the Drivers for Change (Task 2.1), are part of WP2 Vision Development, of the R4E project.

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19 September 2015	Draft - input to the Joint Ambition workshop (Palermo Oct 2015)
1 November 2015	Concept for sharing with R4E partners (limited distribution)
13 November 2015	Final version for public distribution

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quality management, project coordination, financial & administrative activities

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Joint project kick-off & SC
2-day workshop in Eindhoven with all partners to sart project (WP7) and to prepare for ambition workshops and future telling interviews (WP1)

WP1. Ambition setting

Ambitionworkshops
3-day workshop in each city to define specific ambitions per focus area

EINDHOVEN
ISTANBUL METROPOLITAN MUNICIPALITY — public transport, traffic mgt
Murcia
Newcastle City Council — domestic, non-domestic
Ajuntament de SantCugat
Tallinn

Ambition sharing & selecting drivers for change
1-day meeting in Palermo to share the results of the ambition workshops and future telling and to select the drivers for change for WP2

Future Telling
20 interviews with experts on the future of energy in the city in general and especially w.r.t. buildings, mobility and urban spaces, and analysis of the results to define the most important drivers for change

WP2. Vision development

Scenario workshops
3-day workshop in each city to develop specific desired future scenario's per focus area

Murcia
EINDHOVEN
Newcastle City Council — domestic, non-domestic
Ajuntament de SantCugat
Tallinn
ISTANBUL METROPOLITAN MUNICIPALITY — public transport, traffic mgt

Scenario sharing & selecting topics for roadmaps
2-day meeting in Istanbul to share the desired future scenario's of all cities with all partners and to select the topics for the roadmaps (covering sustainable technologies, behaviour and organisation)

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defining generic elements for future scenario's as preparation for the workshops with cities to develop specific desired future scenario's

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2-day training session for expert partners on methodology and way of working

Desk study
analysis of the available information on the selected topics for the roadmaps and to identify relevant experts

Roadmap interviews
collecting expert insights with 20 experts for each focus area

SMART BUILDINGS
- Sustainable technologies
- Sustainable behaviour
- Sustainable organisation

SMART MOBILITY
- Sustainable technologies
- Sustainable behaviour
- Sustainable organisation

SMART URBAN SPACES
- Sustainable technologies
- Sustainable behaviour
- Sustainable organisation

Creation of timelines
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Expert meeting
cross team expert meetings to share and align timelines for the focus areas and prepare roadmap workshops with cities

Roadmap workshops
2-day workshops in each city to develop specific timelines for the realisation of the desired future scenario's

EINDHOVEN
Tallinn
Murcia
Newcastle City Council — domestic, non-domestic
Ajuntament de SantCugat
ISTANBUL METROPOLITAN MUNICIPALITY — public transport, traffic mgt

WP6. Project portfolio

Current projects
each city identifies projects it has running that will contribute to the realisation of the roadmap, as well as the topics for cross-city learning

Roadmap sharing & cross learning objectives
2-day meeting in Newcastle to share the roadmaps of the different cities, as well as the current projects, and to identify cross-learning objectives

New projects
each city identifies the desired new projects to ensure the timely realisation of its roadmap ambition

EINDHOVEN
Murcia
ISTANBUL METROPOLITAN MUNICIPALITY — public transport, traffic mgt
Newcastle City Council — domestic, non-domestic
Ajuntament de SantCugat
Tallinn

Joint portfolio meeting
3-day meeting in Forli to share the portfolios of the different cities, as well as to prepare for joint projects that support the achievement of common ambitions

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organising for continued cross city learning

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Strategy & visuals
developing a communication & dissemination strategy, logo's and graphic charter

Event Palermo

Regular communication activities
electronic project newsletters, other newsletters and information services, project and partner websites, press releases and other media releases, social media

Event Tallinn

Regular communication activities

Final event
conference in Murcia

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ROADMAPS FOR ENERGY®

Version 4 September 2015

‘Roadmaps for Energy’: the R4E project

Introduction

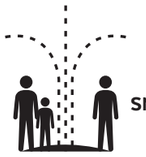
In the Roadmaps for Energy (R4E) project, the partners will work together to develop a new energy strategy: their Energy Roadmap. The difference between the regular energy strategies and action plans and these new Energy Roadmaps is the much earlier and more developed involvement of local stakeholders. These include not only those who will benefit from the new strategy, such as the citizens, but also relevant research and industry partners. They offer a much clearer view of the future potential of the city in terms of measures and technologies, as well as of the challenges presented by today’s situations in the cities. The aim is to create a shared vision, containing the desired, city-specific scenarios and the dedicated roadmaps to be embedded in each city’s specific context. These will take into account the diversity in the geography, ecology, climate, society and culture of the eight partner cities in the project: Eindhoven, Forli, Istanbul, Newcastle, Murcia, Palermo, Sant Cugat and Tallinn.

The R4E project focuses on the vision creation and roadmapping capacities of the municipalities. This includes initiating joint activities to drive the development and implementation of innovative energy solutions in cities. In this way the partners in R4E will learn the process and the roadmap structure. And they will gain the skills they need to work independently on their future roadmaps.

The ultimate aim is to create a process that will allow the partners to work together in developing the Energy Roadmap to achieve their ‘Smart Cities’ ambition. But energy and Smart Cities are too broad to cover in one project, so R4E focuses on three key areas of sustainable energy. These are closely linked to the main responsibilities of the municipalities:

SMART BUILDINGS

SMART MOBILITY



SMART URBAN SPACES

Approach

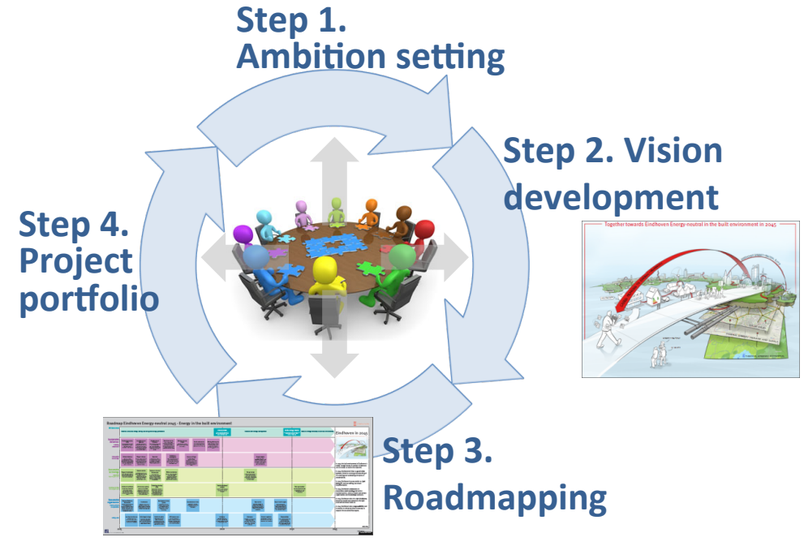
In The R4E project follows a 4-step approach:

1. Set the ambitions of the participating cities on sustainable energy and Smart Cities, as well as their choice of three Smart Energy Saving focus areas: 1. Smart Buildings; 2. Smart Mobility; and 3. Smart Urban Spaces.

2. Develop scenarios for the selected focus areas.

3. Create the roadmap. Identify existing and future technologies and other developments – these will enable the desired future scenarios. Plot the opportunities and developments on a time-line to show the route and milestones towards the desired scenarios. The roadmaps contain common parts for all the partner cities, as well as specific parts for the individual cities.

4. Create a portfolio of new projects and initiatives to achieve the ambitions, visions and roadmaps of the cities. This portfolio shows the shared and individual projects, and includes a cross-city learning plan and a financial plan.



Four step approach of R4E

Step Two: Vision development

This report is part of Step 2 of the R4E approach and describes the first part of Workpackage 2 (WP2). The aim of WP2 is to develop desired future scenarios for the cities in the selected focus areas. To do this, the first step is to hold Future Telling interviews on sustainable energy in general, and on the themes of Smart Buildings, Smart Mobility and Smart Urban Spaces in particular. Based on the results, the cities will first decide together on the most important Drivers for Change to be included in their further vision development. Together with the Drivers for Change, the desired future scenarios for the focus areas will be developed for each of the cities. They will then jointly decide on the topics for the roadmap development in WP3, WP4 and WP5. These topics will describe in more detail the elements of sustainability: sustainable technologies, sustainable behaviour and sustainable organisation.

Future Telling

Twenty-five experts from industry, knowledge institutes and governments were selected to conduct the Future Telling interviews. This method was used to invite them to share their view on the future of sustainable energy in the cities towards the year 2050. The interview results are analysed on the Drivers for Change that impact the future of sustainable energy in the cities. In the joint workshop which is held as part of Task 1.3, the Drivers for Change that need to be included in the vision development are selected.

How to read this report

This report describes the Drivers for Change, and contains all the information from the Future Telling research. It starts with a description of Future Telling – the approach, data collection through interviews, and data analysis to identify the Drivers for Change. Then the thought leaders are introduced; these describe their context, background and relevant expertise for the research. The main part of this report describes the 18 Drivers for Change that resulted from the research. They are briefly introduced, visualised and illustrated together with noteworthy quotes from the interviews. Finally, the Drivers for Change are prioritised for use in the focus area as well as in the cities, as results from the joint ambition workshop of the R4E project.


A new game-changing technology is again on the horizon. The question is which one?
Each individual is provided with personal space to develop uniquely and is suitably challenged in both their study and professional lives.
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Governments are increasingly withdrawing their control. Citizens are taking more responsibility and initiatives; both now innovate together.
39
In the expanding on and off-line social networks, people search for authenticity, economy of scale and a sense of security.
35
DO

Future Telling

Future Telling research

The future is unpredictable and elusive. Recent changes in technology, ecology, economics and society have already led to significant changes.

The expectation is that the complexity that people and organisations experience will only increase further in the years ahead. A number of current Drivers for Change will lead to radical changes in the future. For example, new developments in information technology will create opportunities that we cannot imagine today. These will undoubtedly change our lives significantly, including the way we shop, travel, move, communicate and work. Another example is the increasing social connectivity, which will drastically affect the relationships between organisations and their strategies. Even today, disruptive developments in many areas are challenging us to redesign our world.

This process of change has also become more complex: developments are so rapid that the future is unpredictable, based on our knowledge or models of the past and present. Predictions based on analysis appear pointless. The new complexity is characterised by simultaneous developments with far-reaching consequences. We need a new way to visualise the future, with all the opportunities and challenges that it will bring – an approach that is creative, imaginative and research-oriented. We can't predict the future, but we can create a range of possible, context-related future scenarios. These desired scenarios will direct our decision-making, from short-term actions to long-term consequences.

In the R4E project, the Future Telling research method is used to develop possible, context related future scenarios in a creative, imaginative way. This implies a structured method to map the expertise and ideas of the thought leaders. This process focuses on Smart Cities, in particular using analysis to gain insight into the Drivers for Change for cities in 2050.

Future Telling card set

The Future Telling method uses a set of 51 cards showing general future trends derived from an extensive research project by The Hague University of Applied Sciences. These cards are shown on page 6. They are used to trigger ideas of the research participants, and to inspire them to tell rich stories about how they think these trends will influence the future.

The approach

This research involved 25 interviews with thought leaders holding different views on smart and sustainable energy in cities, covering technological, social, economic, environmental and political aspects.

Thought leaders

Finding suitable Drivers for Change requires both broad and specialist views. This means we need a broad spectrum of experts with a visionary scope. We chose a diversified approach based on the broad concept of 'quality of life in the city of the future'. The interviewees were members of knowledge institutes, companies, consultancies and profit or non-profit organisations. Their expertise was both general on (smart) cities, and specific on mobility, buildings and urban spaces.

To overcome possible cultural bias, the experts were drawn from all over Europe, and even included thought leaders from the USA. These thought leaders are introduced on the following pages.

Structured interviews

The Future Telling card set was used in the interview. The interviewees were asked to identify relevant future trends and to tell stories about how they imagined these trends would develop. The card set with a broad collection of general trends helped in the interviews with specialists by making them consider all the relevant directions (social, technological, economic, ecological, political and demographic), and at the same time to consider more distant future scenarios. The trends that were presented triggered their thinking, and inspired them to give rich descriptions of how they saw the future develop on energy in cities in 2050.

The interviews contained three main questions:

1. Sort the 52 trends on the cards into three categories:
    - Not relevant in the context of smart and sustainable energy in cities
    - Already relevant now
    - Relevant in the future
2. Take the selected cards in the category 'relevant in the future' and pick the 10 cards that in your opinion will have the greatest impact on quality of life (or lack of it) in cities in the context of smart and sustainable energy. (The interviewees could also add missing trends which they regarded as important.)
3. Tell stories about how you imagined these 10 trends would develop and what the future would look like in the city.

For these interviews, the requested expertise of the thought leaders was not specifically their future vision, but their knowledge of important influences in their own fields. The Future Telling method inspired them to use their knowledge to visualise future trends, and to describe possible future scenarios in rich stories. In fact, the richness of those stories makes them fertile input for the R4E project.

Drivers for Change

The next step is to distil a limited yet representative number of Drivers for Change from the large volume of expert material. In this phase, the data from the interviews is analysed by means of clustering, selecting and comparing the quotes by the thought leaders. The clustering is based on both commonalities and contradictions in the statements by the experts on the specific topics.

A Driver for Change needs to address the topic of a cluster, as well as to point in the directions which the future might take. So for each cluster, a short title and a description are given to capture the richness of that cluster. The quotes of the though leaders serve as an inspiration to paint richer stories of the possible new future scenarios.

The analysis led to 18 Drivers for Change for the future of sustainable and liveable cities in 2050. We identified Drivers for Change at the general and smart city levels, as well as more specific Drivers for Change for the future of buildings, mobility and urban spaces.

The following pages give brief descriptions of the Drivers for Change stating the essence of the changes. These are supported by a few quotes from the experts. All interview quotes can be found in the appendices, where you can also enjoy the richness of the visionary stories of the 25 thought leaders.

The thought leaders

The thought leaders were selected for their expertise and visionary scope. The interviewees work across Europe as members of knowledge institutes, companies, consultancies and profit or non-profit organisations. Their expertise varies from human or social oriented to technology oriented. They are introduced through their expertise and the main criteria for selecting them for the R4E Future Telling research:

Tracy Burns is project leader of the program 'Trends Shaping Education' at OECD in Paris (France); the Organisation for Economic Co-operation and Development. We have invited her specifically because of her extensive knowledge on trends and their impact in and across the 34 Member countries. These countries span the globe, from North and South America to Europe and Asia-Pacific and include many of the world's most advanced countries but also emerging countries like Mexico, Chile and Turkey.

Pia Erkinheimo was at the time of the interview Head of Crowds and Communities at Digile, Finland. Digile is a Strategic Centre for Science, Technology and Innovation in Interent Economy, a non-profit company building open ecosystems between the public and private sectors. She is now business development partner and an angel investor at Fintertip, a social decision-making b2b app. We have invited her specifically because of her experience with crowd sourcing and innovation with user communities.

Valentine Agid-Durudaud is director of Future Sustainable Cities Program of Engie at the headquarters in Paris (France). Engie (formerly GDF-SUEZ) is a worldwide energy operator, pro-actively responding to both the constantly changing energy needs, termed energy transition, while also controlling/minimizing its impact on the climate. We have invited her specifically because of her work on the program 'cities of tomorrow', where four scenarios are developed, based upon the political, economic and social structures in the city that may appear.

Ivo Cré is Deputy Director of Polis in Brussels (Belgium). Polis is a network of European cities and regions cooperating for innovative transport solutions. Polis supports the exchange of experiences and the transfer of knowledge between European local and regional authorities and facilitates the dialogue between all actors of the sector such as industry, research centres and universities, and NGOs. We have invited him specifically because of his knowledge on current and future mobility solution throughout Europe.

Gianfranco Franz is professor of Urban and Regional Policies, at the University of Ferrara in Italy. We have specifically invited him for his work in Ecopolis; a network of leading thinkers from the world of politics, business, academia and activism who cast their view on the forces shaping sustainable cities and the role of renewable energy.

Pallas Agterberg is director strategy at Alliander in Arnhem (The Netherlands). Alliander operates energy networks which distribute gas and electricity to large parts of the Netherlands, and is actively leading the transformation to sustainable energy in the Netherlands. We have invited her specifically because of her vision on the impact of ICT and open data on the future of energy systems and the social aspects of new energy communities.

Mario Cucinella is an architect and founder of MCA (Mario Cucinella Architects) in Bologna (Italy). The studio has solid experience in architectural design with particular attention to energy and environmental issues, industrial design and technological research through collaboration with universities and research programs of the European Commission. We have invited him specifically because of his dedication in initiatives like ' building green futures' and 'SOS - school of sustainability'.

Rudolf Giffinger is an expert in analytical research of urban and regional development at the Vienna University of Technology (Austria). He is involved in a number of European smart city and smart energy projects, among others the PLEECE project. We have invited him specifically because he discusses technical innovations on energy solutions for cities and regions in a social science based planning perspective.

Jens Bartholmes is policy officer at the European Commission in Brussels (Belgium). He focusses on the European Innovation Partnership on Smart Cities and Communities. We have invited him specifically because of his personal interest in smart energy solutions in the context of smart cities.

Martin Curley is Vice President of Intel Labs in Dublin (Ireland). Intel is involved in various smart city projects, among others in Dublin and London. He is also one of the members of the Open Innovation Strategy and Policy Group of the EU, and is co-author of the white paper on Open Innovation 2.0. We have invited him specifically because he is a strong advocate for open innovation ecosystems in the context of smart city solutions.

Stephen Grant is Program Director Innovation, Marketing and New Business at Engie's headquarters in Paris (France). Engie (formerly GDF-SUEZ) is a worldwide energy operator, pro-actively responding to both the constantly changing energy needs, termed energy transition, while also controlling/minimizing its impact on the climate. We have invited him specifically because of his visionary, yet feasible view on smart solutions for cities and buildings in the future.

Leendert van Bree is senior policy researcher at PBL (Netherlands Environmental Assessment Agency) and associated professor at Utrecht University. His expertise is strategic policy analysis, environment and health, and healthy urban futures and planning. We have invited him specifically because of his broad view on environmental, ecological and spatial aspects of urban development, including insights into societal trends that influence the quality of life and living in the future.

Tomas Diez is an urbanist from Venezuala and now director at the Fab Lab in Barcelona (Spain). He is involved in projects such as the Smart Citizen Kit, providing open source technology for citizens' political participation in smarter cities, based on geolocation, Internet of Things, Open Source hardware and software for data collection and sharing. We have invited him specifically because of his smart citizen perspective and experience with online innovation collaboration platforms.

Sascha Haselmayer is trained as an architect and urbanist and founded Citymart, where he is now based in New York (USA). The company transforms the way cities solve problems. We have invited him specifically because of his experience in public and urban service innovation from a citizen perspective.

Sampo Hietanen is CEO at ITS in Helsinki (Finland). ITS Finland operates intelligent traffic and transport development co-operation forum for gathering the administration , research and business partners together. We have invited him specifically because of his vision on the future of mobility as a service.

Brage Johansen is CEO at Zaptec in Stavanger (Norway), a company active in the in the field of super compact power electronics for use in cars, energy and space. We have invited him specifically because of his vision that reaches far into the future and builds upon space technology for smart and sustainable solutions.

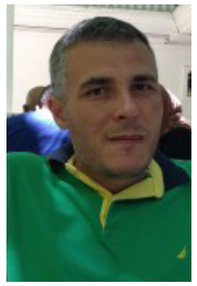
Jim Keravala is Chief Operating Officer and co-founder of Shackleton Energy Company, establishing a fleet of space propellant depots and reusable transport systems utilizing lunar polar water for an assured continuous supply of fuel in space. This infrastructure will form the platform of a major new space solar power consortium, the Off-World Consortium, launching to solve the grand global challenges of energy, fresh water and global high bandwidth communications with a single off-world solution. We have invited him specifically because of his far reaching ideas and interest in technologies that will fuel the space economy and bring sustainable energy solutions for earth.

Maurits Kreijveld was at the time of the interview senior researcher at the department Technology Assessment of the Rathenau Institute in The Hague (The Netherlands). He is a futurist and an independent consultant who is fascinated by the interaction between new technologies and people and how this shapes the future of our society and organizations. His last book ‘The Power of Platforms (2014)’ describes the rise of platforms as a new model for social innovation. We have invited him specifically because of his fascination for the possibilities of new technologies and its impact (such as privacy and security) on humans and society at large.

Ilari Lindy is Senior ICT Policy Specialist at the ICT Sector Unit at The World Bank in Washington (USA). He has been involved in wide range of international, regional and national initiatives supporting innovation policy and systems development with particular focus on development and take-up of ICT enabled innovations. We have invited him specifically because of his view on ICT-enabled social and economic development achieved through various Open Innovation and grassroots approaches.

Peter Loeffler is head innovation and industry affairs at Siemens Switzerland. The company is involved in many front-runner smart buildings and smart city projects, such as the Crystal in London. We have especially invited him because of his view on the possibilities that future information technologies will provide to buildings and cities.

Aybike Öngel is an expert on Urban Systems en Transport Management at the department of Transportation Engineering at Bahcesehir University, Istanbul (Turkey). The department has a works closely together with the municipality of Istanbul on mobility and transportation issues. We have invited her specifically because of her experience on mobility and transportation in a metropole such as Istanbul.



Halit Özen is an associate professor at the transport division of the department of Civil Engineering at Yildiz Technical University in Istanbul (Turkey). His research includes intelligent transportation system, traffic control systems, freeway operations, simulation/ dynamic traffic assignment and pavement management and design. We have invited him specifically because of his expertise in smart traffic systems.

Stefan Schurig is Director Climate, Energy and Cities at the World Future Council in Hamburg (Germany). He devoted most of his career to energy and climate change issues. He works as a direct advisor for governments and parliamentarians around the globe and authored various publications on climate change subjects. We have invited him specifically because of his drive to enable a massive uptake of renewable energy.

Pieter van Wesemael is professor Urbanism and Urban Architecture at the Eindhoven University of Technology in Eindhoven (The Netherlands). The focus of his work is on the interaction between the genesis of the (western) urban culture and the development of new architectural and urban paradigms or concepts. We have invited him specifically because of his visionary view on new city concepts, especially on the correlation between Quality of Place and the Quality of Life for the everyday life of its citizens.

Harald Wilkoszewski is Head of the Information Centre of Population Europe in Brussels (Belgium). Hosted by the German Max Planck Society, this European network builds upon the unique knowledge base of 40 research centres and collaboration partners, and more than 150 leading experts in a Council of Advisors. We have invited him specifically because of his expertise on demographic and family trends within Europe.

We would like to thank all participants for their contribution to the Future Telling research.

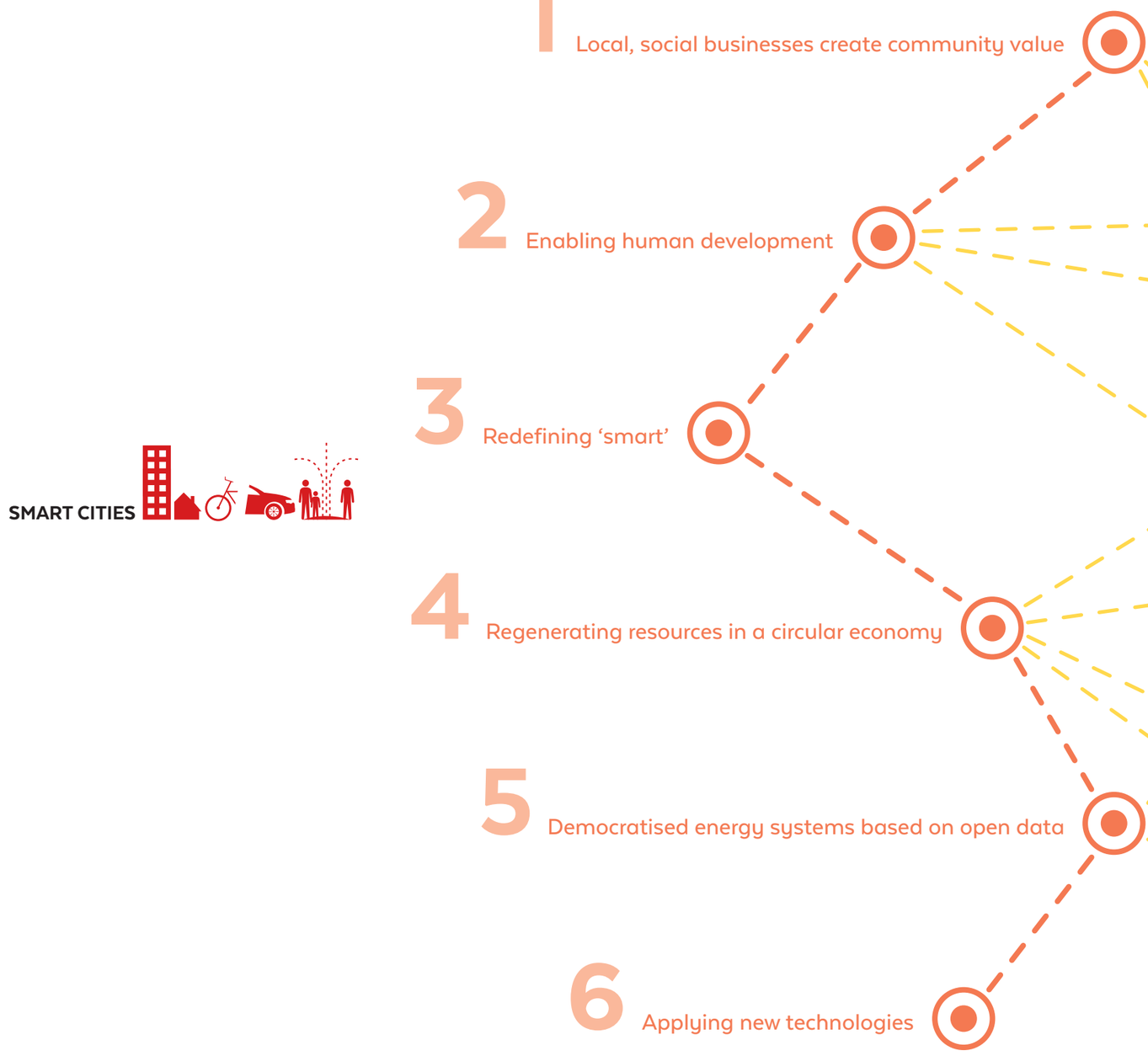
The drivers for change

All the quotes from the Future Telling interviews were analysed and clustered into topics to distil the Drivers for Change. These will determine the future scenarios of Smart Cities in Europe in general, as well as the future of the focus areas of the R4E project. The analysis of the Future Telling interviews resulted in 18 Drivers for Change (see the illustration). These Drivers for Change are as follows:

- 6 for the future of Smart Cities in general
- 4 for the future of Smart Buildings
- 4 for the future of Smart Mobility
- 4 for the future of Smart Urban Spaces.

The 18 Drivers for Change as shown in the illustration are strongly interlinked. The Drivers for Change for the future of Smart Cities in general also provide important foundations for the Drivers for Change in the three specific focus areas. For example, the first Driver for Change – 'Fostering social local business for community value' – is an important enabler for the creation of affordable social housing. It also promotes affordable mobility services that enable citizens to go anywhere, as well as the creation of self-sufficient communities that improve their own living environments.

The 18 Drivers for Change are described on the following pages in short summaries. They are illustrated by quotes from the Future Telling interviews to show what the drivers might mean for cities in 2050. All the quotes are taken literally from the interviews, and each contains a unique code [FT number.number] indicating the interview it was taken from and its sequence in that interview. All quotes from the Future Telling interviews are listed in the appendices to present a complete picture of the possible future scenarios.



Technology with a human focus 7

Better buildings 8

Flexible ‘re-purposing’ 9

Building business for social living 10

SMART BUILDINGS

Experience, experience, experience 11

Personal mobility as a service 12

Valuing public transport 13

Small-scale production through city logistics 14

SMART MOBILITY

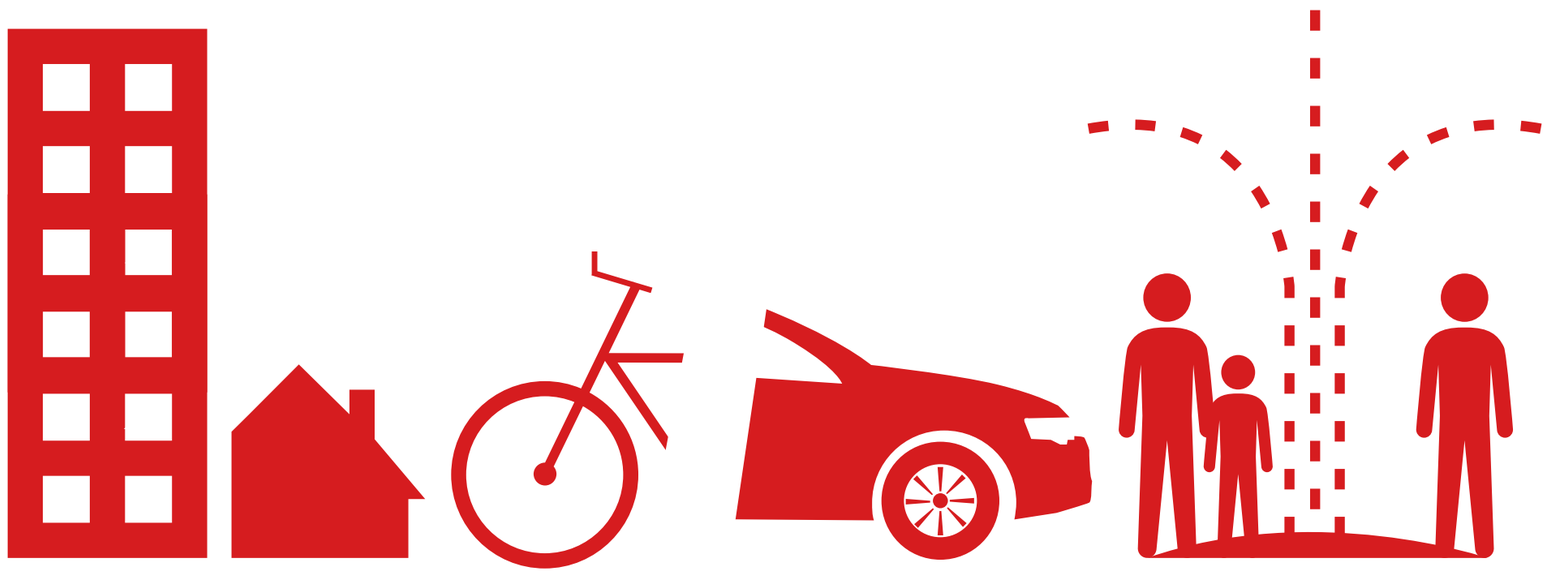
Attractive cities with unique qualities 15

Better living at a human scale 16

Connecting to ‘green’ and ‘nature’ 17

Self-sufficient communities 18

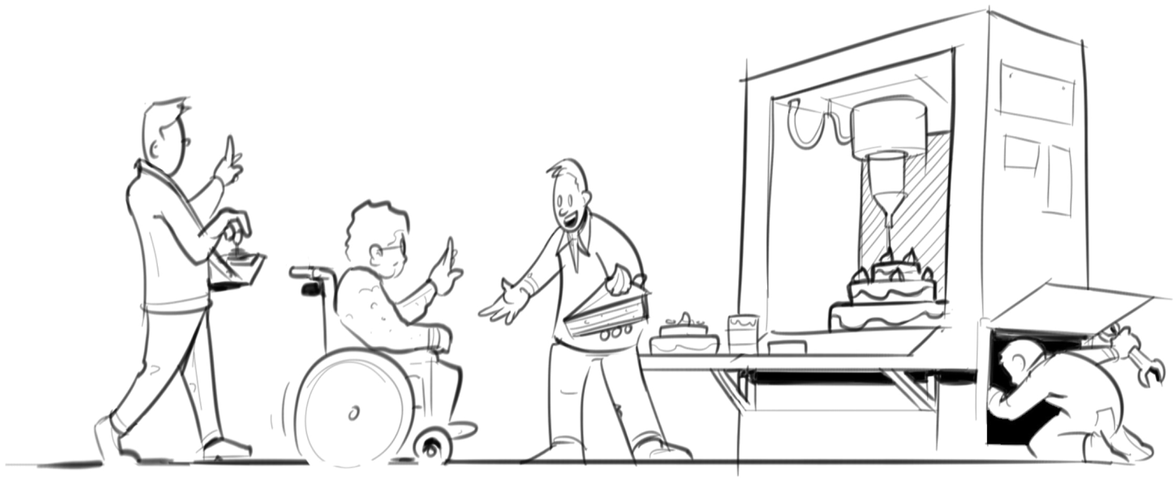
SMART URBAN SPACES



DRIVERS FOR CHANGE FOR THE FUTURE OF SMART CITIES IN GENERAL

1 Local, social businesses create community value

In 2050, smaller businesses creating real social value at local level are the norm. Communities and cooperatives have developed new business models ensuring constant investments in infrastructure. These enable the development of new products and services delivering social and environmental value. Innovation means co-creation and cooperation, aimed at creating end-user values. Self organising, self-managing communities are the new social and market paradigm – all enabled by the new city governance models. These drive the transition to empowered citizens who demand a range of sustainable solutions. Municipalities facilitate this transition by creating the required economic and legal frameworks, and by constantly focusing on the public interests.



This Driver for Change represents the following clusters of quotes of the thought leaders:

a. Business models enabling continuous investment in infrastructure upgrades
b. Fostering local business for social value
c. New economic models taking into account social and environmental value explicitly
d. Reaping the benefits of co-creation & cooperation in innovation on end-user values
e. Opportunities for cities in new governance models to drive the transition, facilitate innovation and safeguard public interest
f. Democratising power: power to the citizens
g. Self-organising and self-managing communities as the new social and market paradigm
h. Setting the economical and legal framework

FT19.10. Like for energy we know that if you create an infrastructure for energy, you should create the condition that everyone, everywhere can connect and deliver and access energy. It is a condition that you should guarantee on the long term. If you develop new services, e.g. electrical cars, you can connect. Now there is in many cities the discussion on what to do to create charging opportunities for electrical cars. … What is relevant for the combination of the cities is to define what is needed from an urban perspective, and what is relevant in terms of access to utilities and business models. There is another party: the grid operators. That is relevant in terms of who pays the price of the investments, how is the charging done. You need regulation to ensure that this is done right. You have to do that now, together with other cities. If you do it in the right way, and you set the right conditions, be clear about the requirements for the charging infrastructure, it does not matter anymore what kind of company does the investments. Then you have suddenly access to all the companies that have the money to this kind of thing.

FT16.05. Important here is also the transition of how people experience value and money. That may be part of the solution. Because when we are looking at what happens in the world, there is money somewhere, and part of this money belongs to people. So I think in the same way as micro-credits supported the development of economy in developing countries, I think it can also help to finance the energy transition.

FT4.09 This is a typical role the government should take. Not the easy liberal way: everything is for the market and the citizens, we just have to find out. But there should be also awareness that you should be involved in his transition. You have to facilitate, or even more actively stimulate: co-initiate. In order to be a matchmaker, you will need some funding, organisational power, space, and then something can grow. The new municipality should be a navigator.

FT3.26. The government is not necessarily losing its grip. It can still be playing an important role in safeguarding public and common interests. … Even communities and crowds have a lot of difficulty in providing high quality of service, sustaining service and with decision making and playing an effective role in negotiations. These functions will still be there. Also making sure that the plans of one citizen and the other do not intervene too much. We might be needing more Judge Judy's, because we need some authority to accept the outcome. These kind of processes are needed.

FT6.3. Certainly technology will have an impact on the social aspects of urban living. Through ICT and internet and mobile phones, we get better connected. That means that those groups in cities who have a low socioeconomic status will be given the opportunity to climb up on the ladder to have the same information, potential and technology potential as their rich neighbour. It will enable those people to also use technology and the internet to inform themselves better. So also this information; it would not have been available if without that technology. It will make them better informed citizens which will improve their quality of living in the city, climb up on the ladder to have the same information, potential and technology potential as their rich neighbour. It will enable those people to also use technology and the internet to inform themselves better. So also this information; it would not have been available if without that technology. It will make them better informed citizens which will improve their quality of living in the city.

2 Enabling human development

In 2050, city residents are resilient, and can consciously adapt their behaviour to enable personal development. The middle class have largely disappeared. People have found new ways to live meaningful lives, building on opportunities at all levels – from local to global. They can handle large amounts of information to make personal choices. Smart, human-centric city environments provide inspiring places for lifelong learning.

This Driver for Change represents the following clusters of quotes of the thought leaders:

a. Enjoying a meaningful life
b. Ongoing learning and personal development
c. Resilient people
d. Personalised solutions enabling to rethink your behaviour
e. Making personal choices in the context of too much data

FT8.15. … And you actually have more free time. And that means that you then have to think about what else you can do in that free time. … So maybe there is a much more modern perception of what is work like verses personal life. And personal life may also include that you are in the governing board of your school, or your cities water production, or solar panel installation group, but that is not considered your work, that is just how you spend your time.

FT22.04. It is very important to give the next generation access to all the knowledge and all the technologies. But also to teach the importance of how to live in the urban society. … It is important to manage all this in the right way.

FT8.16. There will be a need by 2050 to develop not only resilient infrastructure but also resilient civilians to overcome natural disasters. … That there will be more and more dramatic environmental events. And they will have a real impact on very predictable cities and countries. Not only flooding, but also fires, extreme temperature, and I think that in that sense every city will be vulnerable. … You need built an infrastructure for the city that is protected from that. But you also need to build civilians that are able to have that resilience, that are able to "yep, this is coming, this is what we need to do, we'll move on and if something happens, which will, then we have the means to deal with it and we will move forward." … the civilians are actually able to plan for that complexity. They understand that they cannot control everything and they can just manage the effects. And they know that they can do that.

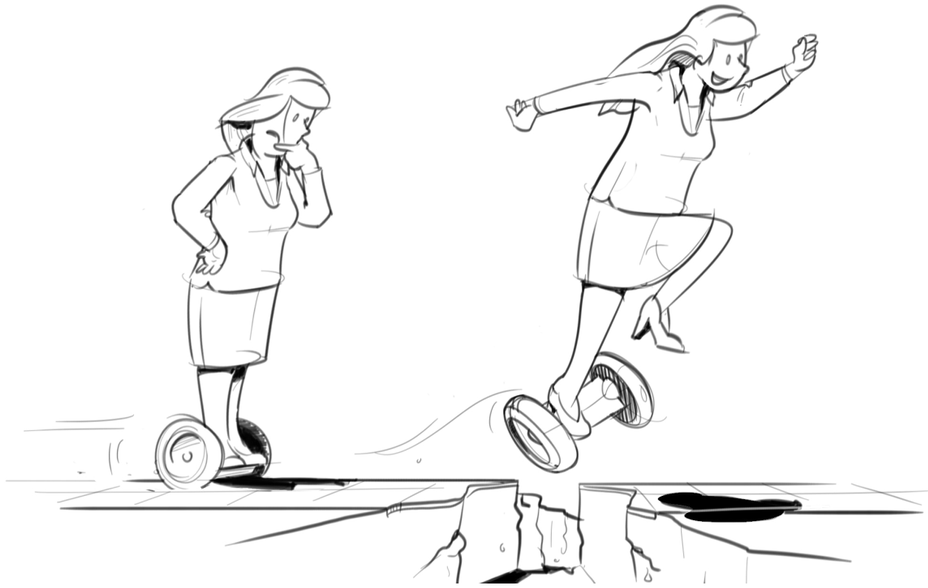
FT9.07. … So the new generation has to optimise their resources and have to learn about the consequences.

FT15.10. How people cope with that will be another question. Today already, let's call it the younger generation, have modified how they take in information, where you and I used to read things from paper, from page one all the way to the end. That will never happen again. The contextual information that you come across, has to be in 150 characters. But that already changed us.

FT9.10. Our behaviour is driven by facts. All this data is definitely defining our choices. What we see on Facebook and Instagram, it has a big, big, big influence on our choices. Our choices are now defined by these kind of social networks…. these networks are easy. And that is even going to be much more useful for the next generation.

3 Redefining ‘smart’

In 2050, we use an extended definition of ‘smart’. Both citizens and municipalities can deal with unexpected, disruptive events. Decisions focus on people, and resilience is key. The belief that everything can be engineered and controlled no longer holds – everyone is ready for uncertainties. The idea of dealing with unavoidable uncertainty has implications for every aspect of city life.



This Driver for Change represents the following cluster of quotes of the thought leaders:

a. Using technology to become more resilient to unexpected events

FT22.10. Now I see that smart cities is not as popular anymore as it was a few years ago as a paradigm, as a model. Now there is a growing concept, which is resilience. Resilience is trying to give new sense to the concept of sustainability of smart cities.

FT22.11. Resilience is going more close to sustainability. It provides a new tentative to sustainability. The word is not clear, for me as an architect it is clear. In buildings it is very normal to use. A building has to be resistant, but also resilient. Probably for an earth quake. It should be resistant for the shock, but if it is too resistant, the structure would probably break. Resilience means to be flexible. Not to return back to the original condition, but probably a little bit different, like old buildings, in just a little bit different state. This means adaptation. So it is not easy to explain to people how that works. Most of the times it is like natural behaviour: to adapt to stay alive. But adaptation and flexibility are very abstract terms.

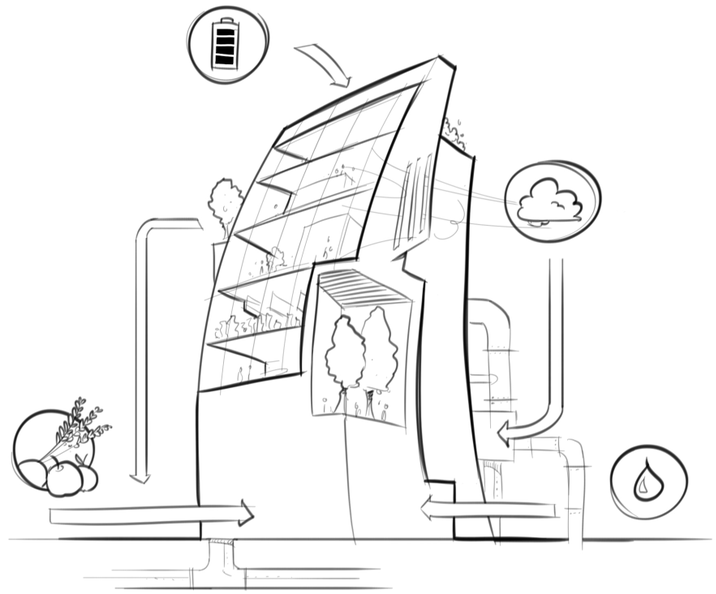
FT20.18. … I do think that in our scenario’s that are really happening now, a lot of things appeared that we have not expected. We should try to capture the unexpected too. We did an analysis with Norway after the Breivic shootings and we analysed the errors. The main outcome was that they were not prepared for the unexpected. You can never be prepared for some crazy shit, but still we should be more resilient to changes we cannot really expect.

FT13.09. Also, that is part of the attractiveness of these innovations, they are all disruptive. To be able to cope with disruption will be the main competence of future cities.

FT19.12. Being obsessed by unfathomable complexity is not relevant, because it only an expression of not knowing what to do when things change. Don’t think in that way. The same holds for worrying about who is able to access knowledge, because it is thinking in terms of winners and losers. But it will not be that way: we win all or we loose all. We live together in the same world.

4 Regenerating resources in a circular economy

In 2050, the circular economy ensures self-sufficiency of cities. Renewable energy is abundant, and this ensures a secure supply of vital resources for life (energy, water, food and clean air), although other resources may still be scarce. Cities have implemented circular systems to regenerate all the resources needed by their populations. These mechanisms are based on small-scale, local solutions, enabled by changed decision-making levels.



This Driver for Change represents the following clusters of quotes of the thought leaders:

a. Self-sufficiency based on an abundance of renewable sources and storage solutions
b. Regenerative cities with circular systems for all relevant resources
c. Securing supply of food, water & clean air

FT3.08. Abundance of energy is really foreseeable in the future, also of other resources, maybe even water. We will have energy producing houses, energy producing green houses, energy producing cars with solar rooftops etc. This will have a big impact.

FT16.13. I see the development of renewable energy too. Not only in generation, but also in biogas. We have made some analysis and we think if we can produce biogas from 100% of the green waste in a city being from homes, from schools, from restaurants, from city gardening, from supermarkets, we are able to produce enough biogas to feed all the buses and all the waste collecting trucks with that. It is still expenses, and now more expensive than filling them with fuel. So as long as we accept the emissions, nothing will change, but in the end we have to. ...

FT15.1. In the not too distant future, so by 2050 we'll have a scenario where there will probably be four commodities as we will see it. Nowadays we've got electricity, gas and water. I think air quality will become something we have to pay for. One of these days we will have to pay for clean air.

FT24.01 We do everything to bring renewable energy better into the grid, by using smart grid technology.... As soon as we have this abundance of energy – either renewable energy or nuclear fusion for example – then we still need a smart grid to put the energy to the grid, but we don't need to worry about saving energy by all means. ...

FT21.14. My vision for a city, for the 'ecopolis', or the regenerative city, is a city that basically has all mechanisms to regenerate the resources that are absorbed by the people who live in the city. Be it the materials, the food, be it the energy, the air that they breathe. And if this principle of regeneration becomes the guiding principle for designing cities, then we will come to this ecopolis. Where you have lots of green spaces to regenerate the air. Maybe some kind of urban farming places. Maybe we see skyscrapers that are not just for offices that remain empty, but that have some kind of food production, that host people, and that are some kind of a sustainable system in themselves, generating the energy. It is actually a very liveable place.

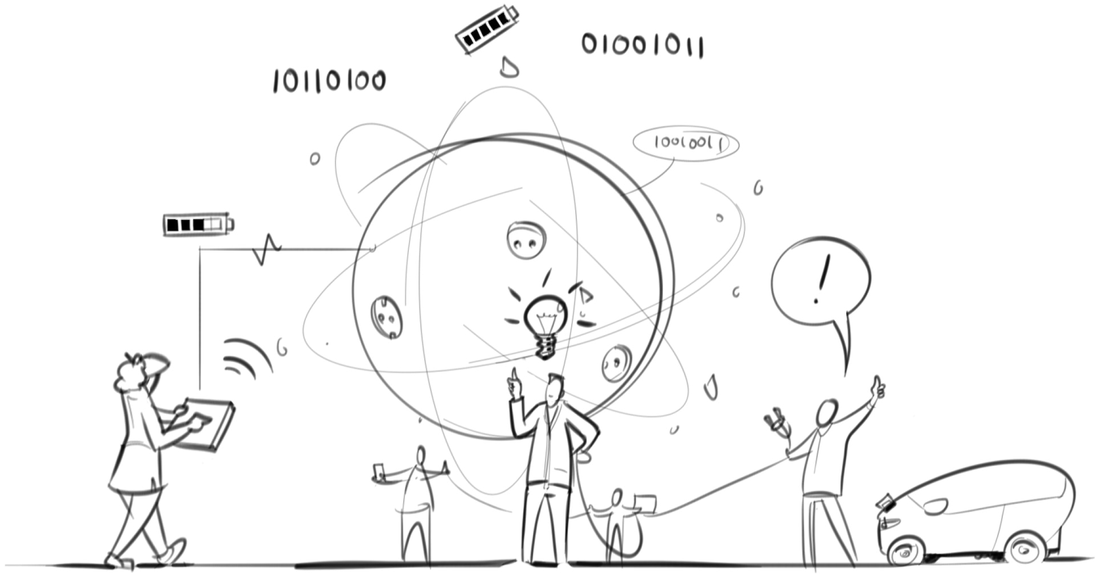
FT17.06. The new game-changing technologies will be more probably in the field of materials. It will totally change the way we make things, and the way we actually can reuse the material. ... It will be more like material engineering, things can be programmed, there is no trash, because you can reprogram the material and turn a computer into a car, just with new code. ...

FT21.4. Major issues, like food, production and water supply are regulated and organised on a global scale. That is already relevant now, but it is definitely one of the future trends. ...

FT21.19. For water I give a concrete example. It is about regenerating the resources. If you look how in some cities water and sewage is treated, ... Treating our sewage or water system in a way that regenerates the resources and nutrition makes a lot of sense to me. ... It is an important factor to start to separate those immediately to be in a position to much easier reuse it, than it gets all mixed up in what we call black water. I think that is still on a very low developed level unfortunately. We had somebody in our expert group, who has proposals for the separation of our sewage and regaining nutrition and bring them back to the agricultural system. That makes a lot of sense when it comes to regeneration. ...

5 Democratised energy systems based on open data

In 2050, energy systems are open, bidirectional, multi-purpose platforms on which (renewable) energy and energy management services are open to all. Entrepreneurs have developed business models that provide value for them, for their users and for society at large. Citizens can choose freely from a range of available options. The system ensures privacy and security of users, who are always in control. Ambient energy networks provide connectivity for (wireless) access to data and energy. Increased computing power and artificial intelligence make system resilient: self-organising, self-sustaining and self-learning.



This Driver for Change represents the following clusters of quotes of the thought leaders:

a. Open infrastructures to bring together supply and demand of energy in decentralised systems
b. Privacy and security in systems and services build on open data
c. Being in control with or being controlled by intelligent systems
d. Merging brain power and computer power to make smarter decisions
e. Integrating (wireless) data and ambient energy networks

FT3.10. There may be a competition of energy networks. Also there will be an integration of data and energy networks. But it could also be a completely new energy internet that is competing with the existing systems.

FT3.09. In cities you will need some sort of layered structure, in which you have a grid that provides stability and interconnectivity, and on top of that you will have more freedom and less restrictions to design your own thing. It will affect the city as it will no longer be needed to have global or national grid that is build by a government. But there will be local grids that provide enough stability by sharing resources so that you have a guaranteed stable energy production in the way you want it. You need to ensure that everybody can connect to such a grid, but it will be more local grids, that do not necessary need interaction. ...

FT19.04 ... One of the other things in district heating now is that the one who owns the network is also the one who provides the service. It is like a monopoly. You cannot choose. We need a new type of district heating - open. Not only to increase the investment capacity, but also for everybody to be able to put heat on the network. So that you have a distinction between the network infrastructure and the heat generation capacity. Because in the city there are a lot of heat sources, e.g. industries, data centres. They produce a lot of heat and this can be used to heat buildings. So you need this openness, like for electricity.

FT19.06. The other important value is openness. The way I described it, the way we organise it has to be open. Technology is available, but what kind of openness do we want? By getting this openness you get a new form democracy. ...

FT13.35. Data is the fuel of the 21st century. ...

FT16.03. ... the fact that people do not need energy, but they need to wash, to cook, to be warm. The fact that they will be able to produce energy directly, or coming from their neighbour. And the fact that digital technology will allow to combine this supply and demand, I will guarantee that all activity will move from energy producer and energy distributor towards energy manager. ...

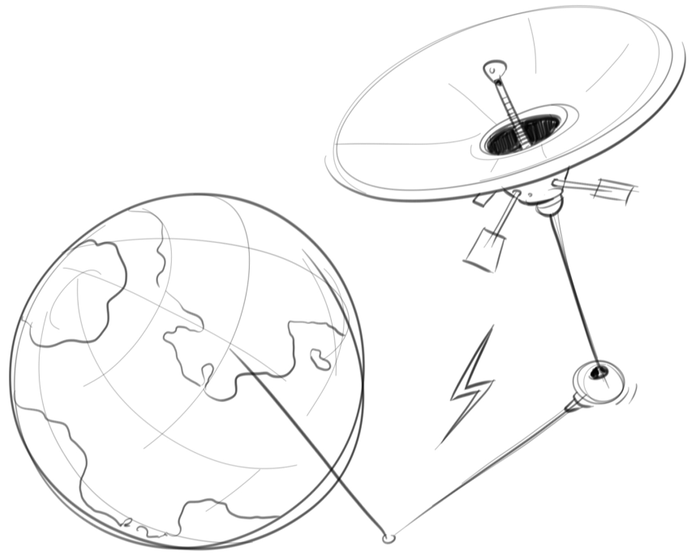
FT1.06. Analysing and monitoring our human systems on the social level, in public spaces or in social contexts, we will have a lot of new conditions which we do not know up till now. Next to an impact on humanity, it means that we have to redefine what is life and what is public and what are our civil rights. ...

FT10.14. ... I think in 35 years, when we really get this wisdom of the crowd, and let the crowd of humans, robots or together decide. You cannot really draw a line between humans and robots and you can't actually soon draw a line between a human and computer. ...

SMART CITIES

6 Applying new technologies

In 2050, a range of new technologies are available and affordable. Some of them are already in development, others are still unknown. Cities apply those technologies in new solutions that contribute to the quality of life, and in particular to the creation of smart buildings, smart mobility and smart urban spaces.



This Driver for Change represents the following cluster of quotes of the thought leaders:

a. Applying new technological solutions to increase quality of life in cities

FT7.17. There is another trend that is now not included: in 2050 humanity has moved into space. We will have much more activity in space, on the moon, on asteroids. ... When we succeed to harvest energy in space and beam it to earth it will be a revolution.

FT2.15. We will have our first test satellite up with solar power in 2017. We might be able to have the worlds first beaming of solar energy from space.

FT5.01. In 2050 I imagine that they are looking for the new world in space, out of our world. ...and maybe, if we will create a much better world than this one, there will be no-one left on this planet.

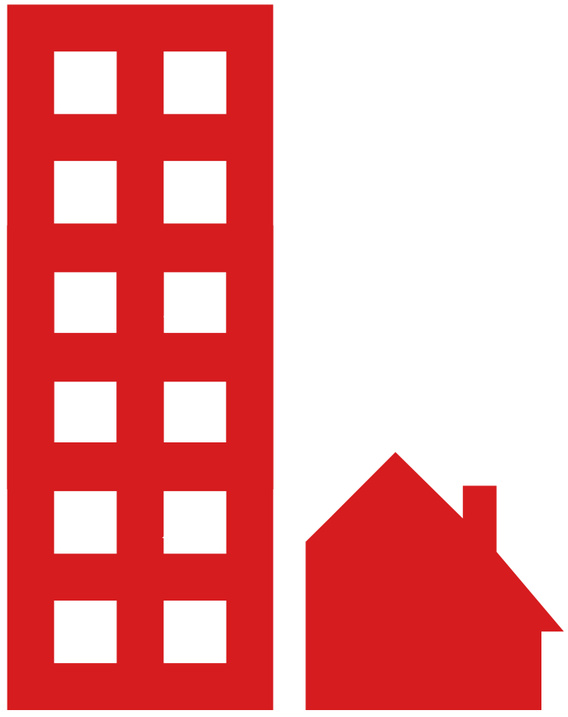
FT8.11. ...Technology will make diseases extinct. ... To be honest I do not know how feasible this is by 2050, surely aids, maybe not distinct, but under control. But if the key could be unlocked, for cancer for instance, I think this would have a huge impact on people's lives. Also because we will be getting older, so the more that you can cut out these kind of things would contribute to premature deaths, but also having an impact on the quality of live ...

FT10.13. ... I am not saying that by 2050 we will have an infinite amount of energy, but we will have so much that we can consider things like the 'beam-me-up-Scotty' type of stuff or space travelling.

FT5.07. ... Technology will enter all kinds of fields and disciplines, so this will happen everywhere.

FT2.12. Maybe the sweet spot is fabrication in the city, in vertical farms or whatever, 3D printing food. If I want a cup of coffee, I'll print the cup. The table will be a 3D printer, printing up my cup. One of the divisions in Carnegie University has a project on programmable matter. At the moment they are little units, but their idea is to have them at micrometre scale, where the particles are basically magnets, they change colour, they've got behavioural autonomy and swarm collective intelligence. It is basically very fine dust that can take form and shapes and lock into. It may sound as fantasy now, but this sort of thing will be there in 2050. ...

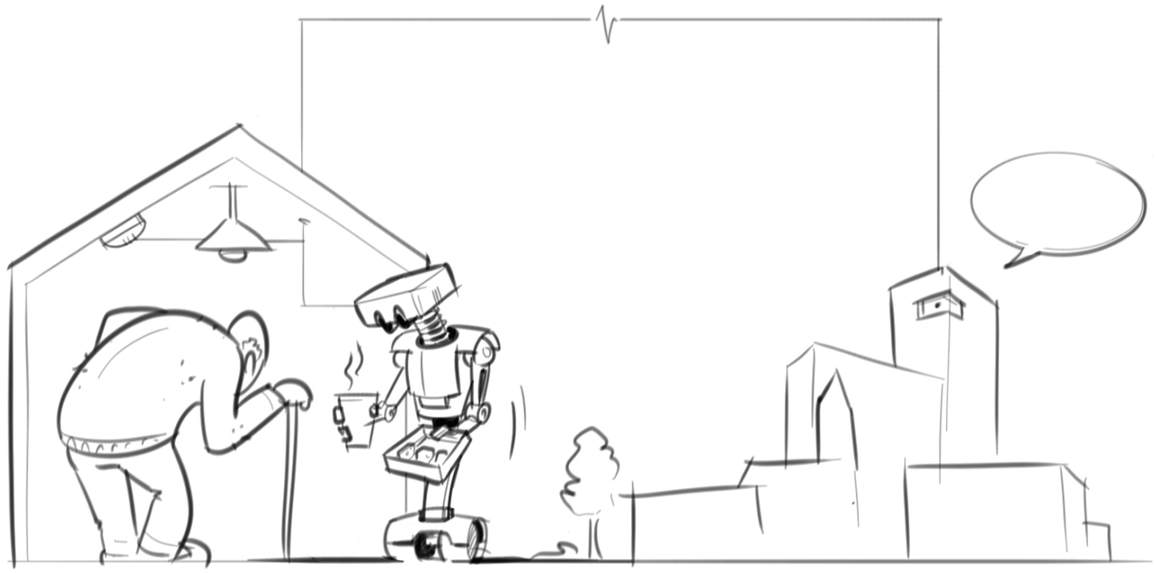
FT15.06. Today all buildings have an AC grid (alternating current), some today have a DC grid (direct current). By 2050 there will be DC grids. The majority of the assets in the buildings will be DC.



DRIVERS FOR CHANGE FOR THE FUTURE OF SMART BUILDINGS

7 Technology with a human focus

In 2050, we've mastered the challenge of ever more complex, multifunctional systems and the need to make them easier to use. Those systems are user-focused: that means users can understand how the systems work, and how their own behaviour affects sustainability and energy use. Robotics and smart (home care) systems support living at home, helping people to live healthier lives and to stay in their homes longer as they get older. There's a range of available solutions that plug-in directly to the city's open energy platform.



This Driver for Change represents the following clusters of quotes of the thought leaders:

a. Smart systems with a human touch

b. Improving quality of life with robotic support and home care systems

FT22.12. It is important to invest constantly. So people understand immediately the advantages of new technologies for sustainability in buildings and houses. Just to save electricity or for condition, because they immediately save money. That is very easy to understand. This requires a change for the experts to develop good scenario's. Not in the far future, or even the future, it starts right now. They have to present in a way that people easier understand.

FT15.13. Now today there is things you can do in the home and around to save energy. … The value in Euros is not worth much. And I don't think honestly that most home owners want to reduce their energy bill either. They just don't want it to go up. … We have the technology to help you do that. Some of these technologies even mean that they can help to reduce your bill. So you could save 5 Euros a month. If you could translate that 5 Euros into something that is valuable. So if you say look, if you allow us to join you, or to involve you in this response-demand program, you will see no reduction in your home comfort, the heating will be on, etc. And we will take those credits and with those credits, we will give you another system in the elderly home where your mother lives, 300 miles away. It is very simple, you can set a scenario, that if the lights do not get on between 7-8 in the morning, or she doesn't put the kettle on between 7-8, then we will send you a text message and you can ring her up to see if she is alright. … So instead of the 2 or 3 Euros, translate that into a service that is very cheap to deliver but of a very high value to the individual. The challenge around utilities is to engage with the customers.

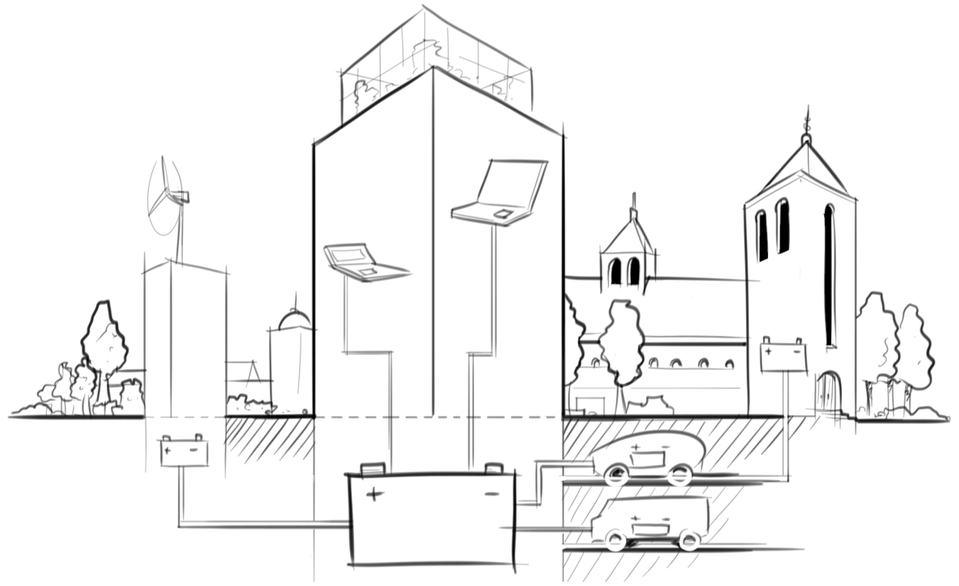
FT23.01. … This is the weak part of the story. If we do not speak about these weak elements of the society in the suburbia, then there is no way to talk about energy. Energy is invisible, people do not see it and do not understand it. They do not know where energy comes from and they do not connect the fact that you have energy and that creates problems in terms of emissions and pollution. So if you do not connect to that idea that energy has an impact on everybody, then you can never win.

FT 15.17. … Interesting will be the lighting. If you want more lighting, and you want to turn the switch, you are actually saying 'I want more light for reading'. Now the building can do anything to his ability to analyse and see if it does so by letting more lights in from using the blinded windows or change the transparency of the walls. It will do whatever the most efficient solution is to give you what you need. And then as a last resort, okay turn the light on. The switch of tomorrow is just a sensor and the robotic support mechanism will change walls, windows, blinds, everything to help you get what you need.

SMART BUILDINGS

8 Better buildings

In 2050, new buildings combine historical qualities and new technologies, creating maximum comfort and functionality for their users. Historical expertise in building for specific local climates is used to design solutions for new buildings, and for thoughtful upgrading of those already existing. The latest technologies and materials are applied to make buildings self-sufficient or even energy positive, contributing to abundant of renewable energies in cities. Policies aim at improving the quality of neighbourhoods and strengthening the sense of community, and not only at reducing energy consumption.



This Driver for Change represents the following cluster of quotes of the thought leaders:

a. Blending the quality of our architectural past with the opportunities of new technologies

FT15.02. By 2050 we will be in a scenario where the building itself stores the energy that it needs. .... Today, even in this building, there is a lot of energy stored in every battery in every machine, but they are not connected to one another. There is a lot of cars parked underneath this building, and whether there will be cars in the future or cars will be slightly different, but there will be battery powered mobility. So all of that collective energy can plug into the building, to pair with the building. And buildings can then plug in into other buildings and share all this energy that is there.

FT23.05. ... because the climate change is a reality, it will effect more the lower class people. Which is a big number of people in Europe these days. Last year, we had a big crisis and people did not use any gas and energy for cooking anymore. They were reducing the amount of energy because they were not able to pay the bills. We need to be very careful about these things. Energy savings in this way is easy, ... I believe we should make policy that is not aiming for reducing energy, but aim for increasing the quality of fabrics and buildings. But if you are not able to explain why this is necessary, then it will not work, because no one will invest money voluntarily to do that.

FT22.15. We also have the problem of social housing that were built in the last decades and all these houses are very bad. Poor constructions, poor systems. After the second World War the set-up, of cities of houses, has been forgotten. There is now no more money to change completely. The problem is that these neighbourhoods become the place where the new people will stay and that creates a lot of conflicts.

FT7.18. In 2050 you will get windows with electricity generating capacity in them. And smarter houses, and new infrastructure for electricity with IQ as we say. A lot will happen in new and refurbishing old buildings.

9 Flexible ‘re-purposing’

In 2050, we’ve adapted to continuous city dynamics. Buildings are part of the constant transformation of urban area. People know that ‘things are always changing’, so they have an open mind on how buildings and spaces are used. So this can change over time - or even during the day – in line with changing needs and events. As properties become available, they are used for meet the specific need at that time. Individuals and smaller collectives with shared interest have easy access to available properties, sites and services. Historic buildings and cultural heritage are ‘re-purposed’, taking their specific qualities into account.

This Driver for Change represents the following clusters of quotes of the thought leaders:

a. Re-purposing as part of urban planning
b. Different use of spaces in time

FT4.03 … If we are going to a situation that is much more balancing between autonomous, cooperative, collective initiatives which are related to each other in a decentralised way, then I think that will have tremendous impact on how we try to manage that. Far more decentralised, semi-autarchic systems then the old hierarchical one. … At the moment you see a lot of examples of temporarily use of spaces and buildings, which is trying to fit into temporary needs of small collectives of local stakeholders or shareholders. That is clear evidence of it. And the increasing popularity of it and it also fits perfectly in this evolutionary idea, because it is not so much anymore about making a blue print plan, it is much more about ‘go with the flow’, or floating on the local flows, and let things grow. That does not mean that these temporary things come, go and there is nothing, they can grow, flower up, go through phases and increasingly becoming richer or more mature, a study for local and area development where we can play and experiment, of which we can learn.

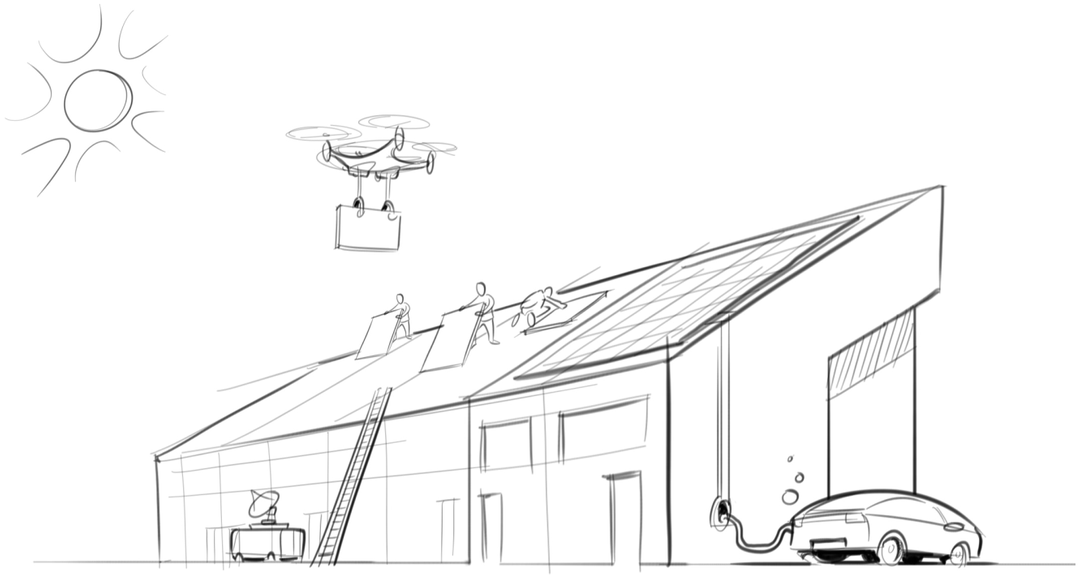
FT14.05. I think that we will face changes in the commercial sector and commercial buildings too. Shopping changes. We will shop quite a lot in advance, and online. Commercial buildings will become more like museums, or galleries, where products can be touched and seen. But necessarily being shopped anymore. So maybe department stores are becoming more similar spaces as museums are now. Which they probably are already today, but they do not yet acknowledge it. I think in Europe we are still not online enough to skip the purchasing part. That is why I think these environments are still run in an old-fashioned business model.

FT17.09. The idea of work, entertainment, life will blur totally. Also having access to computers everywhere: you are learning all the time, and you are probably working all the time and entertaining all the time. There is no need to having the 8-hour shifts. The concept of time will change. This is more abstract, and more difficult. It will be more like a spiral. Now we have linear economy, some people are talking about a circular economy, but I believe we will have to think in spiral terms. We are moving forward, while revising and iterating.

FT25.03. Coming back to buildings, they will naturally progress, but I don’t see that is an area of huge innovation. We’ll learn to build around these new cycles, so it is more an issue of understanding the life cycle of the occupants.

10 Building business for social living

In 2050, suitable financing structures and revenue models are available, offering solutions that are affordable while also boosting the local economy. Both individuals and small communities act as entrepreneurs. They benefit from good infrastructure and technology options, so they can self manage and at the same time improve their lives and the living environment.



This Driver for Change represents the following cluster of quotes of the thought leaders:

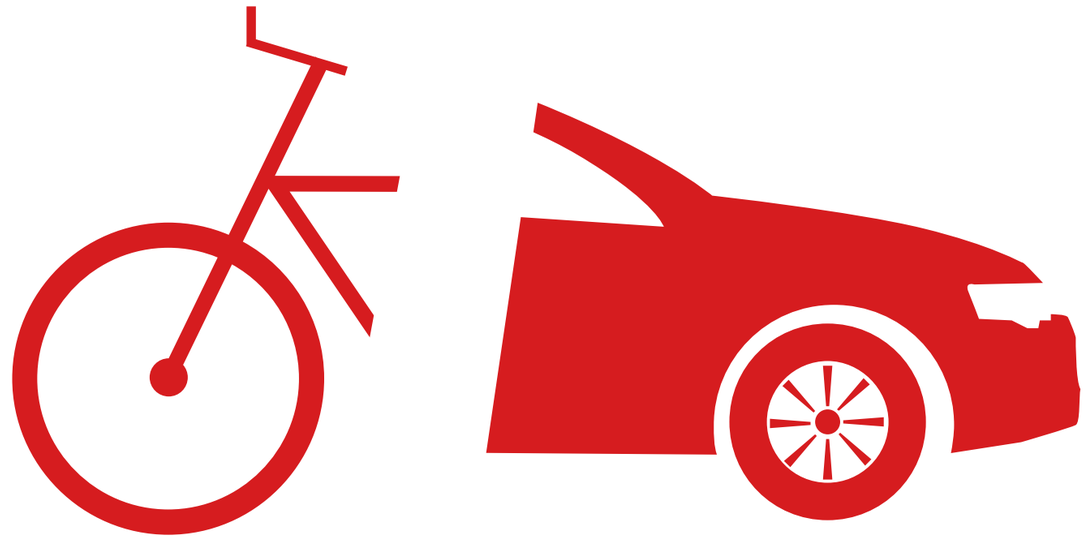
a. Affordable solutions fostering the local economy

FT19.03. Suppose becoming self-sufficient will come available for every household at 20.000 Euro's. That means from then on energy is free, so it is relevant for every household. Some may not have the money to invest. So you need some financial instruments to do so. That is a very relevant condition to create.

FT15.16. Solving the new fuel poverty in smart homes can only be done by technology. So if you are going to build 500 homes, it is beyond me, why you are not building those 500 homes with rooftop solar, with battery storage, and a DC grid. It is not that expensive and will save these people from fuel poverty. In the renovation of old homes also technologies exist, right now, to solve this. Today huge amount of energy are consumed in data centres. If you can convince a corporate company to disaggregate its computing power, so all that back office processing that is happening. There is companies today, one installs it in a water heater, the other one mounts power computers onto a block of aluminium. That 20 kilogram block of aluminium is a radiator. Install it in your home, it manages the energy you use and gets that money back. It just stands there, it is a nice heat, because it doesn't get red hot and cool down, and it just sits there heating the room. Free of charge.

FT12.05 ... The grid for transmission over longer distances will always be a huge investment that can only be done on a high level. But if it comes to micro-grids, where people can simply come together as twenty houses to become more or less grid-independent. It is possible and I hope it will happen. This will change the way people see energy. Now energy is something that comes out of a plug, and it is unfortunate that we need to pay for it at the end of the month. But then it will be also become a game: how can I tweak my system? There will be a play-component that is more rewarding.

FT23.07 ... So I think this is the future: to help the local entrepreneur with money of the government to support investments to make a new generation of social housing. Until now social housing was poor buildings for poor people. This is a disaster. No service, and most social problems in big cities comes from this policy. Give the ghetto's' good infrastructure, improve their liveability, give these people a better life.



DRIVERS FOR CHANGE FOR THE FUTURE OF SMART MOBILITY

SMART MOBILITY

11 Experience, experience, experience

In 2050, city residents travel because they like the experience. For short (hyper-local) distances by walking or cycling, to reach places on a daily human scale. And for longer (hyper global) distances, the whole planet can be reached within a few hours. Even space travel could be an option! There's a range of convenient, clean mobility options, making use of abundant renewable energy. Travel has never been easier – it provides seamless connections from where you are to where you want to go. Services focus on what people need, and not on the available systems.

This Driver for Change represents the following clusters of quotes of the thought leaders:

a. Experience, experience, experience
b. Hyper local & hyper global
c. Space for mobility

FT11.07. It will be nice to see if that will increase mobility. If we get back to that: if this is all much easier, how much more will we move? Will we be on and off everywhere in the world? Or will we stay more in one place and are connected? So far it seems that we are much more 'out'. Even though we are connected, we still want to be somewhere else connected. I kind of think that it is human nature not to just want to sit around the house. More of us want to be somewhere else. It is about experience, experience, and experience. The virtual experience is not replacing that. We still want the real thing. People still go to concerts, although CD's are there, even in better sound quality, but there are more concerts than ever. There is not going to be a big change in that. They are all more accessible in that sense.

FT25.04. .... That is a kind of habit that we have: we accept certain travel times. Commuting will be more like buildings. Mobility is already a commodity, but will be more of a commodity, in the sense that stepping into your mode of transport will be an extension of your living room. You will not drive yourself, but basically it will be like entering another room in your home. Mobility will be a stepping-stone it will not be an activity, so as a cost on life it will disappear – other than separating us from the ones we care about.

FT3.25. For cities there is also a question in public transport. Do you just want a high speed train to bring you in two hours over a long distance to central hubs, and then just a local network to connect the centre of the city to the surrounding areas? Or do you want local networks between cities? Or will it be local sharing services, with e.g. local cars and e-bikes, but not necessarily public transportation like tram or metro. The focus on more local communities means that we need less travelling on national scale. We may have international and local transportation needs, but much less in between.

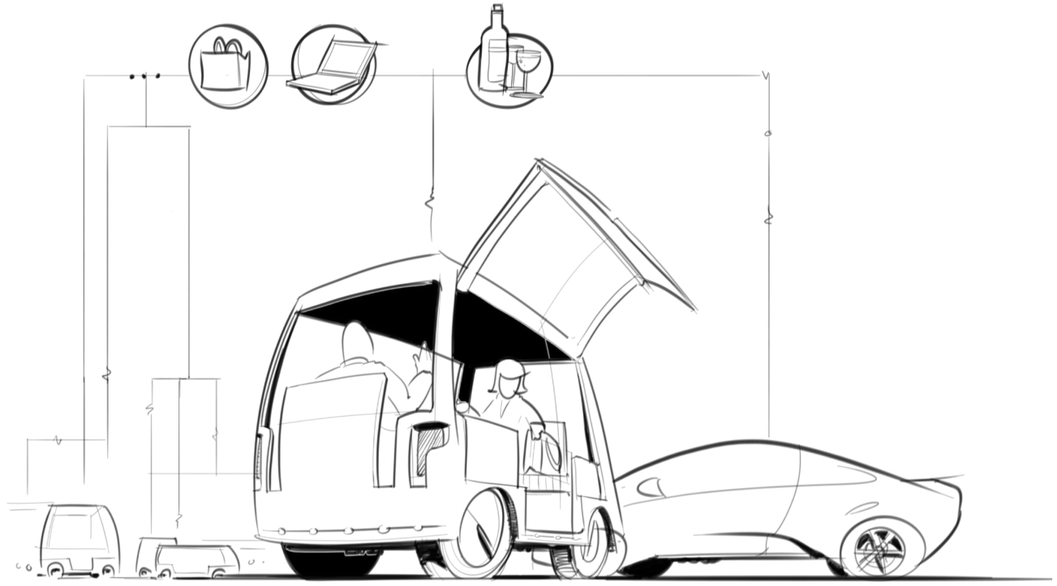
FT13.21. If energy is cheap and available, that also means that you can travel far and long. So you need alternative mechanisms to reduce traffic volumes. Because the space is limited factor then. ...

FT13.22. How do you manage mobility? Space is an element to make people understand what traffic can and will do in the city. For instance when Groningen (in the Netherlands) started to plan its urban space, already in the 70s or begin 80s, when they started, it took them at least 25 years to become a very cycling oriented city. So 2050 is now 35 years ahead as well, if you want to accomplish something by now, you now have to start with urban space management. You can accomplish a lot, but it takes a lot of time and digital policies and modelling to support it. It is not that simple.

SMART MOBILITY

12 Personal mobility as a service

In 2050, technology enables autonomous vehicles. These take affordable personal mobility to a whole new level. Technology makes sharing easy, so everyone has access to a vehicle whenever they need it. It also facilitates the transition to a circular economy, gradually replacing legacy systems with cleaner, safer options. Stakeholder resistance is overcome by the availability of complete, resilient system that meet the needs of city dwellers in full.



This Driver for Change represents the following clusters of quotes of the thought leaders:

a. Mobility as a service
b. Sharing vehicles
c. Autonomous driving, flying etc...

FT7.10. The sharing of resources and products, like Uber and Airbnb show that systems work. Such systems become more relevant and make society more socio-democratic and sharing. This is an important trend for cities. Somehow it will also impact sharing of energy. It will not be so conscious as with Airbnb, but in energy sharing will also take place. When you install solar cells on your house. You do it because you want to have cheap electricity, or because you want to be disconnected from the grid yourself. But it also because you want to give your surplus energy to your neighbourhood. ...

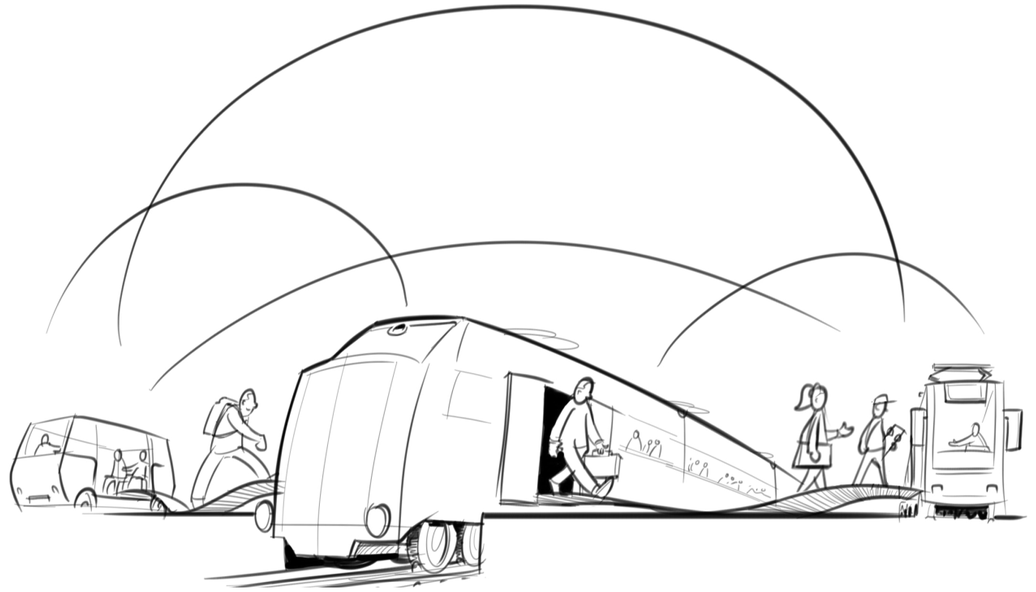
FT11.05. ... People will want everything as a service, more and more. Not wanting to buy anything. How far will that go? ... In mobility I am pretty sure that is how it is going to be. Why would you want to a vehicle: you only need it like 10% to get you everywhere. The strange thing is that it requires hard thinking to see why we would have public transport as we have it now. Trains maybe, but buses? Why would you have a masses option in automated vehicles?

FT3.04. In mobility there is already a demand to take us seamlessly from A to B, that is not new. But the technology will be increasingly there to provide it. Your behaviour will also be changing, because you are just ad hoc or just in time you will change e.g. the reservation of a meeting room when the time schedule is changing. The system is already there to make all these transactions and negotiations possible. It is possible in a very complex system to manage your own agenda, but also to make sure that agendas are aligned and more effectively combined. Even optimising for personal travel time or optimising the average optimum travel time for all the people who want to be transported at the same time. Those kind of management techniques will be there, and make things more efficient. The technology will give us what we want best, not to plan too much, but still allow us to be spontaneous. It is about "I want it know, I want to be with whom I want to be" and the system will make it possible.

FT3.05. In essence we don't want to be thinking too much about the whole system, but want our individual needs satisfied. We hope for the system to arrange it. It will probably become so complex that you need to rely on the system. If want to deviate it interferes with everything else, even your own agenda, and all the other things you are planning. So the relation between the individual needs and the global transportation needs will be in the system. Because the individuals will be less and less capable to adjust themselves, as they cannot oversee the total system. Now the system has still some predictability, with the traffic information that is available you can plan it a little bit with your car navigation. It is not too complex to understand. But when it combines more and more, e.g. your agenda, different transport means, etc, it will be less and less transparent how the whole system is behaving, so you will rely more on the system. Your own cock-pit will deal with your own preferences and can also suggest better planning advice, and persuade you to change your behaviour a bit. You will be able to discuss with it.

13 Valuing public transport

In 2050, cities offer attractive, seamless mobility options: these give everyone access to everywhere. New investment structures and revenue models ensure that the city values (such as inclusiveness) are ingrained in system design. Cities actively influence operators to ensure high levels of customer satisfaction and service quality.



This Driver for Change represents the following cluster of quotes of the thought leaders:

a. Affordable, accessible, seamless and attractive

FT13.30. One other thought line we are starting to explore is the impact of door to door services, the concept of collaborative or shared mobility. … If you believe in this scenario to happen of the fully connected traveller, then probably the urbanite may opt out of the mass transport systems. He may no longer choose the bus or the metro. If you believe systems like Uber for instance, who promise door to door transport, and shared mobility services are more and more organised in a way that you do not have to bring back the car to where you got it and you can leave the bicycle close to your door, then you will be tempted away from mass transport. And if you look at the impact of such a scenario then that will be very big. … And would you then care about spatial structure when transport becomes available at all places at all times.

FT19.05. … the way we look at it now with each city having its own public transport corporation for trains, trams, buses, subways. But in a few years all this can be replaced by self-driving cars. There is a new technology coming up, and it is going to change the way of thinking. Suppose we stop this large scale, mass public transport or we limit it to heavy trafficked areas only, and self-driving cars are just open for use by everybody who want to use them. … If we do that, what would be the problem? What is the kind of issue that might be coming up? These questions hook up to the question to what kind of values do we want to design our cities in the future. That is the most relevant question: what values do we have? One of the important values in Europe is inclusiveness. Public transport is now enabling people who do not have a lot of money to take part. It is these values that are important. It is the same for energy: inclusiveness is important to prevent energy poverty. …

FT20.06.One thing that pops into my mind now is also in this inequality is public transport and the affordability of public transport. … Transport needs to be affordable for people, they need to be able to travel easily from A to B. It is already now not affordable anymore, and I cannot see how that can be sustainable for the future. … we have to rethink buses, trams, trains. Make sure people can move around in your city.

FT24.08 The hope is that in future that big cities that really want to improve quality of life that they have the right influence on the operator to ensure that they invest in customer satisfaction, and not only in earning money.

SMART MOBILITY

14 Small-scale production through city logistics

In 2050, most production is by small-scale services and in the home, rather than by large, centralised corporations. Ideas are shared globally and produced locally, whether they are for physical products (by 3D printing) or for food ('urban farming'). Citizens are 'prosumers', and drive production towards more sustainable, organic processes, at the same time raising process quality. The shift from centralised to local production impacts city logistics: a backbone for resources and materials is combined with digital infrastructures and high-speed parcel delivery. Communities create sufficient social and functional diversity to make them self-sustaining.

This Driver for Change represents the following clusters of quotes of the thought leaders:

a. Local and decentralised production, citizens as prosumers
b. Sustainable logistics

FT24.07. The whole area of manufacturing will change a part of industrialisation. ...There will pop up a lot of small companies, who maybe deploy four robots and three 3D printers. This might lead to a totally different form of industrial society. You can have a small manufacturing company in your basement. This is interesting in terms of logistics in the city for example. You have less commuters, because you work from home. But you need more transport capability, because you have get your raw material, and to get rid of your manufactured product. This could change the traffic patterns in the city dramatically.

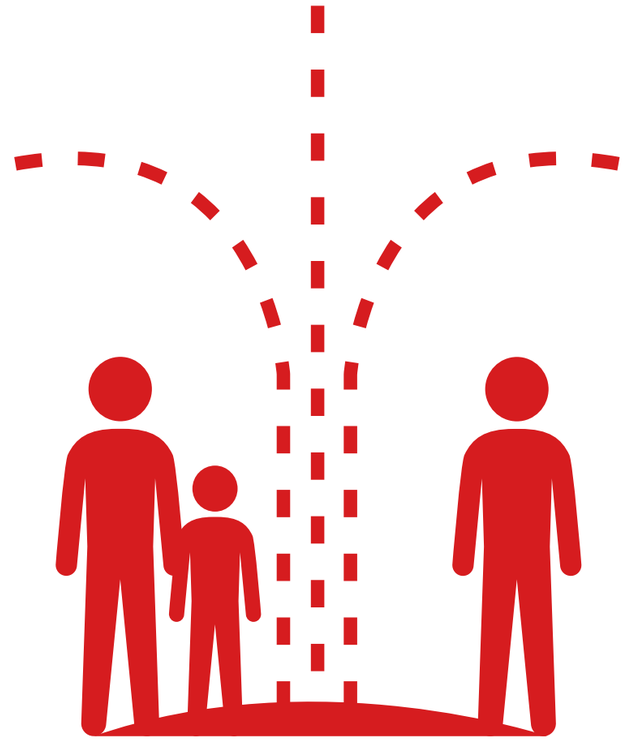
FT13.27. The logistics on getting all these things to the people in the cities is also a challenge. There is a target for that: no emission on logistics by 2030, which is quite soon, being CO2 neutral. We are working on that with new concepts of vehicles, but also concepts that involve even voluntary deliveries. ...

FT3.01. ... the room for local small-scale services instead of centralised big corporations. ... in general there will be more room for local services, also combined with local manufacturing, design, recycling etc. This will replace the large companies, although there might still be some large scale and centralised companies. Especially when you have platform technologies with a certain guaranteed reliability and quality, e.g. 3D printing and robotics allow for more reliable and reproducible. Also as a small company you can guarantee the quality of a product. Those things will develop, and will be powerful and the whole idea of centralised production with distribution and even with marketing and the role of retail can be altered, maybe even replaced.

FT17.05. ... Cities will recover the industrial capacities in a smaller and cleaner way ...

FT8.06. I think now people become more educated about what happens and more educated about what that actually means for those animals, I think that will become a very hard political sell. If people don't know then there is no problem. But even now, there is a real push pack in industrialised meat production, small groups of people become more and more influential, supporting more sustainable and organic production, putting more quality into the process as well.

FT16.18. .. a 'self city', ... makes sustainable and local development the focus of its actions, at the service of citizens who are very involved in the day-to-day life of the city. Supply channels are short, second hand goods and recycling generate new regional business activities. The urban fabric is structured around eco-villages that promote social and functional diversity.



DRIVERS FOR CHANGE FOR THE FUTURE OF SMART URBAN SPACES

15 Attractive cities with unique qualities

In 2050, cities have unique qualities that embody their own history and culture as an integral part of their DNA. The differences between them make the cities distinctive and attractive places for business and visitors. And people of different backgrounds find them good places to work and live. The cities offer a good balance in the quality of neighbourhoods and infrastructure, with affordable services for all income levels. Social needs drive city design, which is constantly and organically reshaped to meet people's changing needs. The use of spaces and buildings is always under review to deliver maximum value for users.

This Driver for Change represents the following clusters of quotes of the thought leaders:

a. Distinctive and lively
b. Accessible for a diverse population
c. Social driven city planning
d. Re-valuing heritage & culture

FT15.12. ... in the UK you have a secondary comprehensive school, they are now aligned, so this school teaches you everything you need to know, but this one is aligned with art. This one with engineering, that one with sports. So maybe we will have a scenario where the urban developers of tomorrow do the same. So London is about financial services. There is of course a lot more there, but it is recognised for that. Maybe in another place people are into technology development, and they will need another urban environment. So maybe in this scenario and people will go where they feel they belong best.

FT4.06. ... We are aware that cultural values in food, in space, in clothing, in language, in all, that culture matters. Economy is a thing, social networking is a basic thing, because without strong social sense there is no economy, but culture is something extra: having the luxury of time and effort to think about it.

FT3.22. ... Social needs will dictate the design of the city in the future, rather than the technological or industrial needs of the city.

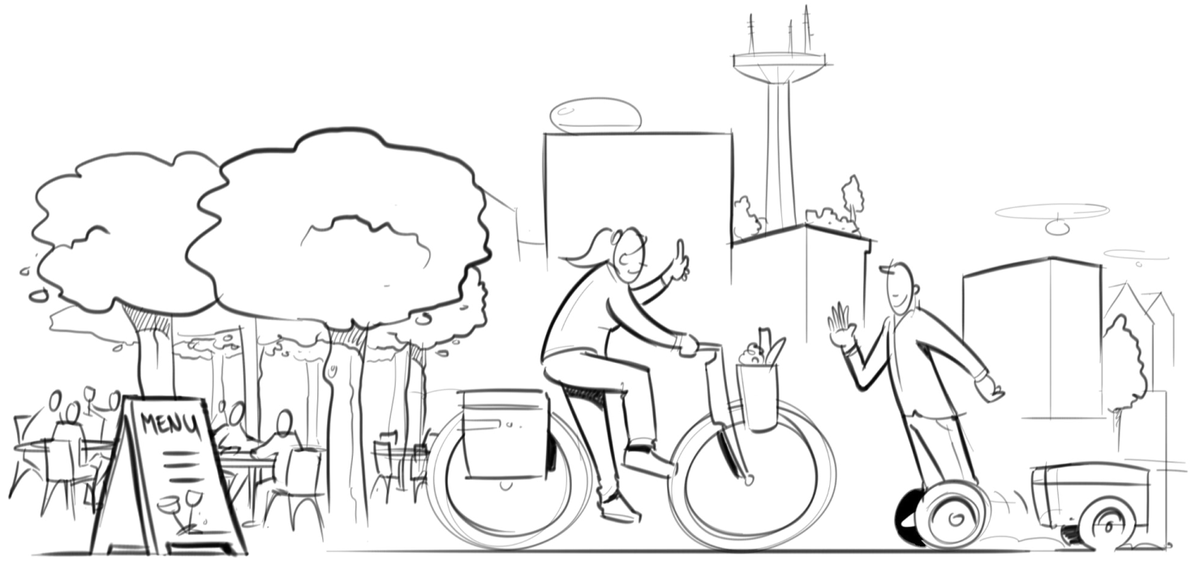
FT20.02. First of all this inequality creates more equality within the city, because there will be more rich and developed people in the city that creates a more homogeneous society. Less interesting probably, and then it becomes less sustainable in a weird sense. ... And I think, and that is the story in this inequality, that cities can steer this and can strike a balance between attracting enough people to bring in money but also enabling people to stay there and keep it fun and interesting diverse.

FT4.01. I think the sustainable city is increasingly seen from a humanistic point of view: an issue of the redevelopment and the continuous development in a more or less evolutionary and organic way of the existing city and not anymore about extensions and tabaleraza. ...

FT11.01. ... I just saw a study how such a [car sharing] system would look like in a city of roughly about a million people – is that there is no more parking space, that provides possibilities for a lot more dense structures. But there are lots of other ways of using the spaces that will be freed up.

16 Better living at a human scale

In 2050, urban systems and spaces are designed on a human scale. Everyday activities are within walking or cycling distance. Communal spaces strengthen social cohesion, giving people the freedom to follow the activities they value most. The city offers an excellent living environment in the European tradition, merging high-quality urban space with nature, culture, the economy and social coherence. Good living means enjoying time with friends, and social life is further supported by availability of public devices in communal space. These enable new forms of communicating, blending the virtual and real worlds in these areas.



This Driver for Change represents the following clusters of quotes of the thought leaders:

a. Respecting human scale in design of urban systems and spaces
b. Safeguarding the European quality of cities and living
c. Public devices

FT4.11. … On the one hand the world is a global village, we travel all over the world. And at the same time you see that young people try to reorganise their daily life smaller and smaller, because it enables them to have a better quality of life. Spatially it is a very interesting topic of how you can accommodate that by not just focussing on the region, the nation and international networks. The only ones that matter if you talk about mobility and quality of life and the attractiveness of location when you settle, but also this daily urban system and the human scale and the walk-ability and bike ability of it is increasingly important. And especially how the two connect to each other.

FT25.07. … the life cycles will change, so a childhood will not be what it is today. Much of this also depends on pubic space. If public space becomes safer, maybe because of automation and so forth, our children will be more autonomous and will be able to develop skills that we think will be important in the future: like empathy, taking responsibility and taking action, and becoming leaders.

FT10.07. There are studies about luxury, and how people perceive what is luxury in different countries. … also spending time in the most pleasant ways. And then you come to our hemispheres. … time with your friends, and having a good time. That could be related to travelling, and also to where you live and how you live. The area, or region or the surroundings is luxury. So you have pleasant and less pleasant surroundings.

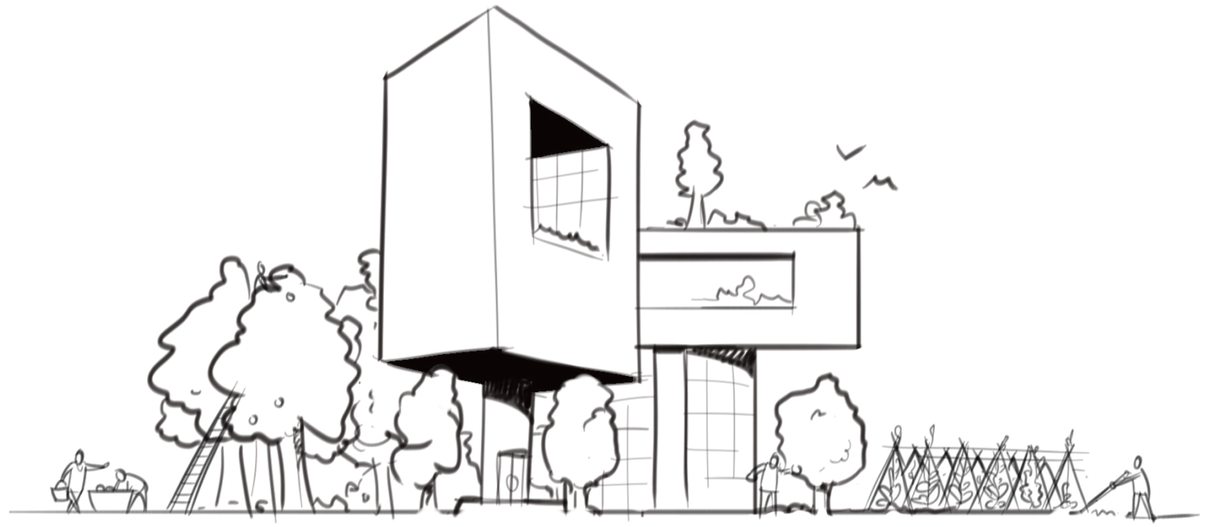
FT4.02. … The relaxed quality of life that lots of foreign people see in the Netherlands has a lot to do with the special quality of the place, which is that it is much more urbanised landscape, fusing all kinds of qualities, not replacing one for another. …. In its aggregation of functions, in its aggregation of social networks, of economies, it is able to compete with a metropolis, but it has a fundamentally different quality in terms of place and life. In the sense that there is much more balance between the green and the red, between the old and new, between the big scale and the small scale, etcetera.

FT23.12. There is not one solution, not one green city. It is all about looking at the context, look at the resources and think about living in a better city. …

FT20.16. The relation between the virtual and the real world. In cities people are much more physical close that in other areas. … In my future scenario people will have emancipated themselves from their own iPhones and tablets. And I think the virtual world will be much more integrated in public spaces and in city spaces. That is not so much “bring your own device”, but it is “use the cities’ device”. … a new way of communicating in public space. I cannot tell what it will exactly be …

17 Connecting to ‘green’ and ‘nature’

In 2050, people’s need for ‘green’ and ‘nature’ is met by well-connected green spaces and landscapes all over the city. Soft birdsong and other nature sounds add an intangible quality and sense of well-being. Urban farming increases regeneration of resources, creating fresh, healthy foods, reconnecting with nature and mobilising local communities. People are aware of the effect of their living environment on health and well-being, and push for cleaner technologies. Advanced systems allow control of micro-climates, contributing to more resilient cities.



This Driver for Change represents the following clusters of quotes of the thought leaders:

a. Caring for nature
b. Urban farming to enable healthy and happy living
c. Improving the environment

FT8.10. … I do think that regardless about how we think about national boundaries or local boundaries, regardless about how technology is improving our day to day life and the access to energy and food and etcetera, I think that at the end of the day humans are animals. That there is something that we deeply need, that is met by green space, that is met by quiet sound and birds dripping, there is this very intangible effect that that kind of peacefulness has on peoples well being, physical and mental.

FT23.16. … – if you read Pope Francis papal encyclical, it starts with “the global eco reconciliation”. It is fantastic. Because the ecology has a big consequence in social impact in agricultures and politics. And it is said by the Pope, who would have thought about this? … Now is the time of reconciliation, because people want to live in cities together with nature, and not just buildings. So maybe smaller cities have now a great opportunity, because agriculture is inside the cities. .. So there lies an opportunity to optimise the relation between buildings and nature, and that may help with our energy problems and social problems. Maybe it is as simple as that. We should not make it more complicated. It can be this simple. …

FT15.07. The other big change we will see is around the urban farming concepts. By 2020 80% of the world population lives in an urban environment. It will become more and more important to grow the food close to where it is going to be consumed. …

FT15.18. It will increasingly become very important for people that live in an urban environment to feel that they are actually consuming a freshly produced food. The urban farming concept with the growing vegetables and the fish is almost circular, since the fish help grow the vegetables and they can eat the waste vegetable products again. So you grow fish to feed them, to grow the vegetables, and you feed the waste vegetable back in to the fish. And then you sell the fish with the vegetables. You capture the CO2 in the building and feed that into the greenhouse because it needs CO2 to grow. …

FT6.02. For example if you look at a healthy city, from e.g. minimising the risk of industrial and traffic emissions, better technology will lead to clean vehicles, clean industry. With respect to air pollution, noise pollution, etcetera, emissions will greatly decrease and therefore increase the quality of living in an urban area. That will not happen automatically, we have a quite strong technocratic steering principle in that classical environmental hygiene type of policy. So there is quite a lot of technology in that area.

FT5.09. Maybe the government will manage all the things from the space. For example right now the US implemented a laser gun and in my imagination after a while they will control everything from the space. We are able to control the weather and the rains. And this will be together with the global water supply.

18 Self-sufficient communities

In 2050, cities and their surrounds are self-sufficient through cross-sector collaboration at local and regional levels. Strong links with the immediate environment let cities use shared resources efficiently and in environment-friendly way, with respect for nature and agricultural spaces. Socially inclusive communities are self-sufficient in foods, fresh water, renewable energy and production of tools and systems. People take responsibility for their own well-being, as well as that of the community, and co-design the physical environment and services.

This Driver for Change represents the following clusters of quotes of the thought leaders:

a. Cross-sector collaboration in the territory to become self-sufficient
b. Participating citizens taking responsibility for their own and the cities well-being

FT4.13. One of the big assignment for my field is how to reload the “unbuilt”. Not so much the public space, although in the end it is the public space. It is about the not literally the space, but the infrastructure of the city. Not just the open public space, but also the city facilities. ... it could still have a meaning, especially when you think about decentralising, autarchic, self-organising communities dealing with vegetable growing, sports, meeting, again on a local level. Then it means a lot also for the ownership of the public space. If this transition to these semi- autarchic systems, then public infrastructure is also key. ...

FT16.19. One of the city of tomorrow scenarios is a ‘castle city’, which is positioning itself in a way that boosts economic attractiveness, thereby protecting its population in an uncertain landscape. The inhabitants adapt their consumption practices. The city organizes quality access to resources and public services, which is primarily based on monitoring regional consumption. Regional development is aimed at increasing urban density in order to reduce the consumption of resources.

FT7.20. ... so cities will become much more self reliant.

FT2.13. ... So you can create communities that are self-sufficient in food production, fresh water generation, energy, fabricating tools and systems. So you can create really new independent cultures.

FT21.09. ... I think the future city will be some kind of a city that has redefined its relationship with its immediate hinterland. Due to the need of energy and resources the hinterland already sees this as a chance to re-cultivate its own regions. ...

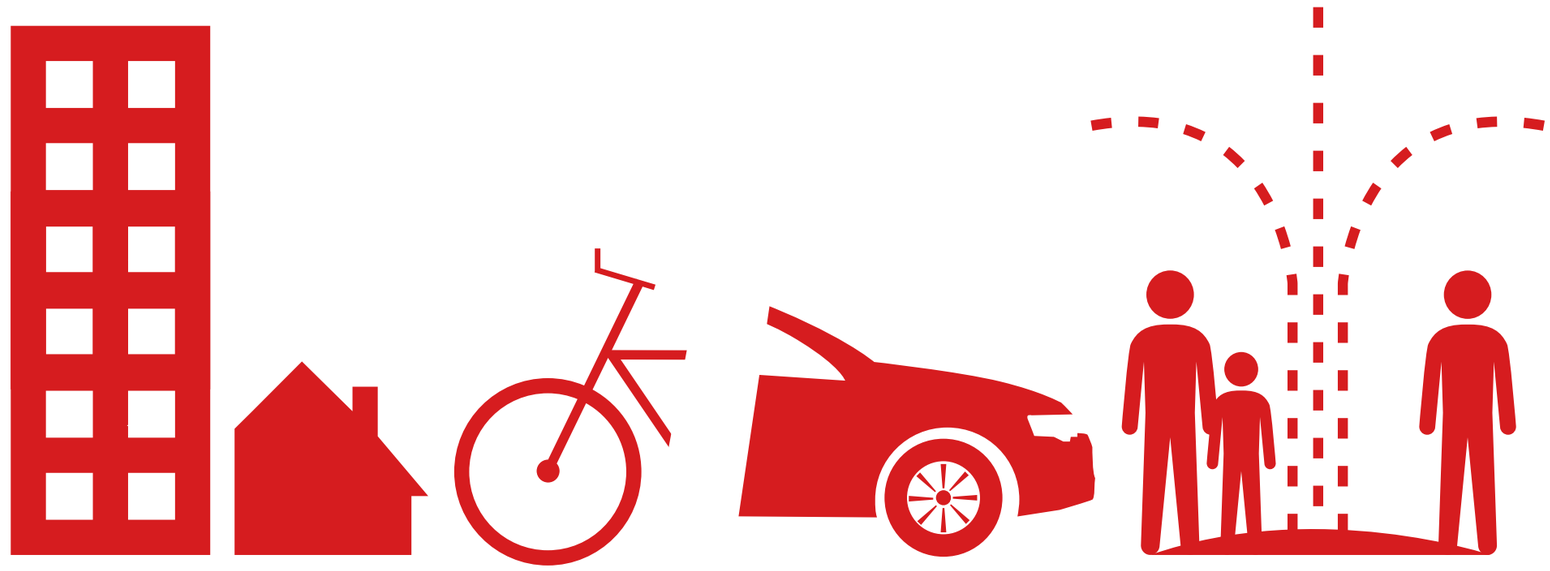
FT8.01. This is the level of mesa- macro level. For me there is sort of a government aspect, which is much more joint governance, which is more democratic. Which is both more accountable, in terms of quickly having interaction between citizens and leaders, and so being able to hold people more accountable, being able to hold institutions more accountable. But really having this joint responsibility, not that just institutions are responsibility. What I already see now is that citizens now take the role of keeping much more the institutions on line. This represents a shift where citizens are also very much responsible for their own well-being and of the cities well-being.

FT23.02. ... In the last few years a lot of communities start to discuss the problems that are created, and actually architects play a very important role in this. They play the role of coach, try to listen to people and help the discussion. Because the problems we face are huge. To make green cities, which maybe sounds a bit poetic “planting trees”, but it can be a great solution for the micro-climate.


ROADMAPS
ENERGY
Understanding t for Change
Relevant to all citi
cities
Not relevant


Understanding the Drivers for Change
Relevant to all cities
Relevant to some cities


Selecting the Drivers for Change
Understanding the Drivers for Change



THE JOINT AMBITION WORKSHOP: SELECTING THE DRIVERS FOR CHANGE

The joint ambition workshop

In a joint workshop all eight cities gathered to learn from each others insights and to prepare the next step in the process. The aim was for the cities to better understand the results of the Future Telling research and to select the Drivers for Change that are most relevant to be included in the further vision development.

Understanding the Drivers for Change

In the joint ambition workshop the Future Telling research was shared with the eight cities. In order to get a better understanding of the Drivers for Change the city representatives have ‘played’ with them and in 3 teams following the focus areas, discussed their relevance for the focus area. This resulted in the next table, where the drivers are divided into three categories:

Relevant for all cities for the focus area

Relevant to some cities for this focus area

Not relevant for this focus area

		SMART BUILDINGS	SMART MOBILITY	SMART URBAN SPACES
SMART CITIES	1 Local, social businesses create community value	Important to involve citizens through new technologies	Sharing mobility travelling system by technology (poor & rich have the same information level	
	2 Enabling human development		Apart from the middle class's disappearance enabling human development is a requirement for all cities	
	3 Redefining 'smart'	We don't agree totally with the way it is described, but we consider resilience important but not in this project	Nobody knows what will happen, tomorrow or in 2050	
	4 Regenerating resources in a circular economy		In 2050 countries (some cities) can partly achieve this goal	
	5 Democratised energy systems based on open data		Since smart cities need data to create smart solutions, it holds for all cities	
	6 Applying new technologies		Upcoming years will bring novelty, innovative solutions	
SMART BUILDINGS	7 Technology with a human focus			
	8 Better buildings			
	9 Flexible 're-purposing'		Changing functions of areas (redesigning) with new mobility effects	
	10 Building business for social living			
SMART MOBILITY	11 Experience, experience, experience			
	12 Personal mobility as a service	Same as 13, + space demand from building		
	13 Valuing public transport	We agree partly, just because we think in the future public transport will use the smart grid for charging vehicles		
	14 Small-scale production through city logistics			
SMART URBAN SPACES	15 Attractive cities with unique qualities			
	16 Better living at a human scale			
	17 Connecting to 'green' and 'nature'			
	18 Self-sufficient communities	Only partly relevant - the expectations of buildings to support self-sufficient living		

Preliminary selection of the Drivers for Change

18 Drivers for Change are too extensive to use in a vision development workshop. Therefore the cities were asked to prioritise the Drivers for Change for each of their focus areas. The cities made a pre-selection of four drivers for Change to be used in the vision development step. The next table shows the preliminary decisions of the cities (the difference in colours of the selection dots is just for readability and has no extra meaning).

SMART CITIES

SMART BUILDINGS

SMART MOBILITY

SMART URBAN SPACES

		EINDHOVEN				ISTANBUL METROPOLITAN MUNICIPALITY		Murcia		Newcastle City Council				Ajuntament de SantCugat		TWINN	
		MOBILITY	URBAN SPACES	BUILDINGS	URBAN SPACES	MOBILITY Public transport	MOBILITY Traffic Mngmt	BUILDINGS	MOBILITY	Domestic BUILDINGS	Non-domestic BUILDINGS	BUILDINGS	MOBILITY	BUILDINGS	URBAN SPACES	BUILDINGS	MOBILITY
1	Local, social businesses create community value			◎													
2	Enabling human development										◎					◎	
3	Redefining ‘smart’																
4	Regenerating resources in a circular economy		◎		◎						◎		◎	◎	◎		◎
5	Democratised energy systems based on open data	◎		◎		◎		◎	◎		◎	◎		◎	◎	◎	
6	Applying new technologies		◎	◎			◎	◎		◎		◎					
7	Technology with a human focus						◎	◎		◎				◎	◎	◎	
8	Better buildings			◎				◎		◎		◎		◎		◎	
9	Flexible ‘re-purposing’	◎									◎						
10	Building business for social living									◎		◎					
11	Experience, experience, experience	◎				◎											◎
12	Personal mobility as a service				◎		◎		◎				◎				
13	Valuing public transport					◎	◎		◎				◎				◎
14	Small-scale production through city logistics																
15	Attractive cities with unique qualities				◎								◎				
16	Better living at a human scale	◎	◎		◎				◎								◎
17	Connecting to ‘green’ and ‘nature’		◎			◎											
18	Self-sufficient communities														◎		

APPENDICES

These appendices contain all the quotes from the Future Telling interviews. The quotes are clustered into the drivers for change that will have an impact on the future of smart cities in Europe in general, as well as the future of the focus areas of the R4E project. All quotes are literally taken from the interviews and contain unique code [FT number.number] indicating the interview it was taken from and its sequence in that interview. All quotes from the Future Telling interviews are listed in the appendices to present a complete picture of the possible future scenarios.

1 Local, social businesses create community value

In 2050, smaller businesses creating real social value at local level are the norm. Communities and cooperatives have developed new business models ensuring constant investments in infrastructure. These enable the development of new products and services delivering social and environmental value. Innovation means co-creation and cooperation, aimed at creating end-user values. Self organising, self-managing communities are the new social and market paradigm – all enabled by the new city governance models. These drive the transition to empowered citizens who demand a range of sustainable solutions. Municipalities facilitate this transition by creating the required economic and legal frameworks, and by constantly focusing on the public interests.

a Business models enabling continuous investment in infrastructure upgrades

FT1.5. **Energy resources will not be free, because you have investment costs and running costs**. For sure we can produce energy with local resources and feed it into the net, which allows the use of more renewable sources. Of course this will reduce the power of the oil producing nations, of the traditional OPEC countries and the new ones like Brazil. For some countries it means a reduction of power, but it is a relative process because the more expensive it becomes the more new regions will produce oil. I guess that in general that oil producing countries will loose some of their power. Some believe we already reached the peak.

FT24.9. I believe that money cities were wrong in selling infrastructures to private companies. Because cities, or governments, have a certain responsibility to their citizens. It might be a good idea to give the operations responsibility to companies, but not to own the infrastructure. Because what you see even more severe in the US than in Europe is that they use the infrastructure as much as long as possible, without renewing it. To make as much money out of it. You come to a tipping point where the infrastructure fails, and if then to renew an infrastructure in a failed environment, that is difficult – it's a nightmare. Many cities in the last couple of years learned this lesson, and are trying to get back some of the crucial infrastructures, like water, wastewater, electricity, gas, whatsoever. The future will really be in public-private partnerships, where you have contracts that keep in mind the renewal of infrastructure and installations, service levels to keep. I am positive that with the new communication possibilities that we have, that we get more opinions of the citizens included. Take again the example of Swiss cities: when they have to decide on something important, they usually have ballots. I would assume that in future with all the technological possibilities there will be more citizen involvement into decisions. This will also change the political and social system in the future.

FT19.10. Like for energy we know that if you create an infrastructure for energy, you should create the condition that everyone, everywhere can connect and deliver and access energy. It is a condition that you should guarantee on the long term. If you develop new services, e.g. electrical cars, you can connect. Now there is in many cities the discussion on what to do to create charging opportunities for electrical cars. The first thing to do is to decide that the one delivering the infrastructure is not selling the services. If a city decides that it wants to put in charging infrastructure for cars, the city is player because they have the urban space, so they can decide where to have the charging infrastructure, in which streets or everywhere. If they want to do that themselves they need to pay for it, but that can be an issue. A rich city can decide to do it themselves. What happens in other cities that do not have the money, a company comes along that offers to do it for them. They create a type of monopoly where they can ask any price from the users. A city can set a price maximum to it, but then the company puts in the charging infrastructure only in the places where they can make this price. So there is a combination of issues coming up. It think that what might happen is that you make a distinction in the charging infrastructure and the services it delivers. The charging infrastructure has a limitation in the prices they use, for instance a cost-plus model with some revenue on it, but no more than a reasonable margin, with open books. This is very simple to do. But if you do that you need to do it not just in one city, because it is a global market. If you do this in a way that it is not fit for all types of cars – for example France is very accustomed to do it in a way that only French cars can be used. If this company that provides the charging infrastructure is related to the car manufacturers this exactly what happens. What is relevant for the combination of the cities is to define what is needed from an urban perspective, and what is relevant in terms of **access to utilities and business models**. There is another party: the grid operators. That is relevant in terms of **who pays the price of the investments, how is the charging done**. You need regulation to ensure that this is done right. You have to do that now, together with other cities. If you do it in the right way, and you set the right conditions, be clear about the requirements for the charging infrastructure, it does not matter anymore what kind of company does the investments. Then you have suddenly access to all the companies that have the money to this kind of thing.

FT19.1. What I see that is going to happen in the coming years. There are some **major technological breakthroughs**. First I go to let's say 2023. By that time the electrical car is cheaper than the one on fossil fuel. By that time energy produced by solar is cheaper than the energy produced by coal. And later on it will be much cheaper. So it is all about the **break-even point of production price**, not taxes etc., but purely production. Combine with batteries, somewhere in the twenties, the cheapest way to have your energy system is when you have your own solar combination, for heating you can use a thermal heat pump, and if you have a surplus on solar, you can store it, as well as the heat coming from solar panels. It takes adaptations to the buildings, but it is not far fetched to say that every building could be an energy producing building. Power generation, heat generation. And that will be the cheapest thing to do. It will be cheaper all over the world, the Netherlands may not be the first, probably it will be halfway in the twenties, but in the cities the Mediterranean area it can be faster, where in some areas it is maybe, already cheaper right now. So it is coming, and it will be cheaper.

FT19.2. The question is if we have **the right conditions now to enable this transition**. Because what's happening in a lot of countries is that it is almost forbidden to produce your own energy, because the energy company must do it. If you have that, you sort of automatically put a limitation on the investments that can be done. To turn a single house into an energy generating house, you need say about 30.000 euro, and that may come down to about 20.000 euro, or even cheaper. So that is the type of investment needed. If only energy companies can do that, you are limiting your investment capacity. **If everybody can make his own investments, you can go very fast**. It is about who is going to invest in it. If it is forbidden than that is an issue. If you have to pay taxes on the energy produced at home, than that you are limiting the transition. Now most national policies are there to protect the energy companies, without knowing it, most countries such policies. Which is a stupid thing to do. And maybe it is not exactly 2023, it may be a bit earlier or a bit later, but that is not relevant.

b Fostering local businesses for social value

FT20.10. My perspective and even in smaller cities, I look at the quarter of a city. In bigger cities you even have an own mayor for that quarter of unit. I think the more room for **specialised, tailored services** can be a good factor of to create these **new social coherence mechanism**. Again, it is a bit back to the roots, but in health care for instance, the decentralisation will improve the social coherence. But also in other services, like shopping or help with car repairs, tailors, etcetera. These may look like naïve problems, but it is actually part of people's daily life well-being and it is tied in with everything around family, demographic, the aging. Cities could do much more to help these businesses to survive and to grow. Cities do not make the law to start business, that is the region or even nation state, when it comes to taxes. But they should be more engaged to facilitate and support that.

FT19.14. Many of the cards relate to people losing power, or being afraid of some new developments. That is not relevant, it will be different in the future. If you look at a longer term perspective we actually only have a recent period in which things were organised differently. Big corporates are only there in the recent history. Before that we had much **more small-scale local services tailored to personal specifications**. It is only in the last 50 years that we lost that.

FT14.13. I will see **a growth of business models based on old-fashioned thinking, like cooperatives**. They become more important, not only on **providing tools and opportunities for people to fulfil their needs, ambitions or hobbies, but also simply just to raise money to provide the services by the people from the community**. This type of model comes back, one hundred years ago we were very much operating in cooperatives, but due to the fact that resources are getting better, and jobs are getting more difficult to get. Jobs will become either well paid, very well paid, or they are not paying you at all. Cooperatives are becoming en vogue again.

FT6.6. And of course, and that is **the power of technology**, it will give cities some sort of prosperity potential because high information, high density internet, high speed internet, is certainly **a positive factor on the economic climate of the city**. So it will help companies to function better and it will **increase your economic vitality also from the business point of view**.

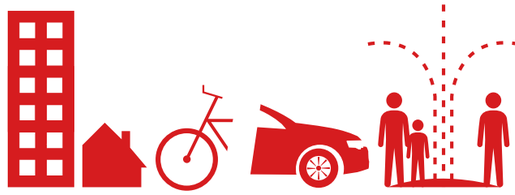
FT23.3. In this energy field. If we only talk about how to insulate our buildings better, that can for sure be a huge economy, but we do not have at the moment the economy **to start this economy**. To give an example, here in Italy, the government pays for energy 4 times more if you produce energy from photovoltaic. They give you a grand. That is 90 billion euro on investments. 90 billion euro! That is the amount of money that does not go to Italy, it goes to the foreign countries, where they produce the products. There is no economy created from this 90 billion euro investments. Do you know how much you could do with 90 billion euro? So if this policy helps Italy to reduce the gap of renewable energy and at the same time should create new economy. So now this policy is a disaster. So how can we implement a policy that also creates, what we call, a social economy? All this European framework of reducing CO2-emission, if all this policy does not **transforms into a social business**, then it will fail. Because only by creating in a community and by a small community, you can create a local economy. These engines work everywhere. I think this is one of the key points that needs to change in the future.

FT1.10. I hope that the niche development will become a snowball avalanche to make our economy sustainable. It will increase in importance. We have quite a lot of small enterprises and collective projects that are now **embarking on the internet and use crowd funding**. This is an important aspect of how **to finance local initiatives**. This will increase.

FT23.6. I am not a fan of regulation, they created disasters, at least in Italy, in the past. I think we have a relation between the high number of regulations and the high level of illegal buildings, so you see the consequences. When you try to regulate, the reaction is to try not to do the regulation, but exactly what you want. So I am not a fan of regulation, but in this kind of specifics: energy efficiency, zero-emissions, in all this **a good set of regulations can make the difference**. Like in Italy, was 2 years ago created an **'eco-bonus'**; they give you 10 years discount on your tax when you invest money to improve the quality of the fabrics of the building. You can buy a heat pump, of make new air-conditioning system, or better performance, whatever you want to do. The investment you do in this energy sector, you can take out of your tax in 10 years. And this was booming, but especially what was booming was the small economy. Not the big companies, but the small companies, selling products or installing systems. Which is **creating a micro economy that is much more horizontal**. That eco-bonus worked very well, because it was interesting offer for individual people, but also creates interesting consequences. So this regulation stimulated both the middle class and the smaller enterprises very well.

FT16.11. Here we can also learn a lot from developing countries in **the way the people develop new services**, e.g. In Senegal, where young people were using open data from cell phones, and mapped the way these phones were moving along the city. From this they made some schemes and models to show the population movement over the day. This was done, just **by young people having fun**, for free. The city **authority then adapted** the city transportation, such as shared taxies, to go much more into certain areas at some times. This didn't cost anything, and we can learn a lot from those examples - there are more - in our developments.

SMART CITIES



C New economic models taking into account social and environmental value explicitly

FT17.4. The market as we know it will be there in the future, because there will always be people that do not want to make things; they want to buy from someone else. But it will **not be mediated by the traditional market values**, it means that it is no longer a single company that produces something in massive quantities – like millions of products. When you have millions of products you have to create advertisement campaigns to make people believe that they need these products. That requires that you have satisfy a model where mass production is the main goal. Those channels are advertisements, retail stores in which the big producer is the main beneficial. Distributed production will allow to have **more customised solutions**, let's say **driven by individual necessities**. Then the designer does not have to design a mould to manufacture something dozens of times. But the designer is actually a mediator, or people become designers as well. I think the chains will be totally different. The advertisement will still be there, but it will be different. The market will still be there, but it will be different. We will **reconfigure it**.

FT6.17. Another point is how international institutions will behave to tackle the complex world problems. Water resources, renewable energy, even political issues as now in Africa, and so on, many refugees escaping their countries. And the international institutions are so far unable to get their finger behind it and direct is. Look at the climate change: negotiations the classical format, the classical roles of these organisations fail actually. And it is my personal hope that the responsible economic people will say the classical way of thinking about profit, of prosperity, in the end the world is much better off if we **take well-being and human health and nature conservation as an economic power**, also. But that is a transition that we are in. Some people, like Rothmans or Weijers, are now saying it but it is complex to make the necessary steps to get there. I think it must get worse first, before it will improve. 2 degrees climate change is for some parts of this world dramatic, but not for the western world. We can handle that, we all raise the dykes. 4 degrees that will come close…. So what is driving the societal innovation: it must get worse first? With climate change it is difficult, since we have already that tipping point, now we have to act and it will still take a lot of time before it is restored.

FT3.18. The **exclusive focus on money will disappear**. This will also influence the way **the sharing economy will develop**. Especially if you think of consuming goods, or things that take place in the city, are more related to status: to the amount of income you have or the things you own. You value the things you have, because you paid a lot of money for them. In the future I expect is a system where you have access to things. You can use your BMW as a service or you rent or lend it to somebody, without the necessity to pay for it, because he wants your convertible car on a sunny day. You can make arrangements for that. It will help to alleviate certain limitations that are there today because we are not really ready for it. In the future we will be having a different mindset, and **less caring for money, and maybe even being less scared about losing jobs. It will make us care for other values**. We will develop **reputation systems** for those as well. There are already some social feedback systems that help this change towards more honest value system. If this gives another boost to the sharing economy, it will have big impact on the city. It will be like a second wave. The first wave is already present: there are people willing to share and the availability of internet that enables you to find other people that want to share facilitates this process. But the shifting values will increase the amount of people that are willing to share and the amount of willingness.

FT16.5. Important here is also the transition of **how people experience value and money**. That may be part of the solution. Because when we are looking at what happens in the world, there is money somewhere, and part of this money belongs to people. So I think in the same way as **micro-credits** supported the development of economy in developing countries, I think it can also help **to finance the energy transition**.

FT7.12. We are **redefining and developing our values and how we are looking at our planet, ourselves and our neighbours**. It is happening: we are changing our views. It has an influence on the cities dynamics and energy use. It is not that important in impact on energy use.

FT13.19. Linked to that is the discussion that if you can **save money in one sector**, like health, **where does the money go and how will it be spend, being part of the public expenses?**

FT15.15. Smart meters are driving the developments in **personal data driven services**. Now the downside of smart meters, and not many people recognize and definitely not that municipalities recognise them. If I take the UK my old job. Many municipalities have to create there new social houses. Some are going to build 10-20.000 homes the next five years. They have all got a number of people that are in fuel poverty. They don t care because the benefit system pays their energy bill. But there is a massive group of people that sits just above fuel poverty. Smart meters come out, very closely beyond smart meters comes **dynamic fares**. Dynamic fares mean that every half hour or every hour, the rate you pay for energy will change. This means. There is a group of people that is just above fuel poverty, they tend to be single income family. So somebody is out there earning some money, somebody else is on the home with 2or 3 kids. They will want to consume energy when it is of its most expensive and all of a sudden, because of smart meters, they are in fuel poverty. The benefit of the system will never ever keep up. So, now as a municipality, you've got another group of people that is in **fuel poverty**, and that have to make a decision: heating and lights on, or food. They will probably **save on food, buy cheap unhealthy food, and the demand for health care will go up, the productivity at work and school will go down, and all these problems that are related to it**. And municipalities have no idea what to do about it.

d Reaping the benefits of co-creation & cooperation in innovation on end-user values

FT3.17. **Alternative forms of value and value exchange**. When you **increasingly co-create goods and services** and you cannot completely distinguish what everybody added to the total, it will be less and less possible to value each contribution. Do we need to establish values for transactions? Do we want to, or can we find a way to not express everything in money? It could be more about social transactions, we may not need money. There is a possibility that we will overcome the real need for ever increasing our salary, our GDP, etc. in the coming thirty years. We need to get rid of the current concept of growth. And if we get rid of it, we can also do a lot of things without the need for direct payments. But commercial companies are still optimised for maximising profits, so they will have a difficult time. They want to be the only ones to extract value as money and then give it back to their shareholders. But you need **to extend that focus to the wider range of stakeholders**. When I produce something I will need the material or other things, like services to install it, from the community. So you can also see it as a cost reduction if you take the community into account. Then there will be less need for money and transactions. Even though we now already have technology that can provide millions of transactions, we will not need it anymore.

FT18.1. Some of the important trends transcend cities and are major societal shifts. What I think is relevant right now, and will be only get more in the future is the paradigm that we talk about in the Open Innovation 2.0 movement. It is about **companies innovating together across sectors based on end-user input**. So that is the open innovation 2.0 paradigm. It is based on a **shared vision**; I think we will move more quickly to better visions and better implementations of smart cities. In parallel sharing resources and products is becoming second nature. The shared economy is real, stuff like Uber and Airbnb, there will be similar implementations across society and companies like Volkswagen will be selling lifts and rides, rather than cars.

FT16.15. I guess that **several of the old big players and producers will disappear** and new developers will take their place, more and **more working together in networks**. Since people will demand more and more for sustainable products, that will change.

FT20.14. What you see a lot is **city partnerships**, which developed after the Second World War, this could be a tool for cities to connect, also on a global scale. I am not an expert, and I do not know exactly, but cities need more to be engaged and to partner up. Also because there are **more stakeholders engaged**. It is an open question. These global agreements are made between countries, and companies are also involved, but cities are not there, not as decision makers. This is a strategic question for mayors on how to position themselves.

FT16.10. When cities begin to have that kind of **new partnership, with new economical modes, and working in new frameworks**, that is a good way to accelerate the trend. The **cooperation of local governments and developers will lead to innovation quicker**. There is not one good answer there, but eventually we will find a way to cooperate as public and private partners . Not one company or one city can have all the skills. And even large companies as Engie will be able to develop fast enough, we too have to **partner up with large and with small companies in order to find a solution together**.

FT1.2. On the one hand site the information base for companies will enormously increase. Having good access to information in clouds or wherever, and in real time. Of course they have to react faster, and to act in a more precise way, assessing the risk when making decisions. So **the ability to cooperate will become very important**, because companies will be more specialised and the projects are smaller and realised under more competition. So companies will have to have a specific focus. The **information on end-users, the assessment of end-users and the preferences of end-users will be available as real-time information**. There will be real-time interaction.

FT9.4. Companies more and more have to **cooperate**. I think by now there is just a limited number of people that understand the consequences of this, but by 2050 **everything is going to be interdisciplinary and everything is going to be connected. You can no longer do things just by yourself**. Many companies, almost all, will have understood this by 2050. Everything will be working together I guess. For them to survive this is necessary.

FT8.9. The next is that **companies innovate together and cooperate across sectors**. This is about linking, it is about technological innovation, it is about both the governance and the regulation of companies, but also human and social capital formation. So are these enterprises, which are now the big powerful ones, who are big players, are they actual able to optimise the scales and the human and social capital that they need in order to produce what they want? I think there is a lot of room for improvement, even though there has been a lot of innovation, and I can imagine that in 2050, that - and that is actually another scenario for governance - is that the companies are actually the ones doing the governing. But I would still think of a more traditional government based structure with **companies having a strong international presence**. With this positive idea that they have an understanding not only of their own needs, but also of … a sort of understanding that if you need to have a better educated and a better self-actualised work force, that it is better for the company as well, not just for the person. So the **human needs and the companies' needs are actually going together.** People and organisations are moving together in a way. So a little bit utopian again.

FT19.15. If you look at breakthrough technologies in health then you see that most of the investments in health are coming from the pharmaceutical industry, because they see a way to make money. It is not even to make medicines, but to make money. **The changes that will come, will need to come from other types of research areas**. From biology and ICT, **because they have another perspective**. I would not invest in pharmaceuticals. The real issue in health will be that we may not die anymore, so we need a new ethical system.

FT5.8. Now, when they are trying to establish a factory, they are trying to at the beginning, just putting a metal things on the one side and on the other side they are expecting a final product. But when we look at that here, right now, this way is changing. When you are manufacturing something, more than one company should **get together and work together**. This will be efficient. Need to come together. Is already happening right now.

e Opportunities for cities in new governance models to drive the transition, facilitate innovation and safeguard public interest

FT20.12. The whole role of the cities will change eventually, where **central government retreats and citizens be will more and more engaged**. I mean, we still talk about citizens, not just people, which I like. When you move to a new city, you become quicker and easier a citizen of that city that of that country or the region even. This is the great integrating function of cities, where they can also create identity. I agree that governments tend to devolve power, or at least responsibility, and that will continue. The big **discussion will be about the resources**. Every country has a **transfer system** from the central level to the regional level. Usually cities are left with the business income, tax from businesses, but definitely in Germany there is now a big discussion on changing that transfer system. But it is not easy, because the central level and rich region like to keep it as it is, so it will become a power game. I expect that the pressure on the governments will be so strong that there will be changes over the next decades. Also because central governments will no longer be able to deliver. If you look at the UK, the population growth is so huge. It needs to change.

FT21.3. The question of national authorities is somehow already playing a role. I do not know if you heard about Benjamin Barber's 'If mayors rule the world', the whole discourse of urbanisations and cities and empowerment of cities. There you have already **a big question mark on what's the role of national governments**. If they can't manage to agree on a climate arrangement on United Nations level, and if they are too remote from their citizens and do not address their interests anymore. I personally find the whole discussion about Greece at the moment very, very interesting. Where you somehow see that national governments, especially our government here in Germany, is slightly **acting disconnected from what people really think**. And we've been told what we should be thinking through old-fashioned media. But it is not representing what people actually think.

FT4.9. In the Netherlands there is a strong tradition and infrastructure of having a dialogue within smaller communities about life, the changing world, and what to do with it. Of course that has also a nasty taste, in terms of paternalistic issues, but especially within that there is also a strong tendency of emancipation, of self-consciousness and things like that. You need conditions for that. One part is social cultural awareness, the political awareness. And the other part it is that the infrastructure is there. I do not believe that, for instance, internet and the free accessibility of information is replacing this. In that sense I really think we can learn a lot from the Anglo-American culture. We imported a lot of their notions, laws and infrastructure, but without really going into how they are really doing it. In America we often only see the romantic story of a ??? process in the city, which is bottom up, has just private individuals, starts with pioneers, etcetera. But if you really look into it, it is far more complex. The government is involved, institutional parties are involved, and it is far more an ecology, working together. We are, in the Netherlands, in a stage that the ecology is not yet there. That has to do with the fact that we had some serious system shifts in the 90s and 00s, even up till now. I am not so pessimistic that we won't achieve it. That is also why we initiated some projects where we intend to get a better insight in the informal processes in the cities, with craftsmanship and new cross overs with creativity, which we know that they are going on, but they are out of sight. We don't know yet how they really work in the city context. The same is true for the culture of events and sub-events. Why is that so rich? How does it work? Who is involved? Do they know each other? **Which role takes the municipality and other institutions**? This is a typical role the government should take. Not the easy liberal way: everything is for the market and the citizens, we just have to find out. But there should be also **awareness that you should be involved in his transition**. You have **to facilitate, or even more actively stimulate: co-initiate**. In order to be a matchmaker, you will need some funding, organisational power, space, and then something can grow. The new municipality should be a navigator.

FT13.6. This process to **define your role as a 'smart' city** is, I think, an important part of the smart city discussion. Because if you look at the expectations, also from industry, and if you see how much – for instance only on parking apps and peer-to-peer parking solutions – you could procure.

FT22.9. One of the problems for Europe is how far will the management of the European management is going away from the normal people. Because the **technocratic solutions, politics, and also the technocratic discourse are far from common people**. This is very dangerous. Educated people, expert people, they don't care about the public discourses: how to explain to people how to change their behaviour, to change the use of the car, all the simple things in everyday life. For sure technology is very important for the future. The limitation considering the city is that the EU until 2007/2008 promoted the investment in smart cities exclusively in terms of technological innovation. They paid a lot of attention, exclusively, to technological innovation, without understanding that it was important to disseminate to people why it is important to invest in these aspects.

FT25.5. Coming back to governance in public space. We will definitely have intelligent systems, like robots in some form in our public spaces. This is where it starts to enter enforcement and so forth. We'll have a kind of big **global segmentation between the cities that offer civil rights, and those that don't**. There will always be places where illegal immigrants will be, but certainly automation will reduce those spaces, unless we will protect those spaces. A lot more will happen about civil rights. This is also connected to **citizens entering a global dialogue and understanding what the essence of civilisation is: how do we co-exist**. One of the topics here is whether we will have a more or less polarised society. Much of this depends on resources. Will we have people starving in 2050 on one end of the planet, so that people in Eindhoven or Sant Cugat can live well? But that will be a big determinant, and that relates to whether we will have an abundance of energy and clean water. I assume we will have! I am an optimist.

FT8.7. On a macro level, the changing government of cities could go through different models. One I can see is, **the growth of a super international stake, such as the European Union or other regional groups which serve as categorising bodies which then allow the cities to operate within that framework**. If we look at the urbanisation data, we expect that by 2050 a very high percentage of people will live in cities. So I think one thing might be this international group working across boundaries, being a more radical way to think about this.

FT3.26. The government is not necessarily losing its grip. It can still be playing **an important role in safeguarding public and common interests**. A government is still a pretty okay way of arranging these things, and I do not see it easily seeing replaced by something really better. As long as we do not have a good alternative, we will still be paying taxes to provide is such services. Even communities and crowds have a lot of difficulty in providing high quality of service, sustaining service and with decision making and playing an effective role in negotiations. These functions will still be there. Also **making sure that the plans of one citizen and the other do not intervene too much**. We might be needing more Judge Judy's, because **we need some authority** to accept the outcome. These kind of processes are needed.

FT13.2. An important influence for the future is governance and the fact that there is a change in the nature of national authorities. The **role of cities** will change over the next 35 years. The local level **will be the front desk of solutions provided to citizens**. Whereas it is the first institution they can turn to if they have a problem, after having talked to their peers. To give an example: we are involved in a project on nodes, urban nodes, stations in cities. We did a user needs assessment, talking to end users, including passengers, operators, everybody involved in the public transport chain .All of the actors, we interviewed 80 something, all say it is the local authority who has to solve the problems. Where in practice, the authorities do not own the station, they are not involved in public transport operation, they sell no tickets, they are not involved in planning, but everybody turns to them for being the director in charge of solutions, linked to the territory.

FT18.8. As the quote says, last century was the century of nations, and this century is the century of cities. I don't quite fully believe that. But **cities are going to be hugely important if you look at the population trends** in terms of the occupation of cities. The large cities will have increasingly important roles **but I am not sure that they have the absolute pivotal roles**. I don't think the people like Boris Johnson in London will ever be as powerful as the Prime Minister David Cameron.

FT3.3. What is difficult to predict is the balance of power between individuals and communities on one hand, and the government on the other hand. Because the government is doing things that erode its current power, but it still has rather big influence on the way we behave. I am not sure of it will be overthrown by these new developments or not. There may a co-existence, because we do not want a 'wild west' or extended free market thinking that also has its problems. So **the self-governing and self-organisation of the community will still be a challenge, and the government will still play a large role in it**. Maybe **in a different way, by facilitating more, and being strict on certain basic rules, platforms or standards, and then giving room to experiment on these basic rules**. Within the basic rules of the game you can play your own game. That is different from the situation now, where you completely describe how things need to done, or how we need to behave.

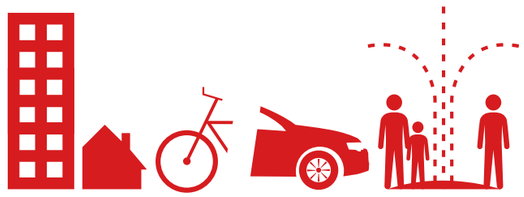
FT13.5. The role for cities that you see appear is the **role of director**, where the smart authorities find a way to establish in which processes they are involved, partly or fully, as a financer, as a funding source, as an operational manager, there is no clear answer, it will be a process. And especially the new services that present themselves as peer-to-peer services where actually they ask in a lot of cases to support, whether it is in-kind or support in view of (de-) regulation. And there are a couple of cities, for instance Barcelona, where they have **a collaborative process, they call their 'discussion logic'**, where they assess whether or not they have to participate in a smart city solution or not. They say the developments are so quick and technological developments so broad that they need a simple process to assess the questions that they get, because we have to be sure if we can link it to our legacy systems or invest in a system, or be part of the business model, or part of the policy structure... And that is how they decide to be in or out.

FT16.6. In this new situation **cities will much more facilitate than central government**. I am not optimist enough to think that people will do it without any own benefit to do it, such as his own life or benefits or ... But if one local government open the door to that kind of program than that may do good. It will need a more **stronger involvement of the local authority towards the population**, not only depending on what the election deadlines are. This cannot be done under 3 or 4 years. So it needs a much longer commitment and that is very difficult. On the other hand, if we look at the progressive population under 21, what we see is that there have been very few commitments until now , but some municipalities are implementing solutions to waste use for energy supply. Much more that central government. If we look at central government I don't see that many important actions. In France, the actions and obligations of central government are not. That is one point.

FT8.8. Another scenario for the changing government of cities might be that **cities themselves become their own governance institutions** and you might have a legacy of cities for instance, that could be much more connected if they are facing similar issues or challenges, population challenges. If technology is above to such an extent that they could work and cooperate together, then you could imagine a plausible scenario where **the governance is on the city level for a lot of the important issues**. I don't know what it will be in 2050, but I can see the options and I don't see a continuation of our current structure of increasingly weakening national states. I don't see that as viable on the long term planning.

FT20.13. Major issues with food production and water production and so on. This is all on a global scale. I am just thinking about the transatlantic trade agreement that is being discussed at the moment. Actual cities don not have much to say in. it is negotiated between countries. And probably other stakeholders; companies have a say in it. This is a dilemma for the cities, because they do not have a mandate, they cannot demand it. It will definitely happen that we will more and more **deal with these issues on a global scale**, like the whole discussion on the climate, or can we use the Sahara finally to produce energy for the whole world? What happens to agriculture when there are now tornadoes in Italy? And all those kind of questions. But **the challenge for cities is – and to be honest I am not sure how successful they will be – is to gain a role in here**. They are now already struggling with their role within their nation state, the classical boundary, and I think it is even harder on the global scale.

SMART CITIES



FT22.7. About 2050, **we will face big questions, of sustainability that require politics and policies, very carefully**. And I do not trust this to go well, since I see what is happening in the ongoing situation. This kind off problems are so unpopular, or at least how to solve these problems is very unpopular. So that is very difficult for politicians, to try to make a difference. On the other hand we have a lot of good processes for sustainability. The Netherlands is a good example, or Germany with alternative energy, or Denmark, all very advanced. Also Italy in the last 10 years reduced the gap and is saving a lot of paper and recycling plastics. There are many, many indicators of a better general system. But in the end we didn't reach a better general solution. I am convinced that we start to live the carbon economy. This is not simple. In terms of the climate change and the environment.

FT7.19. Another trend that will happen is that nations count less, and **cities will count more in the future**. We will go from some 200 nations to some 600 cities that **are the vortex of what will happen**. I like the approach in this project, because that will be the future. London now does incredible infrastructure projects to prepare for the next 50 years.

FT11.17. What solar energy that becomes really popular, what happens then? In Finland we are struggling with a nuclear plant that should have been up and running, and now they are fighting and it is unclear if it will ever be up and running. This is where **governments can make a difference: with regulation changes**, like in Germany. They are getting already more energy from small solar systems than what we are expecting to get from the nuclear plant. Sometimes governments can make a big difference.

FT14.8. Institutions will still struggle in 2050. If anything, institutions are hard to change. Think about 35 years back; in the 1980's institutions in the west, they have not changed much, unfortunately. **The pace accelerates, but people always overestimate the speed of institutional change**. It is not that easy. Too many people have a benefit in the way it is arranged now. Once you start to get masses of regular people becoming unemployed – also people like you and me – and do not know what to do with their lives. Then the snowballing effect will happen, but not before that.

FT21.7. When it comes to cities in particular. The biggest share of human beings on this planet will be living in cities, because they are a very efficient way of organising the demand of human species on one and the same spot. And also they can be very enriching, because they are the space for innovation, where you can find the culture, where you can be creative, where you can find this mutual affection of ideas and so on. **Cities can be a very nice and rewarding place**. Therefore the majority of people will be living in cities. We will be with 9 or 10 or maybe even 11 billion people on the planet. I recently gave presentation in Indonesia. I had to count back when I last went there, that was in 2007 for the Climate Conference in Bali. And it struck me when I looked up the carbon concentration in the atmosphere in 2007. There were roughly 8 billion people at that time, 1 billion people less than now! And that was only in 2007. And carbon concentrations were at 380, and now we just hit the 400 parts per million. And we know that 440 is reaching very dangerous levels. So what I am really not sure about is that time scale that we have, and if we are really able **to create the big transformation in the time that is needed to act, in order to not create a complete chaos**. Especially the climate change is about years, and maybe one or two decades in which we basically need to create a massive transformation.

FT5.5. Robot and automation will probably go faster than 2050, but I do not know how we will get there. Right now it is very quickly. The mobile phone, including all its functions, is going so fast. Technology development is very fast. First we had a mobile phone, after a while we had a mobile phone with a screen, and then we have a mobile phone with a wireless internet in a real setting so we can be reached everywhere , and now there is WhatsApp or Skype or anything is possible. Increasingly, exponential faster. Therefore I am expecting this to be earlier that in 2050. Like driving a car, and maybe after a while we do not need waitresses anymore. We will use robots. I don't think we will still drive by then. Not on the common roads, because of the **legislative rules**. Now we have to, but in the future we will not. It is like who is now riding the horse? You can only do that in special spaces. It is the same.

FT12.17. One of the things of **urbanisation** is bringing people together and that **makes things more visible**. If you live in a rural area you don't see many of these problems, but in the cities you will see it. And hopefully it **brings people together with the will to change** something about it. On the other hand, when you go to urbanisation in China, nobody actually thinks about how the city will become better. Everybody just moves there, in rates that are so high, and draining the rural areas completely. These are people that are just coming there to survive, not to make the city better. Not like the hipsters in New York, that create start-ups there, and at thirty years they have enough money, and if they fail they do not care. In Europe people have the luxury to think about the place that they are living in. Not just to survive. In Europe cities might become more liveable, but we might also be completely out of the market by that time. Then we have to revert our trend from **making cities more sophisticated to getting back relevance in the world**. It will take time, and it will be a slow decline – and I hope it is not happening. Because one of the things we can do is benefit from the fact that we are being looked at from many places in the world as still a very good example of how life should be. So that is very good. We can go on with this by being innovative enough to create and be good in many areas where we can be worthy. We have **the luxury of having time to think and to invent new stuff, so we should also use it for our survival**. This will happen in cities – it will not happen somewhere on a farm.

FT18.6. I think the pace of innovation will be even more accelerated. The possibilities and the permutations and the opportunities will be even greater. There will be even **more trans-global collaboration because of ubiquitous connectivity** and the ability for – what David Reed calls – **group-forming networks**, that will rise spontaneously around topics that will accelerate the pace of innovation. So open innovation 2.0 is a paradigm that hopefully leads to great solutions in the area of smart cities, smart agriculture and smart transportation systems. What comes beyond that I don't know, but I do think that the pace of innovation will be even faster.

FT23.8. Italy is the country of the paradox. It is the most beautiful country on the planet, for sure. But it is like a very beautiful woman with a very bad character. She looks beautiful, but do not talk to her. You cannot live with her. That is Italy. But the paradox of Italy is that it is a country where sometimes we are **able to be very innovative**. The **first regulation on energy savings in Europe** was made in by Italian government in 1978, called 'regulation number 10'. And everybody copied the regulation. The problem is that all the others have applied the rule, In Italy we did not apply the rule and it is a disaster.

f Democratising power: power to the citizens

FT6.16. If informed citizens organise themselves for a particular issue, then they also have more power. For example, we have a couple of very bad vaccination programs. And if parents are worried, because they are afraid of something, then they have a lot of power in influencing societal mechanisms. The **local governments will be much less top down working as organisations, more as a bottom up facilitator, setting a framework and some conditions, and then let the citizens, the free market and people who like to invest, and some representatives' organisations, let them do it themselves**. That is a sort of new urban planning / geography that is happening. But there we are also in some sort of experiential phase, and we still do not know yet if it will only have positive outcomes. Because as said the technocratic steering principle is so strong and we know we will have large benefits from the bad environmental situation, in the last century. If we do it the other way around, bottom up, and let premarket, neo-liberalism sort of thinking, I do not know if that steering principle is strong enough. Maybe it is stronger from the societal support view. But from the quality of the environment point of view may be a drawback, we may not want to clean up our environment in the same speed as we have before.

FT8.2. When **citizens take more responsibility**, it may also mean that cities become very meaningful levels of governance for themselves, if we think about international levels falling down. Then maybe cities start becoming mayor players in governance, so having this connection within a city is an important building block of **democratic participation** in my point of view. I think it sort of is supposed to be the role of cities now, but there is not a lot of accountability. And there is not always citizen's participation. So they are forced to act in absence of someone else taking the lead. And so this is more about power sharing and thinking about working on a future together, rather than working separate on different subjects and administrates and citizens work separate from industry. It is kind of a utopia.

FT11.11. We are going to be more and more connected to everything. What does that mean to the idea of how do we still keep ourselves? We are already in a phase where everything is open. I mean, somebody is filming us, and the recording of this interview goes to NSA anyway. How do you sort of keep your own boundaries? By 2050 we will have found a bit of a different solution. People will find the way to find their own privacy – one way or another. And there needs to be some sort of distinctive manners of how to do it. I would expect that in many cases, like energy or mobility, the role of governments is getting up. We think that the role of governments gets smaller, but actually what they are doing is gaining more power. Not so much in corporates and such. There is a lot that could and should be and will be done by governments: to set the rules for this and taking back the power to create cyber security. For now I would say that it requires both cities, national and European level governments. Many think the role becomes smaller and smaller, but at the same time some decisions get bigger and bigger. Which ones are getting bigger and smaller is hard to predict. But I think that it is at the same time really hard to really stop **people's movement**. It is not getting smaller, it is getting bigger: **one person can start a huge campaign, from one small place, that can become global in a few minutes**. That is not stopping. Although now governments, and especially companies start to take that initiative back by hiring trolls and similar things. They are gaining back their power. But will still be hard for them to remain in power, people are smart. They can have an army of trolls, but they will never be so good that people are not recognising them as troll. There will be new ways of going about these things.

FT8.3. And as part of that joint governance and citizen responsibility, because there is **more responsiveness and connectedness with citizens**, one key element may be that citizens, it is not just the most technological savvy or well educated citizens that will only take part in the discussion, it is **truly democratic and everyone can take part**. And that means that issues around food production and water supply, local food security issues and the fact that there is always vulnerable populations, both on a local as a national and international scale, that there might be a way to have this **organised on a truly global scale**, so that they don't have the same kind of weaknesses that you see now. I do not know this is likely to happen, the democratised governance is more likely to happen.

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Democratising power: power to the citizens - continued

FT14.3. This is coupled to social initiatives limiting the power of the government and large companies. The following up on that is the division between the haves and have-nots, and exclusion being the new norm. I think **the power of masses and people are going to pull together different types of social initiatives**. By default this will limit the power of governments. It is also that not only the power of the government is diminished; they are probably taking some part of the service delivery into their own hands. The fact that the government is not either able or willing to deliver this kind of services. I can see that the care-sector and education – maybe in Europe less education, but certainly the care sector – the welfare of individuals is becoming a big concern. Simply because Europe is a very aging society, and we don't have enough tax payers that can create funding to keep the system going as it is going now. At least in the Northern and Western part of Europe. So the welfare is going to be reorganised drastically. Peer to peer is going to be a big issue.

FT2.7. You need a **democratisation of power**, supply distribution to a massive extent. Otherwise you're talking about the emancipating societies. Power becomes critical. Today it is of course critical as well, but because the power of citizens is still limited to power of governments, comparing means of communication and mobilisation, there is no real threat: there is no central authority threat. As these technologies increase this ability for individuals to connect rapidly and faster with less lag and latency, the central authorities will increasingly try to protect their interest. Even the most benign ones. And you'll get greater regulation for the purposes of security or control, and that can go in two directions. If you get total control with ubiquitous power, you basically get an emancipated society that is probably not going to innovate as much as it's going to be heavily taxed. If you have **the liberation of energy you'd have new governmental structures, but you may find a renaissance, a revolution, in cultural society**, much more like the 16th or 17th century renaissances where you have much smaller communities of e.g. scientific communities, or art communities, more like Venice and Italy in the 17th century. A hotpot of renaissance innovation. I think we'll see a liberalisation like that. Coming from San Francisco I would see it as a world more like San Francisco.

FT17.1. Most of the trends that I find relevant are driving towards the **citizens as the main decision maker on their way of living**. If you think about food and its relation to health, then we will be able to produce food that is beneficial for our health. That means that health does not depend on medical systems, or drugs produced by third parties. So this means that you unhook from the dependency system, as we know it now, which is driven by pharmaceutical companies, which are driven mainly by capital creation and economical motivations. It will bring food engineering close to the people, and will create healthy diets. It will shut down dependency. That is why nutrition as medicine is super important, and may be one of the most important things, related to the usage of biochemistry. We will develop new types of food, where we are not only depending on, again, the food industry, which is another mode of exploitation. The access to food is depending of many modes of operation as well as the location of the land and of some societies that we are not even aware off. It is the main field of the human race.

FT14.15. Especially different types of online groups are popping up. They can be either broad or very niche. But the use of **on-line platforms for discussion** is becoming more important. Especially local platforms. I think we are still much hooked on these global platforms, but I think **local platforms are going to be big**. I was recently visiting a slum in New Delhi. There is this huge building, that had maybe one thousand people living in there, all living with less than a dollar a day. Their main communication vehicle was the local Facebook platform. It was geared for the citizens of that building. Here in Washington you have different parts of the cities where you have communication platforms to keep the different people living in the area up-to-date on what is happening, who and where people are getting mugged, or somebody who wants to sell or borrow something. They become **local social engines**. The difference between Europe and India in ten years time will disappear.

FT19.16. **Citizens will take more responsibility**, but it depends on how you look at it. Because governments have a real task in getting the right control – which is less control, but at the same time more control in areas that are very relevant to the city. It is **more and less control at the same time**.

FT12.21. We propagate smart cities from an energy point of view, because it will improve quality of life in cities. If it is done well. It has the possibilities to **empower people**, but it is not a means by itself. Not because we make it smarter it leads to something. We can spend less money, we may need less time to be stuck somewhere, so maybe we can think more. Some say you can consumer more, but that is not my view on quality life. **Smart for me is not just putting sensors everywhere, and collecting data, while you have actually forgotten why you want the data**.

FT10.9. **Governments are increasingly withdrawing their control, citizens taking more responsible initiatives, both collaborate more together**. We are here now in the open innovation, quadruple helix innovation conference together so I support this. I completely agree. Cities, giving the fact that if everybody would have as interesting living as I live, have as good a taste as I have, when it comes to physical surroundings and the services. And **the services that are designed are based on my means**, that will only increase the pleasantness of being in cities. Now I put my 'me, myself and I' like a big thing at the centre, but actually I do not think that my needs are too unique. I think my needs are actually very, very predictable. I consider the internet nowadays not as a technology but as a behaviour, it is actually an **internet of behaviour, of intentions**. We can do so much more, even at 'lot-size one', tailored to my small behaviour. I think that e.g. the view from this window is pleasant to the eye: the sea, the green, the sun. I do not think people would disagree and would prefer a concrete block. I am ready to take the debate that we do like similar things.

FT25.11. The biggest area where we need to be active now is to ensure we have a very different type of leadership in our societies. Data driven management will be a blip in our development, and will halfway 2050 come to a turning point on some fundamental questions about why are we here, and why are we social beings and so forth. The most pertinent question is how the future or our political systems will look like. Take the city of Sant Cugat, this is immediate. They are one of the last cities that is governed by a traditional political party in Spain. That's changing very, very fast. This may or may not succeed also what is happening in Greece. This may or may not succeed what is happening in the short term, but it is certainly the kind of battle we are going to look at over what kind of society do we want to live in. That will be a really fundamental change. I would imagine that in 2050 we will see government as an equal partner to anyone in society and holder of certain resources and certain mandate to take certain decisions. But **it will be our citizens that will decide, that will solve the problems. It will not be government**. And that transition will happen in a fairly short time. That can either happen because we understand it needs to happen, or by some sort of more extreme movement. We are creating an increasing expectation in society that everyone has a say, and whether we maintain our values of protecting the minorities, or whether the majority decides everything. That is going to make a difference on what kind of society we are. Our civic value system is probably the determinant. And we may well see the example that the cities in this project are no longer part of the same economic fabric. That e.g. Italy may decide to go down the path of populism, and majority rules. The value systems might re-engineer these things. In 2050 it may be different for those eight cities. A lot of that will change significantly in the way government reflect our decisions. But it also means that if I was investing as a mayor in anything right now, it would be in thinking about really quickly creating the change in government. For some cities that is on the agenda, but this concern will grow in the future.

FT17.8. If governments do not withdraw some their control they will disappear. I think we are now in interesting times. We have seen it recently: we never thought that America would approve legal gay marriage or what's happening with Greece today. E.g. Greece is an interesting move: bringing decisions of the European Union to the people – directly. I don't fully understand what's happening in Greece, but it is an example of how **big changes in a country are driven by the citizens**. You may need some adjustments because probably the people will vote for stupid things, but it is different from putting the power in Brussels. It is also a way of reducing the pressure that society has.

FT14.1. New forms of pressure are coming from the masses, increasingly dictating the norm. I believe that due to the lack of job, the lack of work opportunities, **average people** or middle class people as we see them, are getting to be more organised and they **become important pressure groups to have impact on policies, that are dictating the social economic conditions in the cities**. It can happen either through the regular political parties, but also the citizens movements will become a more important channel. This pressure is going up. Probably in Europe the pressure is still going to be channelled through existing or new political parties.

FT12.7. This will have influence on how people see a very **important part of their life that they have looked on passively and will now look on actively**. And this might have changes on how they interact with local and regional policies.

FT6.18. Those classical organisation of the institutions worked well, let's say 50-60 years ago, if you look at the declaration of United Nations. That still worked in 1992 at the RIO conference. The definition of sustainability was made and everyone agreed. Even the Plus20 conference in 2012, there was a document adopted by all countries, a document from the World Health Organisation, focussing on those problems. The document was titled "The future we want", and everyone agreed. But the question is how to implement it. The current discussions about that big international trading scheme, which is now developed between the US and Europe, some people say that the downside of it is that countries lose their influence and even from the national law point of view: national law is becoming less important. Look at the players in that big scheme: it is the big companies. So we still have a long way to go. But maybe in that **changing relationship between science and society and governance**. The **responsible citizens**, the young people, say "he it is going wrong".

FT12.15. New forms of pressure from the masses is already happening a little bit. There is a start, like **crowd-funding and crowd-decision-making** is something different from the static democracy of voting every four years. It is happening, and it will make an influence. People hopefully get **more personalised**, and not just part of a stream. Because if it goes for the stream we are heading for disaster.

FT18.10. There is also the topic of **increased citizen participation**; we are taking part in the Horizon 2020 program called Organocity. 25% of the budget there is reserved for citizens suggested experiments and solutions. I think creating this common infrastructure that then becomes an enabling platform for innovation that is making all sorts of data available via API's and that companies and individuals can innovate on that will be hugely important. This will happen more in the future, we're just at the very beginning. Most of the systems that I see today – it might be different in Eindhoven – but most cities have siloed infrastructures. City managers are very keen to go to share infrastructures because of costs. In the open innovation conference of 2014 we surveyed ordinary Dubliners when we had an exhibition on smart cities. We asked them if Dublin should be used as a venue for smart city experimentation, and if so, if they like to participate in it. We might have expected that 20 to 30 % of the people said 'yes', but over 92% of the people said 'yes' to both questions. So it feels that the culture is changing that **citizens, rather than sitting back and be passive, they want to participate and contribute to the process**.

FT14.9. Today the Dutch court ruled that **government has to take its responsibility for the care for safety of citizens** after a group of citizens filed for court blaming the government for lack of action in enforcing more sustainable energy solutions. This is a nice example of **citizen's movements that do have impact on the bigger picture**. You cannot easily imagine something like this to happen in China, but it could have impact on Europe, through some European countries. Maybe Greece is possible as well, although that is not focused on environment.

FT6.19. You also see more and more influence in the RIO conferences by young people. Their power is increasing. So my hope is, and I now phrase Herman Wijffels: "It is not governance who will make the first step in those transitions, it is **responsible people who will take the lead**". And hopefully then the politicians will follow by democratic mechanisms. As long as big companies have these great interests it must come from the citizens. And the classical institutions will fail. One more aspect. We live in a sort individualistic, more individualistic society than 10-20 years ago. What is the world

SMART CITIES

g Self-organising and self-managing communities as the new social and market paradigm

heading to? To a sort of collection of individual people, following their own interest? Or are we still able to act as a group of people, also caring about the common values? And I don't know the answer. And now I quote my former director Klaas van Egmond: "As a society we have a sort of centrifugal way of thinking. We never end up in the ideal centre of what is the optimal quality of live". And I don't know if we still develop our self as individual persons with our own needs, to be fulfilled. Or **are we still able to function as a group of people also taking care of the common values**. I do not know. Sometimes, from this social point of view, it makes me a bit negative if the developments. Are the new young people capable to do that?

FT13.15. There is also a movement **towards independent** travel, active travel and health and I guess for automated traveling, we are looking at distances that can easily be covered by cycle or on foot. And that is also a phenomenon that we play already now. There is a lot of apps that measure movements and count the amount of calories you used. This is also a trend that will probably increase. The pressure from government and health insurance **to take responsibility** for your own health. That could also become an important factor for independent travel and helping the smart city.

FT6.3. Certainly technology will have an impact on the social aspects of urban living. Through ICT and internet and mobile phones, we get better connected. That means that those **groups in cities who have a low socioeconomic status will be given the opportunity to climb up on the ladder to have the same information, potential and technology potential as their rich neighbour**. It will enable those people to also use technology and the internet to inform themselves better. So also this information; it would not have been available if without that technology. It will make them **better informed citizens which will improve their quality of living in the city**.

FT10.16. It is hard to change as human beings, I understood from biology that **resistance to change is actually important for our species**. But it hampers sometimes progress too. And there is always the doers and the talkers.

FT23.4. We talk a lot. Especially in Italy we have a culture to talk, we have the highest amount of symposia on sustainability. Our culture is that "when it is said it is done". But it is all talk, talk, talk, and nothing happens. For the goals of 2030, we are behind by minus 30%, instead of plus 20%. So the gap is great because they do not really make urban policy with communities and working with people. It is difficult because politicians do not have the knowledge to do it. They all come from old politics. I think it is the key to change. It is difficult to make a change so great, only by the believe to do it. We all believe this is important to do, but **only true government policy can make it happen. It will be changed, eventually, because there is a lot of pressure by the people**. Government is always very sensitive about consensus and instead that policies come from the top, instead they now come from bottom up, because people complain. People want more parks in the city, they want less traffic, they want safe life, they want to live in security, they want more public transportation, and if these things don't happen and people organise themselves, then the only opportunity is to community effect pushing policy to make decisions.

FT1.13. Solidarity is a choice, and it will become a reaction in our society. On the one hand we are more isolated as individuals, with increasing numbers of one-person households, and other social trends in that direction. But on the other side, the idea to have more solidarity will come back. **People feel that they need to organise in a different way**, and social media can be an important platform for such things. People will jointly invest in energy production. We applied for a project that is based on the assumption that we will be able to create energy cells in a social process, like energy neighbourhoods, or energy quarters. In the future we will not only discuss energy production for single houses. Doing it on neighbourhood level opens many possibilities. One house can produce energy, but the other cannot because of its structure, but can use it. We will come to **decentralised solutions on neighbourhood level**. This is **creating new communities**. This will also be for green spaces in the city, or mobility. This will become more important.

FT4.10. In crises we will find a new way. Especially in places where there is enough vitality. But it also means that in places where these conditions are not available, those are the places that you have to worry about. That is the case for places and communities, but it is also true for social stratifications that I have talked about. When people have the capacity, they will solve it. But when they have the misfortune that they don't have it, then it becomes a problem. There is an interesting thing that in urban societies and in cities has always been an influx of immigrants. Always there were clashes, always after 2 or 3 generations it settled. Not by giving up their identity, but by finding a new balance. The new groups will be much more formed around life styles, rather than ethnic back ground. And it will be much more blurry, on different types of interest. In opposite of the old situation, were communities were much more homogeneous. New **communities will be less homogeneous and less static, much more flexible**. Or course there will be tensions and drop-outs, my only concern is how you can stimulate this process of awareness, of learning, of growing, of creating an ecology. These ideas around quadruple helix are very interesting, or as they call them in Anglo-American: the common interest developments. In my profession it use to be an outrage: the gated communities, leading to inclusion and exclusion. But the funny thing is that in many situations that a very strong evolution happened from a very homogeneous, excluded, static situation into one that is far more subtle. For instance 'Celebration' which is a gated community created by Walt Disney. He wanted to create an ideal community in Florida, with strict rules both socially, and spatially for the architecture and urbanism. And they started, of course it was a commercial enterprise, so they sold the land and the facilities. And these people were co-owners and gained rights. Not only from a property perspective, but also at a certain moment being represented in the board. When the project was for Walt Disney financially ended, in the sense that they sold it, then the board of stockholders and shareholders reorganised in a community, with a community system with a different political status. This is a beautiful example of how you, through **a market initiative, can reach to new social communities that is self-governing**. Of course it has this typical American capitalistic hard-core notion of common interest. From macro-perspective there may be a lot of social injustice in it, but the flip side is also there. The same type of things are happening in the bad neighbourhoods: a lot of **self-organisation, financially sponsored by the market, with an interest of lifting up the area and earning some money**.

FT8.17. People will eventually make that change. I am negative about the change in the educational system, also because of what people want from the traditional educational system, but there is all kinds of things happening outside the educational system that people don't call education. Like all the social media stuff, where, next to the bad stuff, there are also a lot of amazing stories of 12 year old bloggers and I think that the more we are able to show our individual strength, I think that those talents come from being educated, but they don't need to emerge in the traditional education system. And the more that we are able to actualise ourselves, have some more time to work on other things, I think the more we will be able to move from ..... If I think of complex systems right now, the policy dialogue and the media dialogue is not there yet, some people talk about that but most people don't. And then there is this sense of helplessness because you don't think you can do anything. The next would be what can we do and that is all the tipping point stuff, where you can do stuff, you just have to start managing it. And **that will happen in small steps until you have enough people, a critical mass of people who understand and feel comfortable with this kind of thinking, and that are not threatened by change**. First of all that requires education just in terms of cognitive skills; you need to have that flexibility. But it also requires education on the willing to take risks, you need to try new things. I don't know if education provides that, but I do think with the educational training we get as children and with all the technological elements we have I think that that can emerge through peer learning and through working with impressive individuals which we have around us all the time.

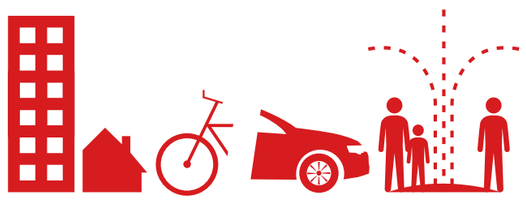
FT6.14. The way the urban system is organised will also change. The classical top down government approach is not working anymore. If you see a restructuring of a certain urban area, then you see mechanism into play now where other stakeholders and actors come together from the beginning of the planning process, try to develop ambitions and a vision and a working plan in order to do it collectively. It is still a bit in an experimental phase, but I think it will increase and develop itself towards the **new cost-benefit models, the new earning models**. People who invest in a certain urban reorganisation and people who benefit from an urban renewal, they should come together and create a sort of fund, that those who invest will also get some benefits out of it. That's a **new sort of alliance formation**, also from the monetary viewpoint, that will become very interesting and will be increasing in time. The new way of urban restructuring, including investment. But still experimental, everybody is talking about living labs and so on, to do some learning. But it will eventually happen in large scale.

FT16.21. One of the city of tomorrow scenarios is a 'patchwork city', which is individualistic, privatised and fractured, is subject to market forced and accepts their consequences in terms of inequality. In the **segregated city**, residents gather by building and/or district into **communities based on income or lifestyle**. The energy and environmental profile is characterised by tailor-made solutions.

FT15.19. The data piece is key. Influencing what everybody does, buying decisions, is **all influenced by data**. By 2050 that will influence your working environment. The choices you make there, and I don't know how or what data that will be. More linked to your sense of contribution. Wearable technology. Could happen that we just plug it in, we do not have to look at it. If a memory is physical in my brain, why can I not transfer a memory? I actually believe that we do, we lost the skill, it is sort of elephant communication, All of what is going on up in our head, eventually we can join the physical parts of memories and knowledge. In the future we can. The **merging of the brainpower**. And that will change a lot of our perspectives. For instance all this privacy. If you look at young people in their late teens, begin 20 s, they think nothing of sharing. They all have somewhere on the internet stored naked pictures. And even in this world with all of the bullying and so on, it doesn't matter. In the old days when we lived in small villages and societies, and you were being bullied, you could not escape. Nowadays, you can easily break out of the circle. **Your circle is as big as you want to make it and there are plenty of people who have the same issues as you have**. So instead of being on your own, you are one of thousands. So I think a lot of people have no difficulty in sharing all this stuff, because **by sharing they are connecting with people with similar problems and similar issues**. And that can go wrong, look at a suicide pact and something... So there are new issues, but it has nothing to do with privacy.

FT14.2. You will have a lot of people who are potentially doing work, and collaborating on producing services, which are not necessarily paid by money. Or produced because of making profit. The peer-to-peer production, voluntarism, I think these are going to become more prevalent. And you see opportunities for cities: different pockets, different corners, the kinds of **people coming together formulating a group, looking for each other**. This is the positive view. The people who are now less included and more visible through the fact that they are not included, this type of a group will diminish. While we see that more and more people are not being included, they have started to become a group and being not included because of the new norms.

SMART CITIES



g Self-organising and self-managing communities as the new social and market paradigm - continued

FT2.8. You'll get this **liberalisation of society** but with more individual security, more individual comradely community, because you can then directly mentally communicate with those you trust and share output with. Basically you'd get a collective culture. I see us going through the most **radical evolution of human society** in the next twenty to thirty years.

FT1.3. If we can assume that economic wealth will remain (which is a rather risky assumption), considering recent trends and if these trends will be an ongoing process we can expect that **people will invest more in utilities in the ICT sector and energy** (rather than in traditional things like cars). E.g. now in Vienna there is big success story on the implementation of citizens solar energy power plant. This will go on if the conditions are more or less the same. This means that the money is still a common currency, but it is used for different purposes.

FT4.7. Also in **energy there will be much more locally produced**. I don't think it will be only realised through high tech technology. We will find out that it will sometimes suit better to use low tech or more traditional insights. Even primitive people already knew how to deal with basic ideas on carefully dealing with energy. So thick walls, the orientation, the role of green in the city, the role of water in the city. So it is very much about cleverly combining high tech and low tech, traditional and modern insights, knowledge and tactics. If we think about more **decentralised initiatives**, and strong tendency of **local groups doing more and more things for themselves**, than the behaviour will be changed.

FT3.24. Technology can give us more freedom, but are we able to use this freedom? **As humans we need routines**. If you have all the time of the world, what will you be doing? Will we doing completely new things, or will we just be demolishing lamp post because you are bored? How much do you want to talk, how much news do you want to consume every day? There is a limitation to what we really can do with all the available options. We rely on certain patterns and fixed things. We may still want to buy our own bread in the centre of the city, just to have a daily bike routine that you like, if there is a nice path through a nice area. Technology is becoming more and more programmable and the question is how do we program it? A lot of people will not be doing anything with it. That also determines how much we travel, or how much goods need to travel to us. If we do not need to work in a large company anymore, than we do not need to be at 9 o'clock in the office. As long as there is not a real revolution that breaks up all industries, to replace them with **local communities**, certain patterns will persist.

FT20.8. These **new structures of families, also influence the social cohesion in cities**. In my research on how different demographic groups differ in their expectations when it comes to well fare and social quality. I could find – in European countries – 3 important factors. (1) age; the older you get, the less likely you are to look towards the younger side of life. This sounds straightforward, but it was disputed a lot. I could clearly find that in child benefit and so on, with age people think less that that is relevant. (2) parenthood and (3) grandparenthood; not only as a function, like having an own child. It is being a parent, gives a different view on life and on the role of the state to address social cohesion. Again these people think less of certain care benefits to be relevant. It is not to say that they are eclistic, it is that they have a problem that needs to be addressed. The state and cities have to realise that the changing life forms in society may become cleavages, have the potential to become cleavages to address then and to make that an integral part of new policies.

FT10.1. The constitution of the 'kernel family' has evolved backwards to what it was in the early twentieth century. The **family is defined broader** as 'the people that use the same refrigerator', not just the constitution that is dominant now: a man, woman, two kids and a dog.

FT20.7. What is family, and what new structures, especially in the context of cities and how they function. To a certain extend large cities, like Berlin and Paris, are cities of singles. That is already relevant now, but what will be more relevant in the future is that this number will increase. And single doesn't mean never married or never in a relationship, but it means in a life course, with a lot of different patterns. Maybe married sometime, then divorced, maybe dating and so on. These values are changing, also with older people. The divorce rate at the moment is the highest – at least in Germany – at 15 years plus, because women more and more say 'no, I can live my life alone.' This is how modern life develops, it is a good thing. But in a way our mind-set is still traditional: father, mother, 2 children. I think cities will have a particular role in there to connect these people. That will become more and more important. To **create spaces where social interaction can take place for people who are not in a family, who are not even in a partnership**. For example my brother is single and says in Berlin it is very hard to make friends. In a way I see the same here in Brussels, I just moved here and people are very nice, but to make friends is very hard. I think the concept of families will over the decades change even more, and we will no longer talk about patchwork families anymore. If you have problems with partners with children from an earlier marriage, then you have to go back to the middle ages. It is going to be more and more about creating your extended families with friends. That also has to do with the emancipation of the gay and the lesbians, who are now more and more into marriages, but still in a very different life style. That will bounce back more and more into the value system of the majority. This has very practical consequences, not only for the individual in his or her apartment, because loneliness is for most well beings, something people suffer from. Might lead to depression or disengagement from society, from political life and so on. Therefore **cities will have to, because they can , reinvent social life, as we saw happening in earlier phases of cities**, or you see in Italy for instance, where – although still family based – in small villages social interaction is built around the interaction of these families. And we will not get back to that system, but I think – and the Netherlands are, at least in the gay scene, already working on this – to have care and friends when they are old, and to organise social interaction. This is a core for cities to facilitate this change, for instance by building new care institutions, but it is still based on old views of couples moving in. but there will be more and more single old women. Again I think we need a more and more homogeneous strategy for quarters.

FT12.22. Many of the things we are doing, like smart cities and communities, not just cities! This can be **local communities, or virtual communities**. It underlines that **it is not just the technical system, but people**. This is a very complex system, it has always been treated very much from a technology and administrative sector types. One decided about the energy of the city, the other one about transport. We're trying to see what can be done if you actually look together. How can I get more out of it if I look at transport, and energy and ICT at the same time, and not separately. This will have an influence once it becomes a main stream thought. Yes it is a complex system, but instead of super-specialising in one area, it is interesting to see what the influences are in the other sectors. This will **always include the people for which it is made**. So we're **citizen focused**. Like the micro-grid, looking at getting more local renewable energy in the system, but also without blowing the grid.

FT11.12. Everything is more global, but on a city level I can see a link of digital cities through **virtual societies**. I can link to a city in Zimbabwe from here. Those virtual societies might become more distinctive. Many people in Finland sort of have their feeling, and it is possible to hold on to that. Your citizenship is a community, even though everybody is moving around. That is forever, it is never changing: you want this connection to your closer group. And it still is never more than a thousand people. **The way that they are formed might be different in the future**. You might be feeling that you're not part of the neighbourhood that you were born, but part of the Goth scene. We can have a virtual country of Goth fans, and we want to have our own rules. Maybe we will really have **virtual countries**. It is not impossible. You can have smaller subsets, who knows? That would be a beautiful country: with Goths.

FT8.18. One thing underlying all of these. One thing I wonder about is social connections and the distinction between social life and the face-to-face. As we have more and more **virtual** connections. What does that mean for what we think a friend is or what we think a neighbour is? And our community and the people we trust. I am very curious about that. That may very fundamentally **change the way in which we define ourselves in our communities and our cities** or if it is just another element and we can live in both worlds at the same time and it does not have an impact.

h Setting the economical and legal framework

FT16.9. Europe is very different in this sense from the rest of the world. In Europe we have dense cities. I don't see them changing that much (I am probably totally wrong). Whereas in North America or developing countries there is much less tradition in walking in the streets. There is no pedestrian area in the street, accept for New York. These might appear and several cities are very deeply into enhancing the urban transporting system, and developing tram systems and cycling systems and **working in partnerships** to create new modes of mobility.

FT22.19. Public works, the departments that take care of the roads and mobility. Because cities are not constantly growing, like in the past, also the policy of public works is changing. Mobility is strategic, but requires **a mix of policies**. North European countries are less civilised, but more civil. It is easier in northern societies to put new rules and to reach a sort of general respect and acceptance for these rules. In Latin countries that is impossible. **It is difficult to change behaviour through rules**. Like the pedestrian considerations, we changed the policies for that, but it is difficult. We are starting sweet mobility, to slow down speeding in the cities, to respect slow mobility. And it is a huge fight. Ferrara is a biking city, we have the highest number of bikes in the city of all Italy. Here it is a bit easier to talk about, because people already use it, but generally speaking it is very difficult to change mobility behaviour. Also because we are too much individualist to understand the relevance of mobility policies for our environments. Our local politicians invest few in mass transportation. In Bologna they are fighting and changing projects and solutions for the Trolley in the historical centre constantly. It is very difficult to get agreement upon. Mobility is a big challenge, also for a smart city. We will also have to change our mobility industry. When I was in San Francisco I saw there are different parking spaces, for small cars and for the big cars and the prices are different. A very socialist policy, that can happen in San Francisco, here it is impossible to do that. How can you explain people that they can buy a BMW, but cannot use it in the city centre? Especially since now in the city centre live very wealthy people. So the very small alleys are filled with big cars and huge SUVs, that can hardly be moved around. But it is a status to have such a car. It is very difficult to change.

FT13.34. Another relevant issue in the future is **the whole financial picture**. The financing is now everywhere somehow linked with fuel tax. That will disappear when everybody goes electric or will cycle. Or you will have a lot of professional drivers. There will be an issue of how to get revenue from transport. That also needs to be prepared now for 2050. **How will you invest as a city, what will you own**? Specifically for transport there could be a large market for others to invest and participate. Here **public-private partnerships** are not new. That is, looking at the global picture, a major question.

FT13.4. In the UK you would call that **a 'nanny-city'**, where actually in reality cities are also part of a retreating government process. Cities are under a lot of pressure regarding budgets, so in terms of mobility, there will by 2050 have been a debate about what can be expected and if it is realistic in terms of **the city as a provider of resources and as director** of mobility services.

FT13.8. In 2050 you might need systems in cities that can regulate or allow vehicles to be road worthy . And we are thinking further ahead about drones, you will have to have **local regulations**. And maybe that is also **how cities can compete and distinguish themselves**, in showing how they act in the different question that come to them.

FT22.20. In Milano the mayor has changed the situation in 4 years, using **a balance of different policies**. Price policies, limitation policies, etcetera. So it is possible, because the mayor in Milano is a very respected person who was able to push the policies forwards and really change the city. So I believe that if municipality administration really want to change, they can.

2 Enabling human development

In 2050, city residents are resilient, and can consciously adapt their behaviour to enable personal development. The middle class have largely disappeared. People have found new ways to live meaningful lives, building on opportunities at all levels – from local to global. They can handle large amounts of information to make personal choices. Smart, human-centric city environments provide inspiring places for lifelong learning.

a Enjoying a meaningful life

FT21.2. I severely hope that people will be no longer work exclusively for financial rewards. That there is **more meaning to life than create a fortune** that you can't make use of in the end.

FT14.12. **People no longer work for financial reward**. That finishes in a kind of positive note. I see simply because the opportunities for people to fulfil their goals and ambitions on a paid professional life are becoming more and more limited. People are smart enough, but with the help of their friends, and the help of technology they are able to understand that working life is not the only thing that is worth to spend time on. Once the mind-set changes, and the tools and technology become more available and affordable they start to understand how to use these **to make life more interesting**. **Cultivating everyday life and physical environment**. People will start to understand how this could be a way to fulfil their daily hours.

FT21.11. Some trends suggest that people are not anymore purely looking to create a fortune or make money, but for happiness. We see this emerging. We just continue to ask the question 'why': why does life make sense if it is just about creating a fortune, for what? Why are we doing this? In the end it is about being here, we should **feel happy and being able to have a spiritual connection or whatever makes us happy, without harming anyone else**. That is something that will become a more determining factor in the future and that is good.

FT14.11. For gaining trust it becomes more important **to rely on local, because people have opportunities to substitute their work and their other type of time by working for common good in their local environment and at the same time make their life more comfortable**. I think that is definitely a growing trend, not only in Europe. Here it is going to be interesting to see how European countries are starting to learn from each other. Because the southern European countries always have maintained these traditions. It is some lesson to teach to northern Europe. It is going to be interesting to see how it impacts societies like Finland, where trust is very high, but it is mostly between individuals and institutions. At the time that institutions are going to change, trust must be sought somewhere else: from the fellow citizens. We will see that grannies are moving back home, which you may find a quite dangerous thought ...

FT8.15. Our need for manual labour and a number of other industries decrease so much because it is provided by machines. And you actually have more free time. And that means that you then have to **think about what else you can do in that free time**. And with more knowledge and more access to green spaces and other things, I would think that the idea of well-being in more general might push how people are spending their time. So more recreation, more leisure, more hobbies, more, even more exercise if you try to get rid of obesity. Those kind of things, or just more if they are taking more responsibility in governance you need time to do that. So maybe there is a much **more modern perception of what is work like verses personal life**. And **personal life may also include that you are in the governing board of your school, or your cities water production, or solar panel installation group**, but that is not considered your work, that is just how you spend your time.

FT3.13. As an individual you may also have an avatar or personal robot that helps you to negotiate. It may be that you have something like an interpreter next to you, while you are having small talk with just a few agenda items, and the other agenda items are dealt with in the meanwhile by the robot. This will give us extra room to **make your personal life become more part of your working life and the other way around**. Now you see people whats-apping all the time, but then they will also want to see how the children are doing, of somebody is travelling. That will not be a problem anymore: we can do these things throughout the day and still everything that needs to be done will be done at the end of the day. We can be more genuinely interested in other people. It may bring up other things, e.g. listening more to each other. Nowadays attention is scarce: **genuine interest and attention requires time**, but that will change. **We will be able to spend more time on that**.

FT8.12. And that is very much related to each individual is provided with personal space to develop uniquely and is suitably challenged in both their study and professional lives. This is a little bit related to the company point I had up here. But really thinking about **human and social capital** again, that there is something **very worthwhile, both personally, socially and economically**, in having this kind of personalised, development or ability to grow. And I think that education hasn't figured out much of this, but education is key to this. And something like this would also make the reduction of things like obesities, diabetes and cancer and aids also much likely to be reduced even if the bio technology isn't there yet. So this is for me really a key pillar. The question is how. Education has dusk far shown itself to be remarkably resilient to technology advances, which is not a good thing necessarily. So I think, things are changing but they are changing very slowly. So by 2050 the computer will have entered the class room, will it have revolutionised the way we..... But just by definition, once it penetrates there will be much more personalised and individualised learning possible. The question of course remains in how well it can be harnessed by teachers and school leaders.

FT14.14. It is not only about technologies, but also about technologies and services, because they become blurred. This aligns with the idea of peer-production. We won't be talking about technologies so much, but about skills. We already see this type of service taking place in elderly care. How unemployed professionals are starting to be interested in caring professions. Not because they are paid, but because **it is an opportunity to do good**. And also to give back. But also because it is a job that is available, and there is demand. So I think that certainly is one area where things are happening quite fast. And of course, Uber, Airbnb and other examples in the **sharing economy** show that things are changing.

FT14.16. I really believe that people do not want to move. 95% of people that are living in a small country like Belgium, they do not even want to move from Wallonia to Flanders. Most of the people want to stay where they are. The most important thing is that they want to do something in their daily life. I think cities are important. I do not think people will move to the country side, even if there is sufficient energy. **People need something meaningful to do with their daily lives**. You need to have incentives, the rural country side does not incentivise and does not give you that type stimulus that makes you think and gives that you **that type of external environment that makes you do valuable things**, without being paid.

FT9.9. It is already the strategy in Turkey that **people seek for more meaningful contributions**. But it is 0,1 percent of Turkey. This will take a lot, there is no green space in Turkish cities, in Istanbul at least, so children will always play on the computer, so technically there is no outside. So if people want to do any good they work for kids or join special works, for elderly, just to fulfil their unmet needs. They are not satisfied this younger generation. Maybe because they have everything or that they do not have to fight for anything, that's why they go searching for what they want. That looking for satisfaction and happiness also relates to sustainable awareness. There is a big switch now to organic products, probably because people have the idea that everything is so polluted, so people are going to adapt a more aware way of living. And they want to **be happy and live healthy**. They go more often to a doctor, this will all be very differently organised by 2050.

FT21.20. **Citizens are at the centre stage**. It cannot be a top-down procedure anymore, because in the end I believe in **free democracy – where people can choose what they do**. And they are only **choosing the right things** if they really understand why it makes sense and if it benefits their services. So therefore **the concept of regenerative cities or ecopolis has to be people-centred**. The buzz-word people-centred approach is the new kid on the block in terms what strategy you should employ in the energy sector for example. In many parts of my country we are not discussion whether or not we should renewables, but will it be renewables from big off-shore plants – generated by a few companies and then distributed on their conditions – or will it be a people-centred approach where everyone can participate in this market and make money with it. People basically become an energy prosumer. That is the right approach, just because all other approaches won't work.

FT20.15. I do think there is a change going on at the moment on **how people frame their lives**. I don't think it is only a class think, I don't think it is only with people that have studied, I think it is a cultural thing. When I look at my parents' generation, and it has a lot to do with World War 2, but it is everywhere in Europe. People had to build up, people had to work hard, to get themselves together. So work was in the centre of their lives. Not so much well-being, that was then called 'leisure time'. This was not attached with a value, this was being lazy. We still do not want to be lazy, we want to educate ourselves as we like, we want to meet other people for inspiration, broaden our horizons, and I do think that becomes more and more a goal for people. This **changing value** is a trend, and I think it will grow further. This also means – I just saw this division of working hours, where Greek work the most hours, and Germans the less – This is all a very interesting discussion: "what is work? And what is our happiness and so on? People will still get their satisfaction out of work, but also out of other things. It will be better distributed, **balanced** if you like. So 50% of your happiness out of work, but also 50% out of something else. We all know people who have sacrificed relationships for their career or for economic well-being or material wealth. And they are not happy. And that is all changing now, you can already see it in the new generation, they do not want to work non-stop anymore, they also want to explore other values. This dimension is changing: a big value change. Cities need working people: they need economic development, they need the taxes people pay, so this is a really interesting question for cities. And then we are not talking about nice parks where people are sitting in the shades eating ice cream. No, this is about **people do meaningful work and contribute to society**. You see more and more foundations doing interesting stuff, like the godfather project I mentioned; this is actually work, the youngsters are educating the children. But these are Lighthouses, and cities need to facilitate this much more.

FT21.6. There is a big difference in how it should look like and what it will look like. I would like to focus on how it should be for the time being, because we still have time to make the 'should be' also the 'will be'. I think it is pretty true that what we can imagine and that **what we are envisioning is how we determine the future**. There is much truth in this. We have almost 8 billion people that have their visions of the future, and they not all look the same. But for certain **the majority of images what we find appealing will become a certain or important part of this future**.

FT12.25. We are putting a lot of money in the development of technological points. To reduce carbon footprint, to reduce energy consumption, reduce time spent in traffic jams. That is what we are looking for, instead of looking for the best heat pump.

b Ongoing learning and personal development

FT17.2. If you have access to food, and have access to healthy food, so if you have health, if you have these basic needs covered, then you have time for more transcendental stuff. This relates to having a special space to develop yourself as a person. It means that you don't have the pre-cooked paths like a menu, where you choose is given to you and you can only become an engineer, an architect, or a lawyer, whatever. But actually careers – or you should no longer talk about careers – a it will be more of a learning process that is never ending, where you can follow your interests. If you find a space for that to happen, and also if you have a space where you create something that you are able to give back to society, then we get into a second layer. I think that this will actually change the value chain: it is no longer about doing a study to get a job, to earn money to buy a car, buy a house etc. But you get in **a constant mode of self-realisation**. Through that self-realisation the value chain is totally different. It is not dependent on an established goal like buy that house, or buy that car. But you are **constantly feeding your curiosity and your interest in changing realities somehow**.

FT9.5. Robots will take over a lot of our processes. I am not sure about education, although there are already a lot of courses online, so maybe computers, but I am not sure about this. But all kids already have iPads and everything and learn a lot from the internet. In that sense I am also a bit worried about the future, because all the kids are, like they are 1 year old in 2050 they are going to be 20 something and **everybody is going to be able to access anything on the internet and use all sorts of technology, smart data, smart phones, that will be more common even than now. That will change everything**. Already the education level has increased a lot over the last 10 years, at least in Turkey, and it is going to be more common all over the world. People have a lot of interest rather than staying at home, because they have all these options right now. I think we are not going to expect a high level of education. Maybe they are going to be much **more social** than we are, maybe they are much better in using computers, or programming skills, but I don't think they will be better in terms of abstract math of physics or some kind of boring topics. So it is going to change education and expectations of companies.

FT6.4. This will lead to a **more equalised society**, although - and that is the drawback - it might rise that sky high that it becomes so complicated and expensive for these people, with every half year a new sort of modelling for them, that ultimately these people can't afford it to have the latest pc, to have the next phone. So there is a risk that they can't keep up with the very fast growing development of new applications. Even in underdeveloped country people say: give everyone a mobile phone and then it will **improve their well-being and their well-fare**.

FT8.13. But of course one of the scenarios is that schools themselves are no longer considered to be the most interesting learning environment. That there is **other ways of learning**, people are grouped much more in their homes **with other people who have the same ability regardless of their age**. At least for children education I am not so certain that it will happen. Not just because it provides so much for kids to go during the day, which is useful, but because there is really a **socialising aspect to going to school and the building of friendships and understanding what is right and what is wrong**. All this kind of normative elements of schooling are actually pretty important for society and so I'd be surprised if we really got rid of the model and people would just study behind their computer at home. Maybe for adult learning, sure, but for kids. But you never know.

FT4.8. If you really go into practice to see who are the **co-creators** now, than it is really the "white, grey elite". It is very narrow. **Awareness and education**. If you look back in history then you can see a strong awareness of emancipation. And growing levels of knowledge and awareness, leading to our contemporary society with a huge middle class. There is a little underclass and a little elite, but there is a huge middle class, who is, compared with the past, highly educated, wealthy, healthy, self-confident, can come up for their own rights. At the same time a large group within that is also afraid of falling back, and if you really look into detail, not really that well educated, not that aware, etcetera. In the 90s we all had the idea that emancipation was achieved and finished: education, civilising is not necessary anymore. That was really a historical mistake. It had a lot to do with the social satisfaction, it has a lot to do with this big group which is just a first generation who has achieved this new status and is afraid of falling back. But it has also to do with that our society s of course very, very political and complex and if you want to stay in tune with what is happening then you need **lifelong learning**. We talk about it, but we do not do it. And all this infrastructure that was there in the past to accommodate that – schooling, newspapers, television station, radio, the church, associations, community work, a fine network of institutions that play a role in **facilitating people**, they are all gone. It is now fragmented, the organisations that are still there are searching for their roles. Talking about awareness that is a big issue. You can doubt about the fact if everyone will be able to keep up.

FT8.14. The trend in now that **school starts younger and younger**, so one, two years of age kids would be starting to work on all these things. There are a couple of models, one is that kids stay in education longer and develop social education until 20-30. The other model is that you start combining a sort of apprenticeship in real life work experience with schooling so that at the age of 15 -17 you start having internships, that regardless your field of study, you are starting **incorporating real life experience** and that would continue through the university. I have no strong opinion of which is the more likely to develop, but I am surprised at how traditional education is, thinking of how much we talk about what it gives you and that it is the building block of all these other innovations and technologies. This is in itself incredibly solid and in many ways very old fashioned. But I also think in many ways parents like that. They feel comfortable by knowing what their kid do, it's safe. They don't want change, if you don't know if it's going to work, you don't want your kid to be experimented upon. So I think there is an inherent conservatism when it comes to our children's learning. Things will change but only slowly.

FT9.8. When this generation grows up, there are 2 options: **Everything is so scarce**, and they will be working very, very hard to get things done. **Or everything is going to be so easy**, though all sorts of smart and technology solutions and they will just have to push a button and everything will just be done. I think it has 2 extremes and it can go either way. I don't know. Much depends on the next 10 years.

FT2.18. It is going to be a massive impact. It is not just the case of 'oh, we have energy', but it is the form, the distribution, the little details. In five or ten years you may still have smart phones, but it might also be that we don't have the products, but still have the functionality. They might be embedded in some devices, e.g. contact lenses. In ten years time we will have commercially available contact lens screens. In twenty years time we will have embeddable optical devices as head up displays. In thirty years time we will have **commercially available mental communication**. So **our generation is probably going to be the most unique generation in the history of humanity**. Because we will have crossed from homo sapiens to home idiotus, where we'll be totally connected. I've been to the Singularity University and everyone there thinks it's great, but in a humorous way you can also say that it is going to level out to the most common denominator. So by the end of the century we will all still be watching stupid game shows, like in the movie Wall-E.

FT22.4. It is very important **to give the next generation access to all the knowledge and all the technologies**. But **also to teach the importance of how to live in the urban society**. The European society is already less individualistic than societies in other parts of the world. It is impossible to stop technological development and innovation. I travel a lot, so I know what it takes to live for hours in the airport, then you **know how important technology and security is, but our freedom is very much reduced by this security. It is important to manage all this in the right way**.

FT18.7. In open innovation 2.0 we talk about shared vision, shared value and shared values. So when there are shared values, the innovation is very likely to be successful. H.G. Wells said that **life is an on-going struggle between education and catastrophe**. As people around the world become more and more educated I think that they will be choosing peace, rather than war. Not just innovation, but many societal artefacts or systems will really be determined by the pasture of the larger nations, like China, the US and the European Union. There is a kind of a preponderance towards peace and sharing rather than some of the competition and war that unfortunately marked the first half of the last century. I think it is going to be down to extraordinary leadership. **People get more and more educated and hopefully they're choosing peace and collaboration over confrontation and war**. But the leading nations will need extraordinary inspired leadership, not just for innovation, but also for the full spectrum of things in society.

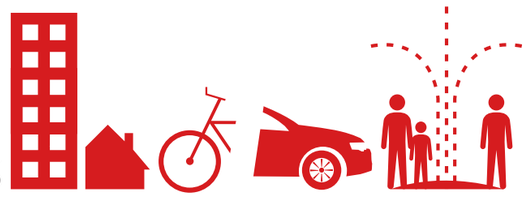
FT25.10. I am really, really not good at predicting game changing technologies, but there will be something. It may be something like Google, or it maybe something that **makes it possible for me to re-engineer myself every morning**. It is probably both of those. It is likely to happen in energy, people would notice, but it wouldn't transform our society but might have some other implications. More relevant will be the whole kind of **self-engineering**. Not just self-measurement, even though that is important, but actually the aspect of how I am not just maintaining my own health, and be my own doctor, but to a much greater degree re-engineer themselves. There will be more extreme interventions than we have today.

c Resilient people

FT8.16. There will be a need by 2050 to develop not only resilient infrastructure but also **resilient civilians to overcome natural disasters**. I don't know much about this, but this is something that emerges. The ecological and environmental projections seem pretty straight forward. That there will be more and more dramatic environmental events. And they will have a real impact on very predictable cities and countries. Not only flooding, but also fires, extreme temperature, and I think that in that sense every city will be vulnerable. You will need to build roads and technologies and energy sources and food security systems that are protected for that. You need built an infrastructure for the city that is protected from that. But you also need to build civilians that are able to have that resilience, that are able to "yep, this is coming, this is what we need to do, we'll move on and if something happens, which will, then we have the means to deal with it and we will move forward." Because right now what you see is this understanding that more things are happening more often but it is basically a media circus. And that leads to two things, one when it actually doesn't happen, like the snow in New York that never arrived, then it turns into that. But also when it arrives that people haven't really focussed on what they should do. It is really about building fear. That would be a very negative scenario if you have these citizens just at the mercy of very strong companies and anyone who is bale to push their fear. But in my scenario here where you got a more modern peaceful proactive society or city, the **civilians are actually able to plan for that complexity. They understand that they cannot control everything and they can just manage the effects**. And they know that they can do that. That for me is a sort of overriding piece that will bring it all together allow it to continue over time.

FT6.13. There is another aspect. It will impact the quality of life from the health point of view. If you have all sorts of apps on your phone, which say that if you are travelling by car, or you sit too long, you get a notice that this unhealthy behaviour. Sometimes you already see it on the streets: if you take a bike by that route, then it takes you 5 minutes and 1000 kilo-calories. That sort of health technology information will help a lot of people in order **to improve your healthy behaviour**. We already see that happening, and that will increase.

SMART CITIES



FT12.28. People don't get the maths right. I have photovoltaic on my Brussels house. On a very sunny day I get 40KWh out of it. On a very sunny day. I can cover 85% of my domestic electricity use. But a car would need 40KWh for one recharge. People are not aware how much energy they use by driving. The information is not there. It is all about **understanding and getting relevant energy data**. You need **to have the incentives right**. Like when you hit your thumb while driving a nail in a piece of wood: you directly feel it. Just imagine what would happen if you would feel that only 20 years later. But that is what is happening with the decisions we are taking in energy now. We don't **feel the consequences**. Once we feel them, we cannot connect it anymore to the sources it came from. Just getting into the minds of people that we have an issue is already a big step. A lot of the starting points of what will happen in the 2050 scenario are already now relevant.

FT3.7. Some things our bound to our physical body: we will still have a physical body, and still be concerned about our health. **Self-management** of health is increasing already today. It can be helpful if it is combined with a good way of getting advice that is really integrated in your everyday life. It is not just about providing the data, because we cannot handle all this data, it is too overwhelming. So it is about **the interpretation of the data and the relevant combination of data**. We increasingly see computers that interpret better than humans, in this case e.g. physicians. So systems will help you with the interpretation and provides the info that is relevant to you, in a way that you can act on it. The self-tracking and measuring everything is already going on today, the future will be about having **a layer of interpretation, persuasion and action corresponding to the information**. Not as an intrusive system, that makes you feel you are dealing with your health the whole day.

FT7.7. I believe people will take care of their own health. And if people stay healthy and **take more responsibility for their own well-being** instead of relying on their doctor, that will have a societal impact. But it will not have much impact on energy in the city.

FT22.5. For sure I think that many aspects, such as sustainability, quality of life, etcetera, are respected the last 20 years. **More and more people are conscious about sustainability**. I am not so sure that by 2050 technology can solve all of our problems. I think, for instance, that too much attention is paid to efficiency. We often use the **metaphor of the efficiency** in the automotive sector. Although cars are much more efficient that they used to be, we do use much more gasoline that we did ten years ago. Because efficiency permitted us to save energy but our cars became huge in the meanwhile. So we are more efficient, thanks to technologies and investments, but we produce more cars and products that use more than in the past.

FT21.8. I am not sure that we have the right **spirit of urgency** here with the actions for transformation. So I am not sure if it in the end will not end up in a really doomy gloomy scenario. Where only a very few people will be using their time to survive and to sort of to keep all the rest of their people out of their frameworks. I had this discussion with Dennis Meadows from 'Limits to growth' just a couple of weeks ago when he was here in Hamburg. He said immigration is a hugely important subject for the long-term future, because people will try to go where the food is, where the work is. We cannot just build even higher fences around us; this will create a lot of trouble. So I don't know if the time that we have is really advocating for this.

d Personalised solutions enabling to rethink your behaviour

FT12.12. The problem might be that **people are not prepared to take up all the information that is pushed to them**. Government has to take the lead and prioritise what is really important for people. Because they are not able to decide for themselves what is important for their life. For their work also. You need people in the government that have this overview. I presume there are less and less people that actually have the whole overview. So e-learning is good. E-health is OK, but with e-living I get the creeps. For me this is a scary word. Now having spent four days in Berlin, a very lively city, there was carnival of the cultures. And people didn't run around with their iPhones, finally. They were doing things off-grid. They were doing things, having fun with the kids, masquerading, having a party that was multi-cultural and everything. If I now see that I have to run around in a city where I am filmed at every angle at least five times at any given moment. This is not where I want to live. This e-living, with friends on Facebook, which I am constantly surveyed, which I don't want. This is something that **government has to guarantee: there must be a human part**. All this e-, e-, e- or i-, i-, i-, is not something that I think that should happen. But I am afraid it might happen. Again with a total loss of prioritisation of what should be good for a human being.

FT12.13. E-health I can see many benefits. The European innovation partnership of active and healthy aging is doing good things. There are things that are online or virtualised that can help people that cannot be all the time supported by persons, because there are not enough of them. But the biggest problem is the **acceptance**. I think of my grandmother, who died at the age of 101, and since she was 70 I tried to make things like a speed-call on her phone. She wouldn't accept anything. It is one thing that we design all these things, but if people to not want to use it, it makes no sense. My other grandmother died at the age of 98, and she said: "If I am dead, I am dead. I don't want to press a buzzer or something when I am going to die." At some point this e-health is a good thing, but it should **never lose the target: do people really want it?** As the CCTV's on the street: I feel the same level of safety if they are there or not, but I feel buggered by them, so I prefer to have none. And presume that in my generation that is a common feeling.

FT12.14. Shared resources and products become a second nature. In Germany there are many things, we have stuff like Airbnb or others. They are not just saving money, but they are a **completely new experience**, because things get **personalised** again. It is a good example, and their might be the same type of solution for mobility. With sharing resources and the micro-grid you don't want your own energy, but you are perfectly happy that you are having community energy with people that you manage together. And who owns it is in the end not important anymore, because if there is an **independent system** that is not there for somebody's profit, but simply for necessity of covering something that you need. Once this is covered, it has done its purpose. This is a **prerequisite of all this sharing** energy production and going off grid.

FT12.24. There are many things we are doing that are all aiming to reach the goals we have for 2020, 2030. But by 2050 we may have a completely electrified system. Now we have to start on how to achieve this. We are now pushing a lot towards more electro-mobility and bikes. It is about how to **convince the citizen that actually it is a good choice for him to rethink his way** of seeing mobility in the city, of seeing energy in the city. This is slow, because it is many stakeholders, and they are interested, but they do not know what kind of questions they have. Not really knowing what they are looking for, but feeling there is something that they should be informed about. We are still trying to get the ship moving in one direction together.

FT12.27. What I think is a big change is that pope now comes out with environmental concerns. Things are getting more and more in the **normal way of thinking**. People in the streets now get more aware of what the 2 to 3 degrees temperature rise would actually mean. But still they don't know how catastrophic it will be. It is also a national thing. E.g. 99% of electricity in Poland is from coal. If you say in Poland that coal is not good, then their national feeling is attacked. It is much more complex than simply saying this a good technology and this is bad.

e Making personal choices in the context of too much data

FT24.5. Already today we have **energy consultants**. I think that customer choice consultants will be available for everything that is complex. It might well be that there will be a new kind of job **to help people to find the right thing**. But the more fully intelligent machines you get: they might be the customer choice consultants. You have the role, but it does not necessarily have to be a human. Today the energy consultants that we have in Siemens are helping other companies in the commercial environment who are willing to pay for that, because they can save a lot of money. But if you look in Germany into the internet there are dozens of portals where you can compare things. You can also compare for your building the different energy providers, and you type in what you pay per month now, and they will tell you what you pay with a different energy provider. That is already a kind of consulting. It is not yet really personal, but I am pretty sure that this type of **finding the best value** – now I am careful because today it is finding the cheapest thing not necessarily the best value – so now finding the cheapest thing and in the future finding the best value that will increase dramatically.

FT9.7. So many people of my generation experience **stress in the choices they have to make in their lives**. Many visit consultants right no. They are high educated people. There is a market, because people have so many options right now and my generation just doesn't know what to do. They just don't know which one is more comfortable. This generation is also very relaxed, they do not want to do so much work. They get millions of dollars a year and they do not want to work I think. **'choice consultancy' will grow in the future**. Social education will have to help people to make up choices of what they want. In a way this generation is so spoiled, they have everything they want and they can choose whatever they want , when I look at my grandma it was wartime and there was nothing, my friend, for instance in the US, is saying that many want to move back to their parents for they do not want to work much. So I think they have to be educated that they do not get everything at the first time they are not going to ask for everything or at least that they have to work for something. So the new generation has to **optimise their resources and have to learn about the consequences**.

FT15.10. How people cope with that will be another question. Today already, let's call it the younger generation, have **modified how they take in information**, where you and I used to read things from paper, from page one all the way to the end. That will never happen again. The **contextual information** that you come across, has to be in 150 characters. But that already changed us. I will not read emails longer than the screen of my phone. Emails used to be memos, now when someone sends me an attachment, I first sigh and mostly scroll to the next email, because if you want me to do something, just tell me and don't ask me to scan down a whole list or text to look for the instructions. In 2050 that will definitely be different. The mainstream will be, more and more, just scanning through, because there is so much information coming your way, you just scan through in order just to be aware of the things that happen around you.

FT12.16. In a place like the Netherlands I can imagine that this also has impact on the system. In places like Sicily and other areas in Europe I can't see it. It is too rooted in the culture, and even the young generations are not fed up with the old system, it is sometimes even worse. That's why I don't think it will happen everywhere, but in many places it has a good potential. We have to tackle this in Europe, because there is no way of having completely different democratic systems. But we currently we have differences in mentality. It would be good if **people get in general more interested in understanding how things happen, and then make informed decisions themselves. And not flooded by data**.

FT9.10. Our behaviour is driven by facts. All this data is definitely defining our choices. What we see on Facebook and Instagram, it has a big, big, big influence on our choices. Our **choices are now defined by these kind of social networks**. I look on Instagram where to go and where to eat and what to buy. It helps to make our travel choices. We work very hard, make many hours and do not have time to investigate all this stuff. So these networks are easy. And that is even going to be much more useful for the next generation.

FT1.4. The **diversification of lifestyle** will go on.

Making personal choices in the context of too much data - continued

FT12.9. Quantum computers take the notion of time upside down. Quantum computing or not, computing at current level is already exactly doing this. We are getting lost in the amount of information. People are getting less and less focused. There is a responsibility in the big data and all the information that we are bombarded with to setting priorities. I can see that there might be a huge problem that you have **people that are informed about everything but have no clue on how to decide on things**. So I can see this as a horror scenario, because then you go away from the **real democracy** that you have dreamed of. You are then not enabling people, but simply boggling them with data and blocking their mind. I think many of our current generations of people under 20 years, this is already happening a lot.

FT14.4. However when we are investing in technologies in a smart way and in time, and if we **familiarise people with technologies**. Robots and intelligent systems can take over tasks in care. Probably in service management in a lower level as well. I am not so sure about mobility, but the housing sector it will change drastically. Buildings, providing the framework for housing, will become more and more intelligent. People are not necessarily working under the control of the robots, but self-managing the building and the built environment in which they are working. In the same way as they are managing their health. Technology becomes a tool, **an intelligent tool on behalf of the human being**. Only in those frames where human beings are allowing or programming the technology and technical devices to do so. Here I think **personalised products and services and data become pretty much standard equipment** of the environment, or the built environment where we live.

FT18.4. I think the biggest shift from a people's standpoint is health. Nutrition as medicine and medication as nutrition are common place in our diet. Just an increase in education and awareness, and the lessening in power of the big food multiples potentially over suppressing information around the poor impacts of processed food. I think that is really a big trend: **people will be a lot more informed and aware**, and will be eating healthier and demanding more healthy organic food. I think there will continue to be a backlash against industrially improved versions of food. I think there will be a very strong organic movement – which consumers will demand. The strength of demand will be proportional to the amount of education people will have around the benefits of organic food and the harm of mass produced food. Related to that people self-monitor their health through increasingly personalised products, services and data provided by self-monitoring, intervenuous data and personalised nutrition supplements. There is big shift, where **people feel more empowered and take more responsibility** for their own health. This will only be more facilitated through technology. And the rise of biotechnology, DNA reading and writing, and stem-cell technology can make diseases like obesities and cancer will be extinct. It is a wonderful thing to hope for, and the possibilities are there if we take a less linear approach collectively to the research. This is definitely attainable, particularly with high performance computing, which is significantly accelerating the research cycles in these areas. Just a couple of years ago the Nobel price for chemistry was won by three chemists. One of them was British, and he said at the ceremony: "The hidden partner in this Nobel price award for chemistry is the high performance computer." I think the high performance computer, and the evolution of it, will dramatically accelerate the research results.

FT1.12. **Self-management of people is already the case, using digital information**. This will become an increasingly larger group. E.g. having the pressure of costs in the health sector this will become even more important. **Decentralised services** in the health sector are needed. E.g. in Shanghai I saw a community centre that offers on digital base health consultancy in combination with a nurse. You can make your first information, e.g. measuring your blood pressure and other simple things yourself. This means there is a new filter and a new possibility to handle your health conditions. This is reducing the distances if it is a decentralised possibility, so it saves energy in travelling. If **people are willing to embark on life-long-learning they will be better educated regarding nutrition and that also has energy effects**. It is a hope on the one hand, but also a trend that will become more important. Increasing groups will participate in that.

FT2.17. Take all the power generation of the planet. Because we need it. If we do not maintain the two degrees increase in temperature cap, the sea levels are going to rise, and we'll have major environmental disruptions. Even if we add no more consumption it is still rising. We have **to reduce to stop the disruption**. It is not clear if this is man-made or a natural phenomena, but I am certain that we are contributing to the mechanism. We can debate for decades while the water is boiling, and we're starting to cook... and maybe happy we won the argument... But unless we do something, whatever the cause: the trend seems to be clear. And even if the trend is not clear, and it is not definitely happening, is there any detriment in us doing something about it anyway? So **the risks of not acting are massive, the risks of acting are benign**. It seems stupid not to act. But as they say: you can lead a horse to the water, but you can't make him drink.

3 Redefining ‘smart’

In 2050, we use an extended definition of ‘smart’. Both citizens and municipalities can deal with unexpected, disruptive events. Decisions focus on people, and resilience is key. The belief that everything can be engineered and controlled no longer holds – everyone is ready for uncertainties. The idea of dealing with unavoidable uncertainty has implications for every aspect of city life.

a Using technology to become more resilient to unexpected events

FT13.9. Also, that is part of the attractiveness of these innovations, they are all disruptive. To **be able to cope with disruption will be the main competence of future cities**. In a lot of countries it is not to be underestimated what a city can do, in terms of legal and regulations to allow innovations. Or what lever they have on a national level to make things happen. You can ban vehicles that are nationally allowed. We have now the discussion in Brussels, again the future is already happening, to ban squads from the main roads, because it is ridiculous that they drive in the urban area.

FT20.18. One last thing, but it may be a mean argument... often when we think about futures we think about this demographic trends and people growing older and so, but then... what about if there is a war, what if there is a big social unrest, what if there is a flood... I never liked those comments, since they do not bring the discussion further, but I do think that in our scenarios that are really happening now, a lot of things appeared that we have not expected. We should try to **capture the unexpected too**. We did an analysis with Norway after the Breivic shootings and we analysed the errors. The main outcome was that they were not prepared for the unexpected. You can never be prepared for some crazy shit, but still we should **be more resilient to changes we cannot really expect**.

FT22.11. **Resilience is going more close to sustainability**. It provides a new tentative to sustainability. The word is not clear, for me as an architect it is clear. In buildings it is very normal to use. A building has to be resistant, but also resilient. Probably for an earth quake. It should be resistant for the shock, but if it is too resistant, the structure would probably break. Resilience means **to be flexible**. Not to return back to the original condition, but probably a little bit different, like old buildings, in just a little bit different state. This means **adaptation**. So it is not easy to explain to people how that works. Most of the times it is like natural behaviour: to adapt to stay alive. But adaptation and flexibility are very abstract terms. So the concept of resilience is very complicated and not easy to communicate. Smart city probably still is a good market, commercial concept, with large companies behind it. The first to create it was IBM, very good in the cultural marketing. But too much related to technology.

FT3.15. If you look at life as being a lot of obligations and logistics, then there will be a lot of technology that is taking over these chores, communication things etc. Everything can become very efficient. But for the city it does not mean that we will not be doing anything anymore. It may be even more crowded on the street if everybody has more time to leisure. There will always be **unplanned activity**, escape of the system. The system might be smart in planning the regular stuff, the more predictable tasks in a very efficient way. But it will be less able **to plan what we are doing spontaneously**. These two sides will co-exist. Because if there is really a separation of those two elements in life, then the logistic system can optimised as a logistic system – maybe underground or whatever, that uses all the planning technologies that we have for the more regulated area. Where everything is predictable, everybody plays his own role and that can be optimised as a collective system. And on the other side you have the simple life, with your group of friends, where you will have your own logic and freedom to do things spontaneously.

FT7.3. What we are more insecure about is the climate change, and the effect it will have. Actually everybody is now talking about the earth getting warming, more draught, more floods and everything. I think that is of course extremely important for cities, that they build themselves very robust, so they **can withstand lots of climatic catastrophes**. More extremes.

FT18.5. Another important factor is **the ability to glean knowledge from a huge mishmash of data**, often gaining a political, economic or social advantage through this skill. I have authored a book with an Italian and Swedish professor called ‘Knowledge driven entrepreneurship’; this is one of the key themes. Knowledge is the crude oil of the 21st century. Whoever harnesses that best, will have the best both **economic and societal progress**.

FT16.7. As regard to developing countries, the issue there is quite different. The issue is to build and to be able to build not only on the building , but also **pay attention to the way the city is operating** in this energy area. Which we do not know how to do now. We don’t know how to build sanitation, how to build large plants, or city farms.

FT19.12. Being obsessed by unfathomable complexity is not relevant, because it only an expression of not **knowing what to do when things change**. Don’t think in that way. The same holds for worrying about who is able to access knowledge, because it is thinking in terms of winners and losers. But it will not be that way: **we win all or we loose all. We live together in the same world**.

FT12.20. For many people data is the answer to everything. I did a PhD in something very data-intensive: probabilistic forecasting of systems. Data is what you make out of it. You have to know what you want to make of the data, and what you are looking for. **Data is in itself just a means; you have to know which question is the right question**. Many people are lost in this, they collect everything and don’t know what to do with it. Humans are not rational, at least not in all our decisions. These things also make a city: if I have a completely rational city, it might be technically smart, but is not functional anymore. Then it simply did not ask the right question. Why do I need a city? For people to live together, hopefully living a good life there.

FT24.2. Linked to that is the **abundance of computational power**: it makes using scarce resources much easier, because you can automate much more. Today all this automation still needs to be programmed. Everybody is expecting this tipping point, where at the end of the day the machines learn by themselves. If you have enough quantum power to create large neural networks, and we get **automated deep learning for computers** – which for me as a computer scientist of the early eighties is a complete nightmare, but it will happen – then a lot of things that we can’t do because it is too expensive in terms of engineering time will be automated too. We can automate much, much more than we can now. In the case we do not have an abundance of power and we still need to save energy as much as possible, then with that much of computational power we can **create a much more intelligent networks**. We really can connect hundreds of small independent networks – that usually generate as much power as they use, but sometimes need a bit more or less – then you have much more possibilities to **online rearrange** those needs.

FT22.3. There are some aspects of which I am not an expert, but that we have to worry about. For example individualisation. Another aspect is **how people are increasingly refusing science**. In Italy less and less people take care in science. They pay attention to strange solutions for health care systems, sometimes middle-aged solution and not scientific. It is important that technology is giving us to possibility to be more informed and to know more deeply, but fewer people can understand the power of technology and the proper use of technologies. This is very dangerous, also for the urban society, because it is very complex. The management of thee urban society is very complicated. On the one hand we have this process of individualisation, caused by technology etcetera, and on the other hand we have some people that pay too much attention to technological solutions and **scientific knowledge, for instance on the climate change**, is ignored. It is a sort of paradox.

FT22.10. Now I see that smart cities is not as popular anymore as it was a few years ago as a paradigm, as a model. Now there is a growing concept, which is **resilience**. Resilience is trying to give new sense to the concept of sustainability of smart cities. In the 70s scientists started the concept of sustainability, but only after RIO people got aware about sustainability. Now it is wide considered, but not within the total concept. Smart cities was, until a few years ago, consumed probably because it was too difficult to understand for common people what it was. A lot of people use it, even without understanding completely the power or the potential. I am not really convinced that smart cities will last as long as 2050. Now I am studying the European programs, and there are few grants and programs for smart cities, and there are much more on resilience. Because it is more ‘cool’.

FT1.1. We are working on the idea of energy production. The idea that it will be abundantly available is a risky assumption. We will have **energy in a more decentralised way**. Whether it will become **more resilient** is not easy to answer because the question is **how it is organised in our society**. But we will have more decentralised sources.

4 Regenerating resources in a circular economy

In 2050, the circular economy ensures self-sufficiency of cities. Renewable energy is abundant, and this ensures a secure supply of vital resources for life (energy, water, food and clean air), although other resources may still be scarce. Cities have implemented circular systems to regenerate all the resources needed by their populations. These mechanisms are based on small-scale, local solutions, enabled by changed decision-making levels.

a Self-sufficiency based on an abundance of renewable sources and storage solutions

FT25.9. In terms of energy, I just think we'll fix that by a combination of sharing resources and peer-to-peer exchanges. We'll largely innovate our way out of that issue. The biggest savings will initially come through efficiency and cutting out waste. More than anything **sharing resources differently and creating less waste** will achieve that. Another part will be more efficient renewable energy resources. If I am now talking about the kind of cities in Europe, that they certainly would be **energy self-sufficient**, using light and wind and whatever else. So I don't think energy will be a big issue, other than adopting along you need to get there.

FT13.20. Due to freely available energy resources the power of oil producing nation will be diminished. I think by 2050 there will be - and this is supported by the international energy agency as being realistically - we will have **a very high rate of renewables**.

FT11.4. For **energy** I think it is more difficult. Because in mobility there are already huge powers in the chain and huge silo's, but in energy it is even bigger. It will take a lot to brake down the walls of the oil and oil-based industry. But in the same time you see it is starting, like in Germany. Governments have enough power and show the ways to frame this. I don't think it is far-fetched that there is not such a huge need for urban living to find energy sources from outside. The structures that we have now: energy is produced somewhere with high efficiently, then transmitted to the next place. But it will be **produced almost everywhere**. That changes a lot in the system. I don't know how it affects the life of everyone. What does it do if I have a solar panel or not? Money-wise a lot, but to my living not so much. Would it make me consume more energy? Once again it is not a huge criteria in that sense.

FT12.4. I can see that actually **citizens empowering themselves, by producing more and more of their energy locally**. In many places there is a huge potential. Like Sicily: the amount of photovoltaic in Sicily is ridiculously small, the wind turbines that are there are not connected to the grid, so it is simply wasted potential. And in this area you have so much sun, you can do a lot of **local energy production without having any new technologies**: you just apply what is there.

FT3.8. **Abundance of energy is really foreseeable in the future, also of other resources, maybe even water**. We will have **energy producing houses, energy producing green houses, energy producing cars** with solar rooftops etc. This will have a big impact. It will decrease tension geographically as it will make us less dependent of the Middle East. It may even prevent some escalation of global wars. So this makes us **less dependent and more local, self-producing**. There will be less trading of energy and less distribution of energy. There will be local networks, not necessarily transportation over long distances. Now with pricing of energy we try to influence the behaviour and energy consumption of citizens and companies, but this will not be necessary anymore. There may be a new revolution with even more electronic devices using more energy. The limitations that we take now into account **to reduce energy consumption will no longer be required**. As long as there is a way of generating energy, we can even use more of it.

FT12.1. The most relevant element is the **freely available resources of renewable energy**. This is something that I see as realistic, and that you see already. The renewable energy part is growing for sure, and will hopefully grow more and more. The problem is that oil is not really diminishing, so it is not replacing fossil energy. I see that the oil will actually have to go, because of security of supply and political implications. I still don't see now, and not in the next ten years that electrical cars have completely replaced fuel engines. It was predicted years ago to have happened now, but it doesn't go that fast. But there must be an alternative way. For me an alternative not just means that we replace one car that uses some kind of fuel by another car that uses another kind of fuel. Because then it might not be dirty on the spot, but it is dirty somewhere else, because it still uses huge amounts of energy. I would see possibilities that we actually go to a **more fancy and more personalised public transport**. It is happening in places, but it is still fuel based. People will simply have to travel less distance in the city and do this e.g. with electrical bikes, which are still supported with energy, but use only 1/50th of what a car uses. This would be a possibility, but it is about behaviour change. It is not about technology, more behaviour change and work structure.

FT24.1. When energy becomes freely available, the power of oil producing countries will be reduced, but we will still need oil for producing plastics etc. We will use much less oil. The other thing is that energy efficiency and how to make the most out of the energy we use will also diminish. If there is an abundance of energy then a lot of the discussions we have today will be irrelevant. It has two influences, politically, but also technologically. If I really have enough power, I don't have to think about smart grids or whatever. This is already a change after the change. At the moment we have to implement all such methods, improving our heating, improving our insulation, improving the building automation controls, whatever. At the moment we do everything to save energy. We do everything to **bring renewable energy better into the grid, by using smart grid technology**. Not only the down-stream from the big power utilities, through the transportation network and distribution network to the end-customer, but also the way back: from the windmill and the solar panels. As soon as we have this abundance of energy – either renewable energy or nuclear fusion for example – then we still need a smart grid to put the energy to the grid, but we don't need to worry about saving energy by all means. **Using energy might even be cheaper than saving it**. Today we only update buildings because we save money through energy costs. If **energy is more or less for free**, nobody will invest in saving energy. Smart grids, and the smart distribution networks will be relevant in the future, because we have to bring energy somehow in the distribution system. But it is a very interesting discussion if in 2050 we are still talking about a lot of insulation and other energy efficiency measures in buildings. If energy is so cheap that you can build cheap houses, then nobody will invest in technology that only costs money.

FT16.20. One of the city of tomorrow scenarios is a 'planet city', which is driven by an enlightened supranational political power, and relies on **green growth** to develop and roll out innovative services. Smart sweet homes, which are more spacious and uniformly connected across the area, encourage cocooning, remote working and virtual entertainment. Power generation, which is mostly centralised, comes mainly from **renewable sources**. A large number of small **organic farms in the outskirts of the city feed the population** that is concerned about product quality. Travel decreases, while public management of transport services **prioritizes electric vehicles and shared mobility**.

FT10.4. I am a development optimist. I trust in humans. We will **solve the energy problems**. There are many ways being explored and we are so close. I am not an expert in this field, but I **trust the sun**. Everything directs to that: you see what it means for Finnish nature. In 35 years we will find a way to use that. Also the fact that world spins around and the waves in the ocean: we will find ways to use those things. Due to the freely available energy resources the power of oil producing nations has diminished. I do not find it very important, but it will change. In 35 years I do not know if we have still national states, and we are talking about nations still. I do not necessarily see the use for nations. But the world is still rather conservative, so they may be there. We do not need such constellations. What will be changing in the cities will be the **abundance of energy**. The answer is out there.

FT12.10. Abundance of energy and clean water. The increased efficiency is something that keeps us on a level, not too much increases, and maybe it will slightly decrease. But this is a quite utopian view. If we can come to Thorium reactors, or 4th generation nuclear, that really works in the next 20 to 25 years, then there will be **extreme change**. Everything is electrified; we don't have problems with waste or with nuclear proliferation, because out of 4th generation or Thorium you will not be able to make nukes. This is a technical question that will have a huge impact on society. Because if you can have **more or less free energy**, that is becoming a common good, like air, and you do not need to worry about it anymore, because it is not polluting, it just helps you, then this will be a huge change. But from the technical perspective this window moves over the last decades: it is always 25 years in the future. The time it is foreseen to be available did not decrease, and I don't believe it will ever get closer than 25 years. The same holds for new game-changing technologies. The working community is putting lots of money in fusion reactors, which is considered one of the game-changers, as 4th generation nuclear. There might be big changes, but I don't know.

FT16.13. I see the development of renewable energy too. Not only in generation, but also in biogas. We have made some analysis and we think if we can **produce biogas from 100% of the green waste in a city** being from homes, from schools, from restaurants, from city gardening, from supermarkets, we are able to produce **enough biogas to feed all the buses and all the waste collecting trucks** with that. It is still expenses, and now more expensive than filling them with fuel. So as long as we accept the emissions, nothing will change, but in the end we have to. That is for a city from about the size of 100.000 people, so for China that will only be a district, but in Europe it **fits the entire city**. This is also a very important way become independent and at the same time deal with the waste.

FT16.22. We also work a lot on energy from buildings and energy from roads. We work on other modes of mobility a lot, such as (bio)gas mobility. At the same time we look at new business models and also into companies that we may invest in. Main developments we look at is in **energy storage, and in digital solutions of the future**. Digital solutions are very, very important, not only for **energy management**, but also for energy efficiency. We cannot be in a market for energy production and storage without thinking about saving energy.

FT15.5. The basis of the building, the power of the building, there will be **unlimited power** and it will power itself so to speak. The **storage** will be in a battery of some description. Now whether by 2050 there will be an outlet of these phase change materials, let's call it that, that can store energy much more efficient that a normal battery can, but it will be a battery storage of some description. It won't be big flywheels as used by UPS today, but we will be using that tomorrow, because I think that just the **biochemistry of storing energy** will be much better than something that has to rely on moving mess. So it will be a chemical storage of some description, it may just not be something as we know it today.

FT12.23. We're working a lot on **storage** in smart cities. Storage is becoming a more and more important point. Not just Tesla's, but general storing of energy. Probably especially **heat storage**, as it is more relevant, because it is more effective.

FT1.7. I am not convinced that technological advancements will save our energy problems. It is always connected to people and citizens and power relations. We know that we have **to cope with this rebound effect**. It is a very important issue because up till now we have no really good ideas how to avoid the rebound effect. We can distinguish first or second order impact and the backfire, which will have a global effect. Based on technology I expect we will have an increasing backfire effect. Because if we are not changing our physical structures, e.g. the conditions of mobility, we will have more time and more resources to be more mobile, and we will consumer more and different products and goods which need a lot of energy and are producing emissions. We now know what the rebound effect of light is: starting over 100 years ago with Edison and now having increasingly **more efficient and cheaper** light, but we consume more electricity. Not only by lighting, but also on lighting. So the first impact effect is clear. The second is that we have more budget for other purposes, e.g. tv, and we have more leisure time, where we consume also energy. The technical system alone will become more efficient, e.g. the technical infrastructure. This will reduce energy consumption and costs because it will become more efficient, cheaper and more economic in production. But if we do not **combine it with other conditions in our urban development** it will not have an **positive effect on overall energy consumption and emissions**. We see projects that aim to counter the rebound effect, but up till now there are no good practices.

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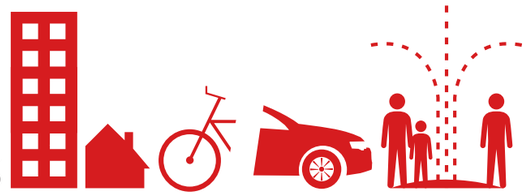

b Regenerative cities with circular systems for all relevant resources

FT21.14. My vision for a city, for the ecopolis, or the **regenerative city**, is a city that basically has **all mechanisms to regenerate the resources that are absorbed by the people who live in the city**. Be it the materials, the food, be it the energy, the air that they breathe. And if this principle of regeneration becomes the guiding principle for designing cities, then we will come to this ecopolis. Where you have lots of green spaces to regenerate the air. Maybe some kind of urban farming places. Maybe we see skyscrapers that are not just for offices that remain empty, but that have some kind of food production, that host people, and that are some kind of a sustainable system in themselves, generating the energy. It is actually a very liveable place.

FT17.7. I believe the future is not based on the scarcity, it is not that we should consume less, but we should find a way to **change our way of consuming so that it is not that impact-full on the environment**. I think that the pattern of consumption cannot be changed. But **to consume will become productive, somehow**. If we can achieve that, than in whatever act naturally you are creating value. You **create new things and objects that are now considered trash into something more valuable**. Then society will also be more fair. It is like an intelligent way of moving forward. In the past scarcity means that prices will increase, so it is a good trade for the ones that own the access to the materials. Materials like tungsten that is used in computers: the ones that control the access to that are the ones that make more profit. But when **scarcity is not the mediator, and the market value is not dependent on scarcity**, then again things are going to change.

FT17.6. The new game-changing technologies will be more probably be in the field of materials. It will **totally change the way we make things, and the way we actually can reuse the material**. The way we do it now: distract raw materials, process them, passing them into industrial processes, making products that are not usable after they have their end of life. It will be more like material engineering, things can be programmed, there is no trash, because you can reprogram the material and turn a computer into a car, just with new code. I think that we will grow stuff very soon, maybe not before 2050, but for sure some time in the future.

FT16.14. Not all energy by 2050 will be green, there will still be hydro-carbon. I think there will still be nuclear production of energy. China has just built 20 or 25 new nuclear plants, so in 25 years they will not be closed. It is not only the waste management towards energy production, but **many more goods will be circular**. I feel that it will be less and less possible to imagine new products or installations, without having **solutions for the end of life**. And that is true for not only smaller product, such as the mobile phone, but also for buildings and industrial plants. We know that resources are decreasing even more rapidly that we were thinking. So probably by 2050 the production of cell phones, it will become more and more difficult to have the resources to produce new phones for everybody. We probably have to reuse the once we already have.

FT12.11. If we have abundance in energy, then we will face a problem with **raw materials**. Because once production itself doesn't cost anything anymore, if energy is free, you will produce even more, and you get a problem with waste. Which then becomes a big problem. There will always be an initial phase. **If tomorrow you will get energy for free, then people produce more stuff, because stuff is cheaper, and after a while it will recalibrate**. Then people will see that it has to be turned down, or they become saturated. There was a time that you got all the stuff of plastic, and now it is more the expensive gadgets, which are energy intensive, like iPhones. You need a lot of energy, but in the end the waste that you are carrying around might stay at a level of now, which is not sustainable. After a peak it may go down. If the energy that is consumed is not polluting the air, which is the biggest problem in countries like China now, that will be solved. But this new freedom will ask again for **responsibility in how to use other resources**. The resources might be depleted even faster with an abundance of energy.

FT16.1. I see two major trends in cities for tomorrow. One major trend is linked with **new economic models, such as the circular economy and the sharing economy**. The way that we search much more for use, might it be in mobility, but also in other parts of the economy. Much more than the products itself or the possession itself. This is something that I think will be very important and have a huge impact.

FT3.6. The way we produce everything we eat or materials will change. It will be **more circular, more local closed loops of producing**. The technologies are just a means to an end. It is not necessarily a certain technology that will be dominant. It can be algae or other things. For the production of consumer goods or food we will have less need for large transportation of products. We do not even need large companies to make our own food. The current system provides us with centralised production and predictable quality and taste. In the future we can locally make new combination to produce a nice meal. The new technologies will also stimulate the **local for local** development. Multinational companies can still add something to this, but not as the only way of producing. This will also impact transportation: there will be less large transportation. I think it will be replacing the current system. The most exiting thing is that because of these new technologies and digitisation, things become more programmable and **you can make anything you like**. You are much less depending on centralised and geographic location of things. The **design of the future is more about making more relevant combinations**. E.g. if eating together is more important, than that will drive the innovation. But our needs will drive new combinations, such as relaxing, exercising, feeding, being social. You can make new combinations: going out with shopping. So our agenda will look completely different than now, but in the end we have still done the same things. The city can provide these combinations locally. There may be production boxes in the city where you can produce meat or algae. It will be completely new way of providing services to the local area, more sustainable. And at the same time we will be globally connected and be able to exchange ideas, interact with people or find soul mates globally.

FT3.16. Unless we really lower our demand for physical goods and consuming, there will also be a lower pressure on the system. Otherwise it will stay **a race against resources** even if we have enough power. There is not an abundance of resources and space. **Scarcity will be in different areas**.

FT21.19. For water I give a concrete example. It is about **regenerating the resources**. If you look how in some cities **water and sewage** is treated, than you see that at one point we extract the resources from the soil, we grow food and vegetables, they are digested by us, and the waste is treated somewhere else, if it is treated at all. In many cities it is just leaking to the ocean, and creates a lot of problems on that end. Where if we go back to nature's idea of circular metabolism, and a circular metabolism of the city, you basically treat the water in the way that you gain back the resources, and channel the resources – the nutrition – back into the agricultural production system. Then you don't necessarily need to produce fertilisers – using a lot of energy. Treating our sewage or water system in a way that regenerates the resources and nutrition makes a lot of sense to me. Very practically it starts already with the toilet – with the separation of the two different kinds of waste that we leave behind us literally. It is an important factor to start to separate those immediately to be in a position to much easier reuse it, than it gets all mixed up in what we call black water. I think that is still on a very low developed level unfortunately. We had somebody in our expert group, who has proposals for the **separation of our sewage and regaining nutrition and bring them back to the agricultural system**. That makes a lot of sense when it comes to regeneration. There are similar ideas, some more mature and some less mature, for the water system. I know there are few cities in the Netherlands that go after the **circular economy and cradle-to-cradle concept** and to reach this in the waste management systems. Which of course already starts with the terminology 'waste'. Waste is just a different resource, by calling it waste we tend to focus on how to get rid of it as soon as possible.

c Securing supply of food, water & clean air

FT5.3. Major issues are **clean water and food supply**; I am sure that by that time we need to do that too. Our sources are not enough, so we should pay attention to this. For example carbon dioxide: in Kyoto we agreed on the global pollution and decided upon solutions, for the future we will do the same thing for clean water. It should and will be **globally managed**, because there is not enough. Also some countries, especially in Africa, will have difficulties. That must be dealt with.

FT21.4. Major issues, like food, production and water supply are **regulated and organised on a global scale**. That is already relevant now, but it is definitely one of the future trends. We already see it now; it is not by governments but by corporates. Nestle claiming that there is no human rights to water – that speaks for itself.

FT2.10. For example, Sao Paolo in the next month or two is risking a water shortage. I think it is our society is only three millimetres away from revolution, if you don't have the basics. If you think of the Maslovian hierarchy of needs. Not only a short supply of energy, but also the ubiquitous distribution and the security of availability and continuity of energy supply give us a certain **level of comfort and security in our minds**. If you've got an abundance of energy, you'll have an **abundance of desalinated water.** So fresh water does not become an issue. If you've got energy and water and then you've got the ability to create vertical farms or internal food stocks and you can localise the community. You can reduce the transport burden for basic lifes. Literally you can take any water supply, any river and pump just any water, desalinate it in a suburb or a city block. When you've got controlled vertical farms you don't need any pesticides, you have food from completely closed and safe environments. So you've got **food, which is at a low cost, readily available, abundant**. You can purchase organic good food, health costs will decrease. You can have a different cultural behaviour with food. So you have less fast food, less sugars and sweet stuffs. Perhaps everyone can have their organic fridge where the fridge is actually growing organic food rapidly, with different UV lights and everything, with different trays for carrots, lettuce. You can have personal food units, even growing meat.

FT8.4. I think that **food and water security** is probably one of the biggest priorities facing our governments now. I do not know whether it will be democratically organised or not, but I do think that there will be some kind of structure realised. It could also become very tense, once you acknowledge that something as simple as water becomes so valuable. Then there is a real question about the areas that are so untouched and quite prestige, that have good quality of water and food possibilities, they become very valuable. In the absence of being able to desalinate sea water, for instance, imagine you can desalinate sea water, in a very useful way, then it isn't that much of an issue. It all depends on the technological developments.

FT15.1. In the not too distant future, so by 2050 we'll have a scenario where there will probably be four commodities as we will see it. Nowadays we've got electricity, gas and water. I think **air quality will become something we have to pay for**. One of these days we will have to pay for clean air.

FT5.4. Right now we are using petrol for **global political stuff**, like for Russia; the economy is going down. In the future it is likely that **we will use water in the same way**. Therefore we should be careful about this and make international agreements about it. In the future, I imagine that we will not have to use any fuel things. We will use much more efficient energy stuff, solar and other energy types. But **the power of oil nations will be replaced with water**.

FT9.2. Turkey has problems with clean water supply and pollution. There is **scarcity of drinking wate**r from time to time. The climate is changing so we will also have incidents from that. So probably we will be cleaning water from the seas. This technology will improve. But we don't have enough money, so we will have to look for new ways to make it quicker and cheaper. We should **invest in clean water technologies and efficient and renewable energy sources**. Invest it in the new recycling from the sea water, and waste management.

FT14.10. I think food and water will become more and more important topics, but maybe less in Europe. To a certain extend, but it is more relevant outside of Europe.

5 Democratised energy systems based on open data

In 2050, energy systems are open, bidirectional, multi-purpose platforms on which (renewable) energy and energy management services are open to all. Entrepreneurs have developed business models that provide value for them, for their users and for society at large. Citizens can choose freely from a range of available options. The system ensures privacy and security of users, who are always in control. Ambient energy networks provide connectivity for (wireless) access to data and energy. Increased computing power and artificial intelligence make system resilient: self-organising, self-sustaining and self-learning.

a Open infrastructures to bring together supply and demand of energy in decentralised systems

FT19.4. The second thing is that a lot of houses are in dense areas in the city, and are not suitable for this kind of installations. So there needs also to be some way to generate electricity for these houses. That could be done by an energy company, or it could be done by creating the options and allowing others to invest in energy assets. Again, if you only limit it to energy companies as it is now, you do not only have a limited investment capacity, but you also frustrate other initiatives. When you **open it up for investments by others, then you create options**. For instance, by using joint wind parks or by creating solar fields. More in the Northern countries heat is very important. If you stick to gas for heating, you will not be CO2 neutral. So we need to shift to other sources for heating. Besides singles houses to generate heat, there can be policies for joint heat solutions, on a larger scales, like neighbourhoods or districts. The way district heating is done now, is really integrated, it is government owned and the owner also provides the services. And again, the investments capacity is not sufficient. It can only be done by opening up the investment options. One of the other things in district heating now is that the one who owns the network is also the one who provides the service. It is like a monopoly. You cannot choose. We need **a new type of district heating - open**. Not only to increase the investment capacity, but also **for everybody to be able to put heat on the network**. So that you have a distinction between the network infrastructure and the heat generation capacity. Because in the city there are a lot of heat sources, e.g. industries, data centres. They produce a lot of heat and this can be used to heat buildings. So **you need this openness**, like for electricity. For the Netherlands that is quite obvious, because we are used already to think in that direction. But for other countries it is not. This is what I see as really crucial.

FT25.12. I would say that hopefully the role of companies changes. There is, certainly in Europe, a fairly small group of companies that effectively owns the lobby of companies determining fundamental decisions relevant for our society. I think transparency will inform citizens much more about that. There might be more often **alliances between citizens and governments against some of those companies that own the technologies with which we live**. But certain technical monopolies will be broken up. Things that happen with railways e.g., that are areas where society can not accept that a company just owns all our infrastructure relevant for our daily life. Hopefully we will democratise the way we create companies, so the access to capital, the access to growth and the access to markets. That is fundamental to challenge existing companies. What I hope we will see is **a new generation of companies that are like the multinationals we know, but that are civic as a product**. What does the Google of transparency look like, or what does the Google of ethical public space look like. We will see as a field that the sector of **civic driven businesses will hopefully challenge some existing infrastructures**. Take something like Wikipedia, in the future those values will create businesses, and not just charities. That will be significant, because it will give us alternatives in whom we listen to as a society and who builds this robots. Something fundamental may change there, it may also not, but it is a potential. Companies generally favour markets that are less diverse, so business will drive us towards segmenting, e.g. Sant Cugat to be the city of rich families with many children, and Eindhoven to be the city of nerds, because companies tend to move towards models that are like shopping malls. They are segmented with clear target groups and clear markets. And few companies have a business model that creates value for all parts of society, this goes back to our understanding to our values in society. Can we build businesses that reflect this value? Is business going to accelerate the drifting apart? A company is more likely to succeed offering a driving service for families with children that brings them exactly to the places where they want to be safely, than offering public transport. Selling that product is easier than challenging pre-conceptions and saying 'I want everyone to meet on the bus'. So I think I am less optimistic about the role of companies, and more optimistic about the role of new forms of companies that give us those choices and trust will change. Companies will do what they do: they will invent new products, they will solve the energy issue for us – all of those things they'll do. On the engineering side the companies will be helpful, but the other areas I would be worried about.

FT2.9. It's the **liberalisation and standardisation of energy transfer.**

FT3.9. In cities you will need **some sort of layered structure, in which you have a grid that provides stability and interconnectivity, and on top of that you will have more freedom and less restrictions to design your own thing**. It will affect the city as it will no longer be needed to have global or national grid that is build by a government. But there will be local grids that provide enough stability by sharing resources so that you have a guaranteed stable energy production in the way you want it. You need to **ensure that everybody can connect** to such a grid, but it will be more local grids, that do not necessary need interaction. Then the question is if they can be build by people themselves or are they build together with new housing blocks as a utility. If it will be a wireless network we will have the equivalent of a wifi modem for energy. But it may be still be a challenge for energy to be wireless completely. The question will be how small we make the self-sufficient entity: will it be on household level, or more neighbourhood? The interesting thing is that 2050 is not that far away: the infrastructures that we build today, will still be there in 2050. Then it would be strange to throw it away. At the moment we do not have enough technologies and energy to be completely independent of a national network. As long as we are happy enough with the networks in 2050 we still will use them and use them more intelligently than we do today.

FT2.4. Governments will have very limited control of how people manoeuvre and protect their interest. Now they've got superior communications, and public masses have less communication. But in this case, unless the local governments control by blocking communications by creating a mental telepathic block, you'll have an almost equal amount of communications. And the challenge would be that these are peer to peer mental blocks. So the ability to mobilise people using **ubiquitously available energy would mean that we would get a real shift in central control, which would mean power distribution would have to be robust** and it couldn't be cut off, controlled by any one entity. You would have a much **greater distribution of power access**, much likely have different gateway stations and different energy stations. You can tune in to an energy frequency, see if there is urbanised wireless energy. Maybe like radio: **different companies transmitting energy on different frequencies**.

FT19.11. **In the requirements of the platform you can arrange the democratic values for each of the cities**. You can do that for a minimum set of global conditions, so that it will work everywhere, but you can **add some specific local conditions, that make it fit a specific city**. This works for mobility, but also for health, for energy, for local manufacturing. It is always the same way of working. For public transport, private transport, it does not matter. Now is the time to arrange it, because somewhere in the early 2030's it will go too fast, and we will be out of control. Then only one thing can happen: computers will take over control of the city, you do not have any possibility to take it back.

FT18.3. There is a proliferation of basic renewable energy, like wind and solar, but also we'll have **a bi-directional circular energy grid that we call the Enernet**. We are currently participating in a Horizon 2020 project called Real Value, which is about building the Enernet. We will install systems in several hundred homes in Germany, Latvia and Ireland, where the **users will be prosumers**. This is actually very important. Due to the freely available renewable energy resources, the power of the oil producing nations will be diminished. If we are talking about 2050 this could be true.

FT19.17. The thing is that organisation is already taking place at a global scale. For food, for instance, that is a big issue. Because if we have patents on food, it is impossible to have decentralised options. This in fact a thing that hampers open production. If you do that for food, water, energy, medicines – you control the world. Some **companies getting a global domination is a major threat to society, it hampers an open society and privacy by design, because it aims for vertically integrated solutions**. This is the most important trend. Don't allow verticals. It is like the in the movie The Matrix...

FT7.2. We are believing and working for cities to be self sustained of energy. With solar cells and green roofs, and we develop technology for a new kind of electricity distribution. It is much more robust, more safe and more intelligent than today. Our first products are electric car chargers, but that is a first small step towards a **really good electricity infrastructure where you can harvest energy from especially solar**. There are lots of trends on this. Two weeks ago Tesla introduced their home energy storage system. It is really interesting how they are in the forefront of such development. In Germany it is happening already: with home solar cells, and making energy more sustainable. Of course we think that will be very important for cities.

FT19.9. So you need to have **a division of the powers within the systems**. Democracy by design is that you need to have a distinction between several powers that can address, the same kind of division that we now need in the market. There is one simple rule: **the ones that are creating the platforms that are needed for the interaction are not allowed to be an actor on that platform**. So if you have a network for energy, you are not allowed to sell energy. If you transpose that for example to Uber and Airbnb, then you see a huge difference. Airbnb provides a platform for demand and supply of empty rooms, which they don't divide. It's the supplier of the room that advertises and decides what price it is. So it is an open system, where the ones buying and selling make their own choices. Uber does a different thing. They match demand and supply on seats in cars. But they deliver the service, they decide the price, and by doing that they have control over the taxi system. There is one simple rule: if you have this platform you can do it everywhere, but you should not be allowed to deliver taxi services. If you make that distinction that you see the difference in the demands on the platform. A platform should create choice, create democracy. If you want this, than you also know what kinds of conditions, terms and requirements must be set on this platform.

FT19.6. The other important value is **openness**. The way I described it, the way we organise it has to be open. Technology is available, but what kind of openness do we want? By getting this openness you get **a new form democracy**. It is not a democracy that you choose once every four years, not even the type of democracy where you fill in a form every evening, before you go to sleep. It is the type of democracy where you can choose the type of solution that you want. That is also democracy: **having the option to choose**. It is another way of thinking. These combined values are important: the way we organise it in the system is **democracy by design**.

FT7.4. Abundance of energy is going to be true. If we design for it in the future. The energy need in dense areas will be solved through batteries. **Solar cells, batteries, electrical cars and that kind of stuff will get connected** and you will get like **a cell structure in the city**, where everything is managed. These cells will be different in size, for different geographical areas. Depends on the infrastructure, solar capacity and climates. In Norway you have different challenges than in the Mediterranean. So it will be different, but it will be more sustainable. That could be just a big skyscraper taking care of itself, or a whole neighbourhood.

FT1.9. It is a question whether governments are learning. For sure we have new social initiatives already, started in Serbia when social movements stood up against Milosevic, and the Arabic spring. But our governments have no idea how to handle that. I see it in a dual way. On the one hand, if governments are able **to use it in an open-minded way, then it will become productive**. But the risk is very high that it is used for control, and then it becomes repressive. I hope that in Europe our government is able to handle it in a good way. But in many other countries I do not see a chance. They will take a restrictive position.

FT18.9. Rather than siloed infrastructure the **multi-purpose infrastructure** will be more important. The same IT infrastructure will be supporting the networks for energy, networks for environmental monitoring, transportation management. I think the idea of **shared infrastructure** is hugely important. We are working very much to make that real in living labs in London, Dublin, San Jose and so on.

FT4.5. I do think that technology is going to help us there. This hype about smart cities is interesting because it is not going to lead to a **completely ICT governed world**. But in the meeting of getting more insight into the flows with the city and the data we get and need when the internet of everything is reality. That is already there and everyone can image that it is going to expend even further. Then we will have this data and we can handle it, and it is becoming really interesting when we realise that with that information - and not in an old-fashioned design process of acquiring data, studying them, making plans, roll them out,

SMART CITIES

b Privacy and security in systems and services build on open data

test them, etcetera – but much, much more interactive. The smart city becomes interesting when it really becomes some sort of augmented reality in the sense that the iteratively of what you see in reality plus the data. So you see reality and you see the data. Then that creates a new perspective of intervening in reality, both for the individual: the apps are already there: they know where you are, they know your agenda, and they know what you like to do and they can advise you what to do with the spare moments you have. That will accelerate dramatically. But it will also enable the professionals who are involved in the planning of society and space and these processes. To learn and to adjust. I don't think it is likely that technology takes over our world, but I do think that it has complementary values and there are complementary experiences. I think the new is in the complementarity. It is like with, I remember 10 years ago everybody spoke about the virtual office, because everybody could work everywhere. But now we have learnt that still meeting, physically meet, is adding value. We can't do it through virtual reality. It has also added new meaning to the physical meeting. The fact that you do not have to do it, but do it anyway has a value. That is what I miss in more technocratic visions, they leave out this kind of more anthropological, cultural awareness of human and their context. So **technology is really going to help us balance between the central and decentralised systems, in accommodating both citizens and stakeholders to do bottom up things**. But also professionals to have some grip on it, because Society and the city are far too complex to really follow the romantic idea of a complete autarchic system or be completely bottom up till the end.

FT12.19. This is not directly linked to energy, but energy is an enabler for society. For the future it should and hopefully will become a common good, that will bring **more self-control to people**, but also more individualisation. **Away from the big distribution companies** that we have energy and for goods. Away "I don't care where my energy comes from". But this is again a luxury. Hopefully in Europe we can do this. But I don't see it in China or Asia currently. The big pollution will go on and on and on. I saw last week an indication of the fine particle pollution in the world. A small part was for Europe, a bigger part for US, and a huge part was for China. And it's growing. If you see pictures from cities in China: it is hell on earth. You get the equivalent of three packets of cigarettes every day, everyone in the city. I would not want to live in a city like that. But anyway that is nice to say if you can choose, but so many people cannot.

FT16.2. Another important thing in cities for tomorrow to me is the **digitalisation** much more related to energy. And these two trends combined with much more renewable energy. The new technology of renewables, like energy from the roads, energy from the buildings, also from the wind and the sun, but I also think we will be able to get energy from the car while it is driving on the road. All the technology will probably, like we have seen with the PV, develop very fast, and I think 2025 will be a good target. By that time I bet that the energy generation will have really dented. The only problem is that it is very local scale, that energy production, and that opens the door to energy management. **Energy management** can only be done thanks to digitalisation.

FT16.3. So, if we mix these 2 trends (the **sharing economy and digitalisation of energy**), the fact that people do not need energy, but they need to wash, to cook, to be warm. The fact that they will be able to produce energy directly, or coming from their neighbour. And the fact that digital technology will allow **to combine this supply and demand**, I will guarantee that all activity will move from energy producer and energy distributor towards **energy manager**. That is, I think, the most important and the most influential trend that we are facing in the future. But becoming an energy manager will take time. And we will have to go through an energy renovation. A strong and important renovation in the western countries. That is also to meet the climate requirements. So for the time being, if we go through the natural regeneration program, only 1% of all building, we will never be able to reach the requirements. I think by 2020 nothing will be done, or not much, but by 2050 hopefully, we will have found ways to do this in different ways.

FT13.35. **Data is the fuel of the 21st century**. The way we look at it here is that we help our cities to build **open data platforms**. But if you look at who is using it: take up is low. It is the question of the chicken and the egg. What we hear is that the wave of an industry that is making use of all this collected and structured data is not yet arrived upon the beach. It is still a promise. For instance now a lot of cities are working with sms-parking services. But if we ask them if they really get the data, not only on revenue data or system performance, they do not. They do not ask for this information, e.g. how many unique users do we get? Or returning users. It doesn't have to be personalised data, you can also get a lot about patterns. But they just do not know what the value of the data could be.

FT12.18. We are being bogged down into a complexity that nobody seems to understand anymore. But the few wizards that actually can **make light in this huge amount of data**, will have a huge potential to do something different. Also to make lots of money, and do bad things with it. You have dual use of many materials, but you also have dual use of data. You somehow want control this, but it is very difficult. This e-thing, like in e-governance: in one hack I can bring down a whole governmental system in a day. And then they struggle for weeks to get it up again. You have unbalanced problems. I don't say warfare, but you should be **very serious about data collection, because it is not always for the benefit of all**. It should be very, very clear. I do not know how to do it, because data is now ubiquitous. Now if you open Google, Google knows exactly if you use another computer and log in from another identity and look for a tie or whatever, and it knows if you go from another e-mail. This is just the beginning. It is a horror scenario to me. Not because I have to hide something, but I don't want to be part of a consumer system. But that is what I become. The chances of getting society in the right direction in terms of the societal challenges will be decreasing.

FT13.14. And what do we do with the data? All these systems generate all these **data that is freely available**.

FT5.11. I worry a lot about the **privacy** too. Technology right now, everybody is able to follow you and know what you do at all times. In Istanbul there is a lot of data in the intelligent traffic systems captured. When you look at the mobile phone, many applications in the background send data. They use my cellar data. I should be careful about this, it gives me a chance to turn it off, but some other ones do not give the opportunity to shut it off. It is possible for them to always use my data. And a lot of people do not know. **There is a responsibility for the government to take care of this**, this is really important, because in Turkey in the data planning, we are paying the for data. They get my location always and use that data. They should pay me. There is not yet much discussion on this, because other things are more important than this. This is a big issue I think.

FT18.11. The **physical and cyber security is very important**. The infrastructure should be secure. You might have seen that millions of Jeep vehicles are recalled in the US recently, because of hacking. That signifies the importance of how security is important. There will be significant emphasis on security in the internet of things. It think will be solved. The **interlinking of software and hardware will be stronger**. There will always be a challenge; there will always be good and bad. And the bad guys are pretty smart unfortunately. The solutions that we'll have will be far more sophisticated, but there will never be completely foolproof. And there will always be bad guys out there, trying to penetrate them. So the paradigm that we know today will be solved, but it will continue to be **an on-going defence**. As the bad guys innovate, hopefully the good guys can stay ahead, and continue to build bigger barriers, physically and virtually.

FT6.10. The third negative aspect linked to the technological developments is the **criminal use of technology**. You see that now by hackers, all sorts of new internet use. If organised crime is getting hold of that sort of technology, which could disrupt society. Technology safety and internet safety is a big issue and I am not sure if we are still ahead of the organised crime people, it looks like they are ahead of us every time. So when they take control over the air plane, instead of us, then that is a big issue. **So privacy, control and cyber-crime are important aspects of technology**.

FT9.6. I am not sure if **merging brain power technologies** are going to be developed in Turkey, but I know many people are thinking about this right now. Probably there will be some people making use of this by 2050. How it is going to be the future if we do not have to do anything by ourselves anymore. Something is just scanning my brain and knows that I want some coffee or something, let me bring that for you right now. I see that coming. There is now a lot to do about privacy, that I do not believe in everything is just going to be so different. If somebody can read my brain and get me what I want, then I do not mind. **Nobody will have privacy anymore and that is alright**. I do not believe in restrictions or something, when everything is open and I can also see what someone else is thinking about, then I do not have to worry about a thing. So I think privacy is not going to be an issue anymore. Nothing will be private anymore in the future. When everything is open there is no problem. The problem is when some things are open and other processes are not. When everything is open, then the problem is disappeared. Also, especially in turkey, people are so indirect and you cannot really trust somebody, you do not really know what is really going on. But **if everything is open you have nothing to worry about, everything is natural again**.

FT13.18. Then there is a lot about global trends influencing the future city. Through biotechnology you are able to reduce health risks. But also maybe reduce side risks for other things that are left, and that people want **a safe and secure environment** for people to use. If you are able to live without diabetes, then you do not want to get killed in a car accident. This will influence the **perception and acceptance of safety and risks** on people's daily lives.

FT24.6. We have so many cross-border activities that are either positive or negative, and national authorities have more and more difficulty dealing with that. **Cybercrime** is a pretty good example. This might of course have an impact on energy and energy supply and traffic in the city, if we don't have sufficient IT security. So whenever we talk about computer based controlling of something, whether it is energy or traffic, banking, whatever. IT security will become more and more important. The best solution for now would be that we dump the internet and rebuild it. The internet was good when it was built in the seventies, but nobody had security in mind. Until the mid-nineties it was expanded and expanded with no security in mind. And then later security was implemented as an independent layer in this whole technology. I think that in future, as we already can see with IPv6 if you have those new protocols, we have a long journey to migrate existing infrastructure into new infrastructures. **In all these new infrastructures security is by far better than in the existing**. I think that the engineers learned from the past, and future systems are already by design far less vulnerable. Now with the new Windows 10, Microsoft is claiming that they have by far less vulnerabilities than they had in the past when they took over code from Windows 98 to Windows 2000, to XP and to Windows 7, and you always have the same holes in the system. Another thing is that **when computers get more computational power, that they become capable to detect by themselves something is wrong** – like humans do: we also get suspicious. In the future also computers might get suspicious.

C Being in control with or being controlled by intelligent systems

FT21.10. It will also be a **digitalised city**. This smart city development that will materialise. Smart city goes far beyond this idea of sensoring transportation flows. It is a connection of **the internet of things**, the smart conduction or operation of our energy grid, our transport grid and we as individuals will be carrying and sharing data with the systems that seem to make life in the city more efficient. That is a chance: if things are efficiently organised we have more time to relax, more time for leisure, more time to enjoy culture or become creative. The 'ecopolis' that I envisage takes the benefit from the digitalisation but that goes to a certain extend back to the concept of what we weirdly call 'nature', that we depend on. It won't be completely replaced with whatever automated system we have come up with. Regarding automation and artificial intelligence in 2050 or 2060 or even 2100, you probably think that you do not need any natural resources anymore. You reach the point where you're questioning your physical existence, whether this is not some old-fashioned model. By then we should maybe be replaced with avatars. To me it all ends up in the question: this means that we have created **a very complex, complicated system, while we haven't understood the very complex and complicated system that we call 'nature'**. We haven't understood this, but we are now in the process of destroying this hugely complex system on which we depend, without having understood this system, without understanding the beauty of it and the chances and opportunities related to it. And we are replacing it with another **complex system: digitalised, run by machines**. That doesn't seem very rational to me. Why should we be destroying a complex system that we depend on, and replace it with another complex system? If it is in the end only about the **redistribution of power**, I am not interested in that. I hope that 2050 will still be a harmonised balanced relationship between humans an nature, and that human beings still consider themselves to be part of nature.

FT6.9. And the second negative aspects linked to the technological developments is '**are we still in control?**' or are we 'controlled by?' That is an important issue, but I see much more positive aspects of the impact of technology on society than negative aspects.

FT24.3. We are building **more and more complex systems**, at the moment we are automating a lot, and we usually forget what to do when the automation breaks down for whatever reason and we get a domino effect. Only one little thing fails, and the whole system fails. If you have enough **computational power** you can make systems that are **more resilient**. Even if one building block totally fails, all the others are working. That is especially important if you talk about e.g. inter-modal traffic. If the commuter train fails, usually today the whole traffic breaks down, people use cars instead, cars block the buses, and it becomes a huge mess. In the future you will have automated, driverless railways and enough computational power and you inform people online on their cell phones, or glasses or whatever gadgets they will be carrying around by then, you can tell them exactly take that train, that stations etc. That is something that we can't do today. Technically we can do it. But it is still costly because of all the engineering effort – so nobody want's to pay for it. With **fully automated, self-learning computer systems** you can solve this issue.

FT19.7. What are the conditions for **democracy by design**? Because it if you count it up: these houses that create energy, with all kinds of installations, and all kind of devices, that do not act only inside the house, but communicate with other systems, e.g. planning systems for public transport – all these systems are connected – that means that **computer take over the world**. The short explanation of what is already relevant now is: computers take over the world. If you look at it that way, and think in terms of democracy by design, then the question is **how can we be sure that the inhabitants of the city are able to make their choices, because that is the basic democracy**. That has to be ensured. This means that how you want to that needs to be **ingrained in the system**.

FT6.7. So **technology on the healthy city, on the social city, on the caring city and on the economic city, a vital city will help tremendously**. How fast it will go and to what extend it will cover our way of life is difficult to predict but what we know now and if you sometimes look back 10 years in time, it goes exponential. So there is **a big potential for technology impacting and effecting our lives**.

FT7.14. Robots and intelligent systems will take over more and more, and it will be more and more natural for us to use them. **I am not very afraid of artificial intelligence. I am much more afraid of stupid intelligence, of stupid computers that are programmed by short-sighted people**. Robots and computers are as stupid as we program them. For example, you have the GPS in your car, and if you choose the cheapest route you will never go on the highway. Which is very frustrating for a Norwegian travelling in Italy and only discovering it late in the vacation. This **stupid intelligence and such things are a danger in the future**. But more of it is coming anyway.

FT3.11. There will be a lot of automation, robots and intelligent systems, which take over tasks from humans. This means that we will see more robots in the city, but there will also be humans that are still doing things. Maybe we are just hanging out. I really wonder if we will accept that there will be drones flying all around transporting things. I cannot imagine we will like that, so there will be a lot of discussion before that happens. But it can be different systems we cannot imagine now. Are we still having a job in the classic way of thinking? I think we will be **co-working with robots and intelligent systems**. There will still be a lot of task that are not automated. I think systems will become more intelligent, now they are already dealing with data in a way that we are not able to as humans. So the question will be if we will decide for robots what to do, or will they just decide for themselves? Will they oversee the task better than we do? **Systems will be more self-sustaining and self-arranging**. For interactions and emotions we will still want personal interactions. These will not be replaced by robots. But to deal with complex material at the back-office level, that will be done by robots. Also when we do not have enough people to provide the service, robots will increasingly be used, e.g. in health care. The health nurse will be there for personal contact, but distribute her task with robots.

FT6.1. It is quite obvious in our thinking that **technology has a large impact on society and on urban living in general**. That goes through various processes. If you look at a city as a healthy and clean city, a societal city, a caring city and a prosperous city. Almost in every type of such a city technology will play a role.

FT6.8. There are of course also negative aspects linked to the technological developments. The first that everybody always notices is the point of privacy. And the second one is '**are we still in control?**' Or are we 'controlled by?' A lot of people do care about these negative aspects. It is my expectation that we will try to overcome it. There is always a risk that somebody is collecting personal information and make misuse of it. But I think that society will be able of handling these issues and develop enough guarantees to prevent a large misuse. But we know, through our mobile phones and if you have your GPS switched on, then you are traced every second of the day without knowing it, so people are sometimes complaining about it and sometimes they freely talk in the train and say where they are, where everyone can hear it. So that is some double sensing in that.

FT19.8. So now we come to the thirties. **Artificial intelligence has come to a level that it surpasses the human brain**. At that point these computers can develop the next generation computers, who then develop the next generation – and the speed is going to increase tremendously. If we now have speed 1, it becomes speed 1000 in a few days, and 1000*1000 in the months thereafter. It is exponential. I think you can pinpoint a moment, lets say 10 o'clock in the morning of October 10th in 2031, then these **computers take over the control of energy and can in fact do anything**. So the question is what they will be doing. **Computers can solve issues, but they must be set into a direction**: people set them in a direction. That will be in all of directions, because all of the things people are doing right now, will then be done by computers, but thousands of times faster – so also robbing banks. The first things with next generation computers is that bad things happen – it is always like that: it is either sex or bad things. Like the way we are hacking right now: there is some hacker finding a new method, and the contra-hackers find anti-methods and then it is solved again. So this process will also happen in the future, but then by computers. So in the future if computers indeed take over at 10 o'clock in the morning, then by 11 o'clock banks will be robbed and go bankrupt. But then money is no longer of value, so it will be a pointless thing to do. It is irrelevant.

FT3.12. We will see completely new kind of jobs. It is not just about doing half of the things we are now doing and the computer or robots the other half. But there will be so many things that will change that we cannot oversee. We will be much more efficient: you can manage more accounts, you can manage more citizens with just a few persons. You can manage a factory with just a few workers, and the rest will be **automatised or robotised**. Production will be synced with demand on the market place, so you do not distribute. As a person you cannot add much to such an efficient system, you may only hinder it. You can **add value by understanding what people want, or by designing things for them, or explaining things**. People will not be the one that does all the calculations.

FT1.6. **Analysing and monitoring our human systems on the social level, in public spaces or in social contexts**, we will have a lot of new conditions which we do not know up till now. Next to an impact on humanity, it means that we have to **redefine what is life and what is public and what are our civil rights**. So this will have a huge impact. For example regarding our health conditions and our health system. We will have transplantations in forms and conditions we cannot imagine now. We will reproduce e.g. hearts and lungs and other crucial things or make a diagnosis based on codes, for which we have to answer ethical questions. When a child is born we will know immediately what is the future of this human being. We have to answer whether we want to know it or not.

FT25.8. Another interesting thing is since we are able to cutting out the kind of face-to-face exposure or direct interaction with anyone, unless we want it. It means also that it will have probably implications on **trust**, and with trust on crime. If I never actually meet anyone, but I am using a lot of systems and services then my **responsibility to act ethically** will no longer be motivated by understanding the impact, but it will only be motivated **by enforcement**. Which means that our society is governed through enforcement and some form of policing. And that may not just be government policing, but also insurance companies policing you or other things. Or we will somewhat win **the battle of values**. I think public space is going to be a really contested area.

FT15.11. The robotics comes down to the tasks we have to do. We are familiar to manual tasks being automated, lots of administrative tasks, and by that probably management, because that is mainly administrative, will be **done by robots**. So, maybe what we do, unless it is out of personal interest, to deep dive into information isn't necessary anymore anyway. We will just be **handling exceptions**. This is an exceptions because it failed in all this scenarios. Which probably means it will just be deleted. And that will be as deep as you need to go. Now what that means for technological advancement, and things like that, in people pursuing in their studies, etcetera, I don't know.

FT21.1. When talking about the future I wonder whether my guidance should be as I think it will be, or as I think it should be. Some of the trends are resonating very much with what we are thinking at the moment or what we are broadcasting, officially or informally. It all ends up at the general question of **what our physical existence basically means in the long-term future. Or will artificial intelligence take over and at some point make our physical existence obsolete**. Which is not what I find some kind of romantic thought, but there are signs that are suggesting that to a certain extend.

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d Merging brain power and computer power to make smarter decisions

FT2.3. Basically **everything is wireless connected in an urban environment both communications and power**. Because communications between people are much, much greater: if we imagine how social networks today extrapolate in 35 years we will probably be thinking in transferring thoughts. So we may have quite a **high resolution of telepathic communication**, from neural stimulus to digital data and up again. We will be thinking in swarms, in real-time, we can turn the chatter off or on. Because we've got real-time thought, and seamless communication within an urban environment, our ability to make collective decisions to do something could create peak-loading on power requirements in a much sharper spike. E.g. we all decide to go to a concert or restaurant together or something, we will all be there, we will all be on buses causing traffic spikes. We'll get mass-mobilisation of crowds. If a **mental mind-mind communication** is viable, and I don't think it is science fiction – it will be possible – those who subscribe to such user groups could basically mobilise a mass riot or mass protest or march in five or thirty minutes, and everybody will be there, in real-time.

FT7.1. The emergence of a new human, so to speak, that is already happening. Already we have changed because of the iPhone, smartphones and everything. **Our brain is changing** because we use our thumb much more. Of course it is typically something that scares a lot of people, but it goes **gradually** and they don't even notice.

FT10.2. A new game changing technology is on the horizon, the question is which one. I'm a development optimist. 2050 is thirty-five years from now, we may come up with something in the next ten years, and then we still have 25 years to develop applications for this completely new technology. I think it has something to do with **spiritual capabilities, our way of interpreting our emotions**. Technology has spread very widely: more than 2 billion people will be exploiting that new innovation. Now mindfulness is a bit fashionable, but something related to our own existence. It will be something that all people use, like make-up or toothpaste, but then **linked to our inner-self**. Technology doesn't need to be very technical. Technology is not just mechatronics and engineering, I interpret it wider.

FT11.9. There will be some sort of technological thing that none of us actually already understands that will change everything. I am kind of worried that it is something like a Finnish writer recently described: that hooks to your brain directly. You don't need 3D glasses, but **you plug your brains in directly**. It worries me, but my kids might love it. It is already doable to some extend: you can hook your brain into somebody else's body. In 2050 I am over 70 years old, so if I want a new body I just buy it from **some sort of body-shop** in Brazil, and become a 20 year old Brazilian guy. How what will that be? You can say it poses a bit of an **ethical problem**. In many ways! By 2050 something will happen there, or totally something else.

FT21.5. The **merging of computers and brainpower**. I am so happy that I am not born 100 years later, but now. I can still be an old-fashioned romantic type of guy, and not relating to all this **artificial intelligence**. But it will be amongst us.

FT5.10. In the future **brainpower and computer power will merge**. It will happen. In our brains, they are already looking for electrical energy. Part of the **brains create energy** and when we are sad something else happens. They solve that problem and with that energy, turn up the lights, maybe that one happens. Technology is something like this. The sound and the lights are the way.

FT1.8. Urban development, development structures of urban developments. Technology will have an impact on our social behaviour, and on our information and decision structure. I hope that we can use **ICT to bring forward a better decision-making process**. This one of the main challenges in the PLEEC project: energy efficiency in urban development.

FT10.15. With Digile we are working on co-creating intelligence. How to **combine artificial intelligence, human intelligence, the wisdom of the crowd**. Crowd can be robots, humans or computers. Because of the technology changes, one person can have bigger impact than 200 years ago. Decisions were more simple. Now it gets complicated, you need to put all kinds of things together.

FT10.14. I am advising an internet start-up, called Fingertip.org. They are looking at crowd-sourced decision making. They are branding it as social decision making. I think in 35 years, when we really get this **wisdom of the crowd, and let the crowd of humans, robots or together decide**. You cannot really draw a line between humans and robots and you can't actually soon draw a line between a human and computer. It will impact how decisions are democratised, how it brings people together, and also makes the execution better. According to our business review, 51% of the decisions made by directors and leaders and senior decisions makers are against the strategy. It is called the decision making amnesia. When the Y-generation comes, you can't actually lead them if you haven't engaged them really. They say 'what the heck, if I don't get it'. I can tell huge stories about Nokia's collapse. There was a strategy, but the vice-presidents weren't executing them. And they have so much power, their ego's are so big. So they just can execute whatever they want, showing their finger to the strategy department. Nobody punishes them, because it is a cash cow, as long as they make hundreds of millions profit. You saw it everywhere, it is interesting. And now there was a global company that mentioned it is now actually going the other way around: Young people, in their twenties and thirties, they don't obey, and they just don't follow. So the decision making in 2050 will be different. How does democracy work, how does this affect city sustainable lifestyle?

e Integrating (wireless) data and ambient energy networks

FT2.2. In 2050 the demands for **wireless energy transfer** are huge. Everything I have and use, from the moment I wake up, when in the car etc. will use energy. I might have augmented knees or something, or bionic legs that make use of an entire ubiquitous grid around the city. Everything, from cell phones, to bionic legs, to cars etc. will be powered by the same system. The modern version of the plug will be a wireless plug.

FT7.11. The democratisation of energy, the **Internet of energy**, will be developed, and will result in oil producing nations will have to change their way. I think oil will finally become extremely expensive again, but the next decades the oil price will be low, and the oil companies and oil nations don't earn money. It will stay cheap because of the solar trend. If you are in the government of a city and you are weighing what to do. Should I buy a coal plant, or a diesel aggregate or should I invest in solar cells. There is so many benefits with solar cells, and now they are cheap too. So the choice is obvious. You will see that diesel and gas and coal plants will be secondary. More as emergency power.

FT3.10. There may be **a competition of energy networks**. Also there will be an integration of data and energy networks. But it could also be **a completely new energy internet** that is competing with the existing systems.

FT2.1. Increasing uses of technology place greater demands on energy consumption and immediate distribution at an intimate level. **Everything I have needs to be electrically connected**. So not only greater consumption, but I should have to plug my smart phone in for a month.

FT2.6. With ubiquitous common power architecture, things like robotics, cars, electronics all over the place, or all kinds of equivalent products based on **ambient energy** and small ambient energy devices, you do not need battery power or storage attached to the device. The ergonomics of those products will be much greater. You will not need batteries, only as a back-up maybe.

FT2.5. We'll have to solve the problem of **power density**, otherwise we'll be cooked, or get an eternal tan. We'll need to watch out for those details. But this sort of thing will be possible in the future, and very interesting.

6 Applying new technologies

In 2050, a range of new technologies are available and affordable. Some of them are already in development, others are still unknown. Cities apply those technologies in new solutions that contribute to the quality of life, and in particular to the creation of smart buildings, smart mobility and smart urban spaces.

a Applying new technological solutions to increase quality of life in cities

FT15.6. Today all buildings have an AC grid (alternating current), some today have a DC grid (direct current). By 2050 there will be DC grids. **The majority of the assets in the buildings will be DC**. So all of these devices even now are DC. They are only getting hot, because they are converted from AC to DC. So if it was DC, which solar energy is, if it was DC anyway it wouldn't get hot, which is the 20% of waste you get from converting. Today you generate the solar panel energy DC into AC, using 20%, and then convert it back to DC to use it. So by 2050 it will all be DC, maybe there will still be some AC, but I think that will be limited. I think that is probably 10 years away. The technology today it there. The only reason why it wasn't DC in the first place is that DC is dangerous. With AC if it runs through your body you can let go. With DC you can't let go, but now the interrupters exists so you can let go. So there is no reason anymore why you couldn't have 500 DC networks in a building. And it would make much more sense since everything already runs on DC motors anyway, and a USB plug is the only international standard that we know. So you will have a DC building, and that DC energy comes directly from the sun. That will be the key part of the building.

FT2.12. Maybe the sweet spot is **fabrication in the city, in vertical farms or whatever, 3D printing food**. If I want a cup of coffee, I'll print the cup. The table will be a 3D printer, printing up my cup. One of the divisions in Carnegie University has a project on **programmable matter**. At the moment they are little units, but their idea is to have them at micrometre scale, where the particles are basically magnets, they change colour, they've got behavioural autonomy and swarm collective intelligence. It is basically very fine dust that can take form and shapes and lock into. It may sound as fantasy now, but this sort of thing will be there in 2050. With ubiquitous energy in the room, and this constant energy maintaining all of those systems, a cup could just form and grow from dust size robotics. Then the cup appears and you can pour something in.

FT2.15. We will have our first test satellite up with solar power in 2017. We might be able to have the worlds first **beaming of solar energy from space**.

FT7.17. There is another trend that is now not included: in 2050 **humanity has moved into space**. We will have much more activity in space, on the moon on asteroids. And that will change the whole society. Maybe not the city planning directly. When we succeed to **harvest energy in space and beam it to earth** it will be a revolution. Energy will no longer be a problem. But I believe that we can solve that even without space. If you calculate how much of the earth you need to cover in solar cells to produce all the electricity that we need, it is not that much really. It is doable without space. The space enterprise will change the way people will think about themselves and their role in the universe. It will have less impact on the cities directly.

FT5.1. In 2050 I imagine that they are looking for **the new world in space**, out of our world. How is the impact in 2050? Right now it is just a few countries, by then nations all over the world will together create a new space shuttle, or something like that, to look for this in much more efficient way. In 2050 I don't think this will have happened yet, but the search will have been further developed. If this has happened then we will have much more space: we do not need to use the land for food production, and maybe, **if we will create a much better world than this one, there will be no-one left on this planet**. No more congestion, etcetera.

FT10.13. There will be new technologies, like **geo-engineering**, with uncertain consequence and immense impact. It is often like that. Many inventions are due to a mistake. It will help us to reduce the challenges of energy. I am not saying that by 2050 we will have an infinite amount of energy, but we will have so much that we can consider things like the **'beam-me-up-Scotty' type of stuff or space travelling**.

FT5.7. Right now, actually, especially the surgeon, the micro surgery, that all starts with the engineer. The engineers do a lot, but they ask to the surgeon: "what do you need?" The surgeon explains and then the engineers develop new things. Maybe later it will not be explainable, because of the complexity, therefore the surgeon should go to the patient, if they need any improvement, especially for the software or something. **Technology will enter all kinds of fields and disciplines**, so this will happen everywhere.

FT9.3. By 2050 I guess **everything will be automated**. Technology develops much faster than we expected and by 2050 everything can be automated, like care, education, maybe I can go for an MRI scan and I can scan myself by just a push on a button. That is very possible actually. I never thought people in Turkey would be so easy to accept new technology, but actually they are, so that will not be a problem.

FT5.2. In 2050 I imagine that not only the hairdresser will be automated, but we do not need to go to the barbershop anymore, we will **buy automation at home** and we will use that one. For example, already in the US, some apartments have no more wash automation, they use shared ones. Maybe that will be done with more **automated systems**, they will put it in our houses and we do not buy the service anymore. We will just go there, put a coin inside and it will be done automatically. In that way we do not need to spend time anymore to go to the barbershop or to other places. But we will miss out on the social activity: we go to the barber to talk to people, to read the newspaper, to get other knowledge from people. We will miss that then, how that is replaced I do not know.

FT8.11. Then on the micro, individual level. This is more about well-being. The first is about physical well-being. **Technology will make diseases extinct**. That could have been on the governance level as well, but I choose to look at it as an individual one. To be honest I do not know how feasible this is by 2050, surely aids, maybe not distinct, but under control. But if the key could be unlocked, for cancer for instance, I think this would have a huge impact on people's lives. Also because we will be getting older, so the more that you can cut out these kind of things would contribute to premature deaths, but also having an impact on the quality of live the more important it would be. I think.

FT3.14. Like we now have pets, we will also carry our **robot pets** into the street.

FT5.6. In the US everybody drives huge cars, right? Nobody drives a small car. But in Europe everybody drives a small car. In Istanbul it is mixed. Maybe 10 years ago people were looking for the sedan cars, but right now when you look around you see a lot of hatchback cars. Because it is easy to park. In the US they do not have that problem, so everybody drives big cars. When I look at Istanbul, now most of the cars are manual, not many are automatic gear. When I image the future I do not think people would like to drive manually, but we will be 10-15 years behind the trend in Europe. It will not be easy, but it will happen. Look at mobile phones, we didn't want that either, but now everybody is using the mobile phone. The same will be with automatic driving.

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7 Technology with a human focus

In 2050, we've mastered the challenge of ever more complex, multifunctional systems and the need to make them easier to use. Those systems are user-focused: that means users can understand how the systems work, and how their own behaviour affects sustainability and energy use. Robotics and smart (home care) systems support living at home, helping people to live healthier lives and to stay in their homes longer as they get older. There's a range of available solutions that plug-in directly to the city's open energy platform.

a Smart systems with a human touch

FT23.1. Relevant in the future will be the quality of life in the cities. Especially in European context, and I also talk about Italian context. These cities are the centre of the culture and the economy. But at the same time cities are the concentration of problems. Social problems, education problems, and of course in terms of pollution and sustainability. I think what we need to change in the future.... In the last decade we have focussed very much on the efficiency of buildings. Energy performance, the kilowatts, etc. But unfortunately the sum of all these buildings does not make a sustainable city. The problem is not the buildings itself. Of course it gives a contribution on the quality of air and so, but I think what is the most interesting phenomenon of the last few years, is **the concept of re-generation.** The concept **where the software are the people and the hardware are the buildings**. Until now we have only taken into consideration the hardware, not yet the software. How people live in the city and how they interact with the city. Especially here we have very old cities, with strong social structures, and what happens outside the historical centre, what we call suburban areas, is that we completely lost the connection of hardware and software. The hardware is very bad, because they are poor buildings, and the software is suffering from this. There is no connection, no interrelationship, and no good services. We miss the idea of how to build a city together. This is the weak part of the story. If we do not speak about these weak elements of the society in the suburbia, then there is no way to talk about energy. **Energy is invisible, people do not see it and do not understand it**. They do not know where energy comes from and they do not connect the fact that you have energy and that creates problems in terms of emissions and pollution. **So if you do not connect to that idea that energy has an impact on everybody, then you can never win**.

FT22.12. It is important to invest constantly. **So people understand immediately the advantages of new technologies for sustainability in buildings and houses**. Just to save electricity or for condition, because they immediately save money. That is very easy to understand. This requires a change for the experts to develop good scenarios. Not in the far future, or even the future, it starts right now. They have to present in a way that people easier understand.

FT15.14. So to engage with you in your home, what is important with you, and how do we create **a platform that gives you the information you want**. So we can disaggregate between every asset in your home if you have a smart meter, which you will have eventually. So if you got two fridge freezers, one in the kitchen, one in the garage, we will be able to tell you what that's consuming. But we can also tell you if it has got a problem. So if somebody let the door open or if the compressor is not working fine. Now that is information that might be, if it is presented to you in a good way: e.g. we recognized that your fridge in the garage is consuming 20% more energy, is there a problem? And you go down and find the door not closed properly. So there is value you can give that is far more usable than showing a graph of your energy use in the last 12 months. And I think that will come into the building of tomorrow. **This can all be done in data algorithms**. And especially if you combine that with personal data, of which also in Europe very much is free available, like your purchase, the holiday you booked, etcetera, then you can narrow it down to **very personal messages that can be very valuable to you.** And that creates **fidelity and engagement.**

FT10.10. Using biochemistry or something like that will be ready to produce food etc. It will impact **the way we design our housing**, to include this. In 35 years we will have **equipments around us that are part of our human existence**. Like a fridge, I do not know how we will do it, in a second roof or any other way. But it will happen sooner than we understand – so we do not need the three generations that it normally takes to develop a technology in this case. It will be within this generation. It will be somehow embedded in our environments, and we take it for granted, as we do with refrigerators now.

FT15.13. Now today there is things you can do in the home and around to save energy. There is demand response, those kind of things. The value in euros is not worth much. And I don't think honestly that most home owners want to reduce their energy bill either. They just don't want it to go up. And they want to stop reading in the press that utility companies are ripping them off. So if you say well look, this is your utility bill is a 100 euro do you want to fix it for the year for 100 euro a month. They say yes I do. Right. We have the technology to help you do that. Some of these technologies even mean that they can help to reduce your bill. So you could save 5 euros a month. If you could translate that 5 euros into **something that is valuable**. So if you say look, if you allow us to join you, or to involve you in this response-demand program, you will see no reduction in your home comfort, the heating will be on, etc. And we will take those credits and with those credits, we will give you another system in the elderly home where your mother lives, 300 miles away. It is very simple, you can set a scenario, that if the lights do not get on between 7-8 in the morning, or she doesn't put the kettle on between 7-8, then we will send you a text message and you can ring her up to see if she is alright. "Yes, I'll have some of that". So instead of the 2 or 3 euros, translate that into a service that is very cheap to deliver but of a very high value to the individual. **The challenge around utilities is to engage with the customers**. And the only way you can engage with customers in my view because we do the same. We are giving people smart thermostats, it doesn't work. Maybe for the first month the geek may play and see what happens, or what his energy consumption is, because he likes to see a graph in kWh, but it means nothing to most people. The only way to engage is around this **broader service capability**.

FT13.31. This week we had the discussion in Belgium about having an M-label for housing. So next to an energy-value, measuring the energy level of a house, you can also measure the **mobility-value of a house**. And give certificates for how are you situated for the diverse mobility modes.

b Improving quality of life with robotic support and home care systems

FT15.17. Business process outsourcing. Robots will replace all automated work, but also the management of these robots. So a lot of administrative tasks that will get out of the way. You will probably see more and more robotic devices around the buildings. That might be a device, like today, automatic vacuum cleaners and so on, air quality measurement could be something you will see much more robotic devices around. So in the glass building we know today, there are a lot of engineers that sit in plant rooms, the hard service guys, the soft service guys are on reception and security, that sort of things. More and more of these people will be replaced. Lots of the current maintenance tasks today are not necessary. The new equipment doesn't need maintenance, so people are monitoring. With the internet of things you won't need monitoring by people either, because it can all communicate with the cloud anyway. So we will need new mechanisms for these services. When you are feeling too cold or too hot where you are, you won't ring a helpdesk, or use a thermostat or something, you just click on something, saying I want more heath. Interesting will be the lighting. If you want more lighting, and you want to turn the switch, you are actually saying 'I want more light for reading'. Now the building can do anything to his ability to analyse and see if it does so by letting more lights in from using the blinded windows or change the transparency of the walls. It will do whatever the most efficient solution is to give you what you need. And then as a last resort, okay turn the light on. **The switch of tomorrow is just a sensor and the robotic support mechanism will change walls, windows, blinds, everything to help you get what you need.**

FT9.1. First of all people are going to living longer, because there are more opportunities in terms of health care, education and the fact that people are going be more careful. So hopefully people will be healthy old by that time. Since people are living longer, that will have consequences. Senior housing and elderly homes will be more common and care is being improved. In Turkey it is tradition that the kids will take care of their parents, but I don't think it is going to be possible in 2050, so **more home care systems** are needed and **more elderly people will check in to those kind of apartments**.

FT6.5. Technology will certainly have an impact on **the caring potential of the city**. All sorts of e-health and domotica will help people not only to understand what their physical condition is, but it will also help the caring professionals in order to better know what is wrong with the person. Sometimes even without physically seeing a doctor. And that sort of technology will especially be introduced into the group of older people and will help them understand what is wrong with them. **E-technology and especially in combination with domotica, will certainly help older people to get older better with healthier life years**. And not ending up in some sort of retirement home.

FT7.16. Health and aging are two major trends: we will get much more feedback from mobile phones and systems around us on how we are doing health wise. **We'll get advise on healthier living and will have longer life, so a much older population**. They are combined. An older population will have an impact on cities, because things will go slower. Traffic goes slower already, because we have automated cars, and hopefully you get a more wise population that takes things more relaxed, walks slower on the pavement and enjoys life more maybe. The backside of an older population is that they may get more ill or have Alzheimer's disease or struggles with being older. Then of course it becomes a burden for society. But I think we will solve most issues about people getting older, and we'll make a better society. To give another example: in the office we got a girl working for us with a wheelchair. The initial response is that we have to redesign the office and everything. But what happened was that the office becomes much better also for ourselves. We made more space, doors were removed. **The changes that you need to do for an older populations, like to have robots doing things or having bigger signs with bigger text, that will be nice for everybody.**

FT15.9. The blend between professional, social, personal, family, of course there are differences, but that is increasingly getting lost. Where people immerse in their day with work and home, family etcetera. You will get info on your phone, saying something is happening at home, or the fire alarm goes off. All this **information comes in all day** and that will set us for some interesting challenges. But I think from a **work environment and a smart building environment of tomorrow**, we have to create environment where people can actually do that. Where they can deal with all these different aspects of their lives at the same time. It will increase even further. For now, if I am reaching for something it is always my mobile phone. I limit the context of what that can be, because I still refer to it as my phone. The least I use it for is for making phone calls. Once I can actually dispel the idea that it's a phone, and then the next step is, if it is not actually a phone, than I do not necessarily have to pick it up. There are now watches coming close to that, but of course the wearables of tomorrow: my shirt will be my phone. And it could be relying information to me all the time. Or with glasses or whatever, there will be all sorts of media. That will change more and more, it will no longer be physically picking up a phone or typing a text. That **interconnectivity will be ever-present.**

8 Better buildings

In 2050, new buildings combine historical qualities and new technologies, creating maximum comfort and functionality for their users. Historical expertise in building for specific local climates is used to design solutions for new buildings, and for thoughtful upgrading of those already existing. The latest technologies and materials are applied to make buildings self-sufficient or even energy positive, contributing to abundant of renewable energies in cities. Policies aim at improving the quality of neighbourhoods and strengthening the sense of community, and not only at reducing energy consumption.

a Blending the quality of our architectural past with the opportunities of new technologies

FT15.2. By 2050 we will be in a scenario where **the building itself stores the energy** that it needs. Some of that energy, or actually a great deal of that energy will be collected from the sun. So definitely solar power is going to be the future. There is lots of investments in wind power as well, but I think that will be completely overcome by the solar technologies. In all parts of the world, because the collective piece. Today, even in this building, there is a lot of energy stored in every battery in every machine, but they are not connected to one another. There is a lot of cars parked underneath this building, and whether there will be cars in the future or cars will be slightly different, but there will be **battery powered mobility**. So all of that **collective energy** can plug into the building, to pair with the building. And buildings can then plug in into other buildings and **share all this energy** that is there. This is not so far ahead actually. The technology needed is already available today. It is more on collaboration really and costs, it needs a driver. So I think the building in 2050 will store the energy it needs to use, so we need to build a macro-net and a net user entry from the grid, wherever that energy is stored that will use it.

FT15.4. I think **energy will become abundant**. Once we are fully harvesting the power of the sun, and the storing of that energy, then effectively energy itself will become a free commodity. And we already see that in some countries today, where - to balance the grid - they pay consumers just to consume energy. So I think that will be an abundance. Many of the current buildings will still be here in 2050, now definitely all incorporates some method of collecting solar energy. That may be through **translucent solar panels**, where all windows become a solar panel, or as we know today with biogenetic chemistry, you can actually have solar active materials that can even be printed on paper or something in many different colours. And by 2050 that can be cost effective so you won't paint a building, it will be wrapped. Or indeed, let say these **storage chemicals**, these chemicals will be injected into the building materials itself. So concrete becomes solar active, all you need to do is plug the but back into the terminal. So that will be collecting that energy.

FT23.5. There are cities in Italy, where the tools for planning are dated to 1978. So they use 30 years old tools. How can you manage the city policy with tools of 30 years ago? The dynamics of what happens the last not even 30 years, but 10 years. Aging populations. How are you going to deal without make a planning about these solutions? And what happened in 2003, there was another heat wave, hitting Spain, France and Italy. Almost 15.000 people died in France in the heat wave. One of the consequences of this drama was the family structure. Because in Italy you don't leave your mother alone, you don't leave your old granddad living alone in the sun. They are living in with their families, and that saved a lot of lives in Italy, because they take care for each other. These **social structures in that sense work very well for the climate change**. In France that does not exist and many people died alone in small apartments, and the people who died were the people living in the bad buildings. No insulation, no shading, bad quality. So, I always say, because the climate change is a reality, it will effect more the lower class people. Which is a big number of people in Europe these days. Last year, we had a big crisis and people did not use any gas and energy for cooking anymore. They were reducing the amount of energy because they were not able to pay the bills. We need to be very careful about these things. Energy savings in this way is easy, this what they do in China. They say: our buildings are very sustainable because it only consumes less than 50 KW per m2. But the building is terrible. But they just limit the use of technology. So in the night they can only use the cooking system for 2 hours. In the summer they only allow the cooling system to be used for a limited amount of hours. This is not a policy that we can apply in Europe. I believe we should **make policy that is not aiming for reducing energy, but aim for increasing the quality of fabrics and buildings**. But if you are not able to explain why this is necessary, then it will not work, because no one will invest money voluntarily to do that.

FT11.8. Now we go to the climate change and everything. If housing is **zero emission** and most of the heavy industry does not have to be that heavy anymore, then we can **make things a lot lighter**.

FT15.3. Today already the air quality we breathe inside the building is probably worse than the quality external the building. In particularly in your home. And as homes becomes energy efficient that scenario gets worse. So, we are not too far away from where we have to do a lot more about **air quality in a building**. In a work environment there is already ventilation that drives that. But I think there is a lot more to be done about air quality. Today we only pay for air quality in commercial context. So already in this building now we consume energy to change the air quality in this office. So in a residential context that doesn't happen. People - mainstream –may be paying for air conditioning, but I think in the future people will be prepared **to pay for air quality within their house**. There are many devices now that can to some degree measure the air quality in your home. There are some technologies that can treat the air quality. That will increase. Because today if you got pollution, or carbon dioxides hoping up, then people open a window , even with the heater on. So there will be more and more device which will mean people will pay for air quality in their home today they don't recognise it. They may be paying for heating, but they do not see. In the energy efficient homes, all the VOCs from carpets, from paints and everything else is trapped. And you live there for at least 8-10 hours a day. Breathing in all that. While when you were to be outside, even in the city, or in most cities, the air quality is better than in your home. In the UK a study is done, proving the home air quality is the biggest contributor to premature death. More than cancer. There is not much press about it, especially since people are saying we should built more energy efficient homes. In the old days when they were leaky and cold, at least the air was fresh.

FT7.18. In 2050 you will get **windows with electricity generating capacity** in them. And **smarter houses**, and new infrastructure for **electricity with IQ** as we say. A lot will happen in new and refurbishing old buildings.

FT22.15. We also have the problem of **social housing that were built in the last decades and all these houses are very bad**. Poor constructions, poor systems. **After the second World War the set-up, of cities of houses, has been forgotten**. There is now no more money to change completely. The problem is that these neighbourhoods become the place where the new people will stay and that creates a lot of conflicts. In Italy we face the problem, although less than in the Netherlands or England or France. The cities are very small and very balanced. This is choking them.

SMART BUILDINGS

9 Flexible ‘re-purposing’

In 2050, we’ve adapted to continuous city dynamics. Buildings are part of the constant transformation of urban area. People know that ‘things are always changing’, so they have an open mind on how buildings and spaces are used. So this can change over time - or even during the day – in line with changing needs and events. As properties become available, they are used for meet the specific need at that time. Individuals and smaller collectives with shared interest have easy access to available properties, sites and services. Historic buildings and cultural heritage are ‘re-purposed’, taking their specific qualities into account.

a Re-purposing as part of urban planning

FT22.18. When talking to the smaller cities and helping them, it is difficult, also for the mayors of the cities, to make them understand that they have to change their vision. They will also have to respect a lower income from this kind of buildings. For cities as Bologna or Ferrara it is a bit easier than for rural municipalities. It is easier for public buildings, than to change this in private buildings. For instance here in Ferrara we have changed a fire brigade building, 5000 m2 in the city centre, completely abandoned. The municipality tried to sell the building to the private market, but there is no market. We have suggested to create a non-profit association o give us the buildings for 5 years for free, and we started a process to create co-working spaces for young people, creating their own smart start-us for free. This is a good practice, and you can see these examples all over Europe. But with private owners this is more difficult, because they want better profits. But I think this is a good direction. So **urban planning will change more towards urban transformation inside, urban renewal, urban rehabilitation**.

FT20.4. This all is embedded in a bigger trend, where cities cannot escape as well. We have the next decades a time where we will have a lot of inheritance. A lot of the old generation people will die and there is a large amount of money that is looming there. **Properties will get available again**. That is not necessarily only positive. If there is a lot of offers on the market, prices will plummet. This is a likely scenario for quite some areas. Of course London and Paris will always be attractive, but they work on a different scale. But also there are in Paris areas that are less attractive. And if you could buy some property in Prenzlauer Berg now, you will probably not have a return on your investment in the coming decades, 35 years is a medium length for mortgages. This will have an **impact on the housing market and the revenues for the cities** out of that. In these areas something new can happen, but we need to steer that.

FT14.5. I think that we will face **changes in the commercial sector and commercial buildings** too. Shopping changes. We will shop quite a lot in advance, and online. **Commercial buildings will become more like museums, or galleries**, where products can be touched and seen. But necessarily being shopped anymore. So maybe department stores are becoming more similar spaces as museums are now. Which they probably are already today, but they do not yet acknowledge it. I think in Europe we are still not online enough to skip the purchasing part. That is why I think these environments are still run in an old-fashioned business model.

FT4.3. This is also a landscape and a condition that form a very good basis for the shift from an institutionally organised society from the welfare state towards a participation society or the triple helix or the quadruple helix. In which **more and more is organised from smaller groups who have a common interest**. In America they call it ‘common interest development’. These can be socially oriented, economically oriented, or all kinds of cross overs. I think that is also going to help in terms of sustainability, because probably it is going to help us to tailor in what we need and how that can be organised and supplied. I think this also means we will see a big change in how we organise and try to manage society and economy and mobility and energy; let’s say the flows of goods and ideas and information and money through the city. Traditionally, especially from the half of the 19th century until the end of the 20th century, this was very much centralised systems. If we are going to a situation that is much more balancing between autonomous, cooperative, collective initiatives which are related to each other in a decentralised way, then I think that will have tremendous impact on how we try to manage that. Far more decentralised, semi-autarchic systems then the old hierarchical one. For instance we can see it in the market of energy, increasingly becoming decentralised, autarchic cells which are related to each other, so you can have the benefits of both the central and the local. At the moment you see a lot of examples of **temporarily use of spaces and buildings, which is trying to fit into temporary needs of small collectives of local stakeholders or shareholders**. That is clear evidence of it. And the increasing popularity of it and it also fits perfectly in this evolutionary idea, because it is not so much anymore about making a blue print plan, it is much more about ‘go with the flow’, or floating on the local flows, and let things grow. That does not mean that these temporary things come, go and there is nothing, they can grow, flower up, go through phases and increasingly becoming richer or more mature, a study for local and area development where we can play and experiment, of which we can learn. For instance in IJburg in Amsterdam, almost accidental, they started with events, like ‘Blijburg’ along the beach. It became an enormous success and then was formalised. But is also brought in other initiatives. I think it is very important to realise that this going with the flow, and this temporarily is also enabling us to anticipate, being flexible, but also to grow.

b Different use of spaces in time

FT25.1. The one interesting area to think about is health. Given that health will be much more self-managed and as a result people will be healthy and more independent. Naturally there will be no retirement, as we know it. So I think if there is no longer a retirement age, people will organise their life expectancy differently. Every city has citizens that will live a 150 years. That means that they may retire at the age of 20 for 10 years, so people will have multiple cycles of what traditionally was a life: learning, working, retiring. I think they will organise differently because the expectation is no longer that retirement is something that you do at the end of your life. That means that the way we understand demographics changes, and begins to reorganise itself. Age is no longer the traditional determinant. I would not foresee necessarily that fertility cycles change, I can’t make those predictions, but life will be organised differently. I just can’t get my head around having children at 140, but that might well be the case. Anyhow, we’ll do a lot more self-medication, it is integrated in our food supply, we have medical knowledge, so we will basically all be largely self-medicated and much more independent. We’ll have some robots helping us if bits of our body fall to pieces. So what that means that two things can happen. If my home was actually to be my home for my life that would be extraordinary, imagining that **you will be living in a home for 150 years**. What does that mean in terms of flexibility, in terms services and so forth. We will probably outlive our building several times over. That creates a whole issue around planning, about ownership, about even construction and technical systems. In the course of your life, the technical systems will be reinvented maybe 20 times. So that raises interesting questions about **how we are planning, how we are building and what kind of life we are designing for**. Equally we will probably see people going through the different cycles in their lifes, they’ll have more a kind of nomadic lifestyle. I wouldn’t know the statistics, but say that today people live on average in three homes during their life, in the future they might live in 20 homes, in different countries, different cities, different sizes, different partners, different social structures. That will have an **effect on our communities, on how we are living**. This point, when you’re life is 150 years long, the idea of people looking for a meaningful contribution to society, will be part of the cycles you go through, in different ways.

FT11.6. One of the interesting questions is when **things are getting servitised** all the time: what happens to housing? In offices there is already a trend that you don’t have your own office, but that you hold your office in coffee shops etc. But how about housing? In 2050 will we have a own house? How moving are we? How will life be in that sense? What kind of expectations will you have? This week I am travelling to Delft, and we are guaranteed that the kids get a similar kind of education as they get here. And they have their education package, and teachers and so on. So it becomes **independent of where we are**, I think. I might just as well take the whole family and go to Botswana and be there for three months and nothing changes. We are actually close to that. If you think we are not much more hooked all the time. People can live somewhere else and they can have their friends and talk through Skype all the time. And this development will go further.

FT17.9. The idea of **work, entertainment, life will blur totally**. Also having access to computers everywhere: you are learning all the time, and you are probably working all the time and entertaining all the time. There is no need to having the 8-hour shifts. **The concept of time will change**. This is more abstract, and more difficult. It will be more like a spiral. Now we have linear economy, some people are talking about a circular economy, but I believe we will have to **think in spiral terms**. We are **moving forward, while revising and iterating**. But it is not a closed loop: it has a third axis. The idea of time will be in more dimensions: what happens in the time line of people will also affect time lines of other people in the system. It is more about thinking quantumly, then about time itself. It won’t change the way we measure, but it will change the axis in which we measure.

FT16.16. In developed countries, the **behaviour around work and working places will change a lot**. People will go to **a central place**, and maybe not every day, closer to their home, **where the facilities are**. They can work there instead of in their own office or at home. By 2020 that will already be established.

FT15.8. This all comes back to the work spaces. Today, what I saw when I came to France, everybody is still in an office. I used to be the MD in a company in the UK and I teared all the walls down, so we just had one big open workspace. We didn’t get to the point where you had a work-space orientated for a particular use. Which according to google is the Holy Grail, maybe universities years ago were doing this but didn’t realise they were doing it. If you were a student and you wanted a quiet space, you would go to the library, or you went sit in the grass when the sun was shining, if you wanted to work in the pub, you go work in the pub. Nobody minded. But once you get paid, you’ve got to sit in an office. Now, in google you can, and I like that. If you look at **great collaborative working groups** then maybe on a Wednesday morning you go somewhere that is busy and noisy and collaborative and people can sit there interact and draw on everything. Or if you do want to go lie in the floor somewhere in a quiet space, you can do that. We need to do that in **the workplace of tomorrow**. First of all because it aids productivity, but second these new generation is going to demand it. The world they have been educated in and how they have educated themselves to some degree, would not lend itself to a desk with a screen in an office and a corridor on a particular floor. And, even in a company like this, we keep telling that we want to employ the best talented people of the world, they come right from university, and when they get in here at 9 am, they cannot use YouTube, or Facebook. It isn’t going to happen, they will go work for companies where they can continue to do that.

FT25.3. Coming back to buildings, they will naturally progress, but I don’t see that is an area of huge innovation. We’ll learn to build around these new cycles, so it is more an issue of **understanding the life cycle of the occupants**.

FT12.2. I do not believe that teleworking will solve everything, because then instead of heating your office, you will be heating your house. Some of the trends also relate to **a different work-life balance**, this will in the long run have a strong influence. But it is also behaviour change.

10 Building business for social living

In 2050, suitable financing structures and revenue models are available, offering solutions that are affordable while also boosting the local economy. Both individuals and small communities act as entrepreneurs. They benefit from good infrastructure and technology options, so they can self manage and at the same time improve their lives and the living environment.

a Affordable solutions fostering the local economy

FT23.7. There is still a **demand of social houses**, still everywhere in Europe. In Italy still 6 million families still have problems to access housing. The difference to other countries is that in Italy the government doesn't do anything more in social housing. The public is not making any more houses for them. Now there is a project – actual proposed for the EXPO, done by the private sector, supported by the money of the government, to support companies with a lone with 60% of the money at a very low rate, so companies could invest in very low cost buildings. These towers, which is now the buildings for the EXPO, they are already sold on the market for very low prices. They have very good energy performance, very good quality buildings. So I think this is the future: to help the **local entrepreneur** with money of the government to **support investments to make a new generation of social housing**. Until now social housing was poor buildings for poor people. This is a disaster. No service, and most social problems in big cities comes from this policy. **Give the ghetto's' good infrastructure, improve their liveability, give these people a better life**.

FT16.4. This requires a **major transition** and there will be need for money to finance it. That is going to be the major question mark. I do not have the answer, but we will have to do it, because in the western countries it is a way to transcend poverty. Right now we are suffering from a lot of energy leaks: the buildings are losing energy because they are poorly build, because it is hot in summer and cold in winter, and we need a lot of energy to heat or to cool it, etcetera. And if you look in the cities, especially in the poor neighbourhoods, there people who own their houses do not have the money to renovate. And if they rent it, they rent it at the lowest price and therefore the landowners cannot renovate either. So, what I see when I speak to electrical people, dealing with city authorities, it is one of the major targets from them. **So the question is much more about financing**, and how to find that.

FT19.3. Suppose becoming self-sufficient will come available for every household at 20.000 euro's. That means from then on energy is free, so it is relevant for every household. Some may not have the money to invest. So you need some **financial instruments** to do so. That is a very relevant condition to create.

FT15.16. **Solving the new fuel poverty in smart homes can only be done by technology**. So if you are going to build 500 homes, it is beyond me, why you are not building those 500 homes with rooftop solar, with battery storage, and a DC grid. It is not that expensive and will save these people from fuel poverty. In the renovation of old homes also technologies exist, right now, to solve this. Today **huge amount of energy are consumed in data centre**s. If you can convince a corporate company to disaggregate its computing power, so all that back office processing that is happening. There is companies today, one installs it in a water heater, the other one mounts power computers onto a block of aluminium. That 20 kilogram block of aluminium is a radiator. **Install it in your home, it manages the energy you use and gets that money back. It just stands there, it is a nice heat**, because it doesn't get red hot and cool down, and it just sits there heating the room. **Free of charge**. What you need to do in your fancy new industrial zones with the PriceWaterhouseCoopers or something of a kind, is getting to them and say, look there is huge elements of your data processing that is done today that can be done in a distributed sense. We can do it in a thousand homes that are in fuel poverty. And heat them free of charge. Hot water, free of charge. Whereas now, it costs a huge amount of energy to call our data centre. It is ridiculous. So if you have a street with old houses: it needs no plumbing, all that has to go into it is a 20 kilogram block of aluminium that you fix to the wall and yes it does need a data connection. And why is the university not doing this? It is their own data centre, they have all these buildings and student houses, why not use your own stuff. Now maybe by 2050 they will do it.

FT23.9. The social housing issue is very interesting and important, because there is a large number of families, which economic situation is not so poor. We do not talk about people with no income, we talk about people with maybe 2500 euro income. They are able to manage their house, but difficult. Maybe a family with 2 children and 2000 euro's. The gap is becoming bigger between people that work and people that do not work. Looking for more and **more access to affordable housing**.

FT12.5. As there is so much going on in this sector there will be new developments that will change the system. We have already very high efficient photovoltaic solutions that are still expensive and mostly used in satellites. There is a 3mm photovoltaic cell that is as efficient as a 20*20cm panel. Stuff is there. It is not yet used on a wide market, so in this area there will be change. It will not be technical changes alone, but it will also influence the way we see the energy system, and how we use our grid and how we update it. The grid for transmission over longer distances will always be a huge investment that can only be done on a high level. But if it comes to **micro-grids, where people can simply come together as twenty houses to become more or less grid-independent**. It is possible and I hope it will happen. This will change the way people see energy. Now energy is something that comes out of a plug, and it is unfortunate that we need to pay for it at the end of the month. But then it will be also become a game: how can I tweak my system? There will be a play-component that is **more rewarding**. If you can really be independent and you don't pay anymore for your energy, but you produce it yourself and paybacks are so reasonable and acceptable that in 5 to 10 years you have a working and free grid for yourself. It is a big change.

FT22.1. In general, smart city can have an important impact on quality of life, environment and in terms of economy. Because to **invest in renovation**, the technological renovation of buildings, we can **push really green industry** in Europe. In my opinion this is very important. The renewal technologies for existing cities and buildings. In cities we have technologies for sharing information, for saving public lights, etcetera. And working in cities means public investments. Instead buildings means private initiatives: people investing in their homes. Of course this requires policies of municipality, but utmost it requires the awareness of people.

11 Experience, experience, experience

In 2050, city residents travel because they like the experience. For short (hyper-local) distances by walking or cycling, to reach places on a daily human scale. And for longer (hyper global) distances, the whole planet can be reached within a few hours. Even space travel could be an option! There's a range of convenient, clean mobility options, making use of abundant renewable energy. Travel has never been easier – it provides seamless connections from where you are to where you want to go. Services focus on what people need, and not on the available systems.

a Experience, experience, experience

FT11.7. It will be nice to see if that will increase mobility. If we get back to that: if this is all much easier, how much more will we move? Will we be on and off everywhere in the world? Or will we stay more in one place and are connected? So far it seems that we are much more 'out'. Even though we are connected, we still want to be somewhere else connected. I kind of think that **it is human nature not to just want to sit around the house**. More of us want to be somewhere else. It is about **experience, experience, and experience**. The virtual experience is not replacing that. We still want **the real thing**. People still go to concerts, although CD's are there, even in better sound quality, but there are more concerts than ever. There is not going to be a big change in that. They are all more accessible in that sense.

FT24.4. I could imagine that with all the progress in technology that some kind of travel is changed. Not only in terms of individual travel. There are two roads into the future of travel. If **autonomous driving** develops in the next couple of years – not only within cities, but also for long-range service, than that will mean the death of the rail ways. If **I can jump into a car in front of my house – with my luggage in the trunk – and the car drives me from Zurich to Berlin and I don't need to change trains or whatever, and I can read newspapers, play games or watch video's**. This might be a challenge to all kinds of long distance travel, except for those where e.g. the train is much faster. But then the question is what to think about high-speed trains: they are then only competing to the airport. This is one important thing. The other thing is that people will travel less, because they have a full 3D **visible experience** of places where they want to go to. It might be that people go to a place only once, and after that revisit virtually. I think that sightseeing is something that you do in physical places, and sometimes you want to have a certain experience, like riding rolling coasters, then it might be different. But when visiting Rome to see the coliseum that can be done virtually, and without the noise of the city. Personally, I wonder if I would do it, but people change. When I look at my son, these kids are really different from how we were.

FT13.12. I do not know if the mobility will be totally overruled by automated systems, there is also **the element of pleasure**, of having control.

FT19.13. I believe that travel will not be less common. If we organise the energy system in the right way, we will reach into an age of abundance by around 2030. These computers that manage the world can solve complex issues we were not able to solve. If it is about water, that is a technical issue, the computer can solve that. They can design new machines. All the more technical issues will be solved by then, so they are no issue. That is the positive point. The only thing is if you have organised it in the right way. So mobility is not an issue too. How much people want to travel and where they want to travel is irrelevant, because it will be solved. **The only thing that matters after abundance is there is experience**. Which means that we look at **other types of experiences than we value now**. Maybe the only people that incur a good income will be magicians. It is about experience. E.g. cooking: it does not matter if it is a good cook in your neighbourhood, or special restaurant far away.

FT11.2. We still need to do a lot of going around. I don't think that the internet will take us from moving from one place to another. Because we are still humans, if we don't have to go to work, we'll go somewhere else. Nobody would like to be at home all the time. **There will be more possibilities, people will go there**, but the forms of how it is will change. It actually transforms the city in how they look. It is definitely automated, it is definitely seamless.

FT10.12. We are now in a interesting project with prof. Blomqvist who is studying the concept of trust. We are finding that in digital working we can actually **transmit tacit knowledge**. When I was a young person we used things like e-learning etc., I was convinced that you cannot transmit tacit knowledge. But I need to eat my hat: you can actually **share your cognition and your tacit knowledge**. It is always interpretation, like in communication, but now in a consumer setting we see now all these expressions, that spread worldwide off the Western world, in English language or in smiley's and all these things. They embed tacit knowledge. This is interesting: **how much of me needs to be in the journey in order for me to feel that I am in another place, or that I am travelling?** I suppose you can do that with drugs, or what we understand as drugs in 2050. I don't know really.

FT13.23. The **blurred virtual and real world**, which will increase. I do not believe that people will stop travelling because of these developments, we didn't see that happen the past years, but you can maybe take the top of the growth. But **people will want to travel**. My son of 9 has just discovered the fact that the Microsoft hololens exists, and it is now that these things are taking shape, but I do not think it will stop people from moving around.

FT7.6. I don't think travel will be less common. I think **people need to travel**. I just read an article that the biggest movement of mammals in the world are not like the millions of animals at the Serengeti in Africa, but it is the Chinese New Year. That is the biggest movement of mammals; next to it is Thanks Giving in the United States. I also read that if you count the people working with food, or lodging, or travelling it adds up to 10% of the earth's population being dependent on other people travelling. So I don't think that will reduce.

FT11.3. Our standard of living is another issue. We can already pretty much do what we want at any time. It is already seen, we are all connected even though we are in a café now. With mobility the same happens: **you're not thinking about the transport,** but what you're doing actually during that time. It is just the way it connects places. So you will be exercising, **having a good time or whatever in that space**.

FT25.4. In that context, in mobility we will see things will naturally be moving faster. There is no doubt about mobility being shared in the future, but that is already happening three to five years from now. Mobility has not changed over the last 500 years. **Once you can go quicker from A to B, the distances become longer**. You will still commute for an hour, but instead of going from Eindhoven to Amsterdam, you'll go to Los Angeles. That is a kind of habit that we have: we accept certain travel times. Commuting will be more like buildings. Mobility is already a commodity, but will be more of a commodity, in the sense that **stepping into your mode of transport will be an extension of your living room**. You will not drive yourself, but basically **it will be like entering another room** in your home. Mobility will be a stepping-stone it will not be an activity, so as a cost on life it will disappear – other than separating us from the ones we care about.

b Hyper local & hyper global

FT3.25. For cities there is also a question in public transport. Do you just want a high speed train to bring you in two hours over a long distance to central hubs, and then just a local network to connect the centre of the city to the surrounding areas? Or do you want local networks between cities? Or will it be local sharing services, with e.g. local cars and e-bikes, but not necessarily public transportation like tram or metro. The focus on more local communities means that we need less travelling on national scale. We may have **international and local transportation needs, but much less in between**. The current economic model thrives on centralised companies. But in the future there is no need to stay in that model. You can combine services on a local basis. It is much more useful to combine different services locally, than to have global company providing services in New York and Amsterdam. If you are Amsterdam and need a taxi, you do not need a company that is also providing taxi services in New York. It should shift to more local bundling of public an private services. An international company can provide you with an algorithm, like we are now depending on Google to make sense of all the data on internet. And Uber can e.g. provide an algorithm that is very good at matching real time demand and supply. But in the end you want **local combinations, because you want local services to provide you seamless mobility, with no threshold**. You want to have combinations to bring you where you need to be: school, hospital, work. Now in the sharing economy you see a lot of global companies that have an monopolistic model. Like we now have Facebook as a way of communicating, which prevents a lot of local interaction, because it is only facilitating my personal interaction in a global network, but not my local interaction with local shops or with local governments. We need **unbundling and rebundling on a local scale**.

FT25.6. So mobility will be an extension of our living room, and the cost of mobility will only be the physical separation of our families and dear ones. It will accelerate, but it will also create a combination of a **hyper local and hyper global society**. There will be little in between. Those extremes we see in other areas: the disappearance of the middle class, all kinds of middle things are disappearing for more extreme experiences or contrasts. That is going to be one of the features of our societies.

FT11.16. It is going to be nice to see **how global we will get**. Will there be some kind of a set back at some point? If it would go linear, we will be able to be present anywhere. What that brings needs more thinking. I am trying to think of my fifteen year old and how he thinks of the future. It is a bit different; they are connected all the time. They have totally different ideas on what they want and what they need in e.g. mobility. He does not see any point in getting a drivers licence. He anticipates on automated vehicles, so does not bother on driving a car. It is really easy for him to find out where he wants to be, e.g. Berlin. It is not scary for him: he has all the information on e.g. what it is like there. Everybody has been everywhere already, so things are so much more accessible. That may be a good thing in globalisation, because that **evens up the whole planet**.

FT10.3. Space travelling for ordinary people will be available, not just for the rich. We will have solved the issue of energy consumption to get into space in 2050. To my understanding that is what hampers us now to get there. In 35 years we will have solved the energy sufficiency to such level, that we can provide **affordable space travelling**. It is just mind tricking. I don't know if we will ever skip drinking champagne, but it will be something like champagne: you will not drink it every day, because then it suffers from inflation. Space travelling will be something like champagne for the 2050 people.

c Space for mobility

FT13.16. We are also working in projects where **cycling and walking become more visible in the data stream and in the modelling of transport**. Gathering this data to be able to get a more complete vision on the mobility, to also be able to build better models and better manage traffic as well as crowds and to help **balance neighbourhoods and regions to develop strategies to better plan and arrange people in the city**.

FT13.21. If energy is cheap and available, that also means that you can travel far and long. So you need alternative mechanisms to reduce traffic volumes. Because the **space is limited factor** then. In the smart city in 2050 we will also need measures to make up for the fact that cheaper energy decrease their emissions by better vehicles and better information, etc. You will have to **manage mobility differently** in future cities.

FT11.10. In mobility the **calculation** for motorways are made **with a 30-year horizon**. So you have to be pretty bold to say that car usage will still be in the way it is now.

FT13.22. How do you manage mobility? Space is an element to make people understand what traffic can and will do in the city. For instance when Groningen (in the Netherlands) started to plan its urban space, already in the 70s or begin 80s, when they started, it took them at least 25 years to become a very cycling oriented city. So 2050 is now 35 years ahead as well, if you want to accomplish something by now, you now have to start with **urban space management**. You can accomplish a lot, but it takes a lot of time and **digital policies and modelling** to support it. It is not that simple.

12 Personal mobility as a service

In 2050, technology enables autonomous vehicles. These take affordable personal mobility to a whole new level. Technology makes sharing easy, so everyone has access to a vehicle whenever they need it. It also facilitates the transition to a circular economy, gradually replacing legacy systems with cleaner, safer options. Stakeholder resistance is overcome by the availability of complete, resilient system that meet the needs of city dwellers in full.

a Mobility as a service

FT11.14. About 1/4th of energy consumption is transport. That is changing somewhere in the 2020's. Not because it gets electric, but because of the change in the whole system and how it's managed. There will be less energy needed. There is one potential issue: once you get a really effective, based on automation, type of system, so inexpensive and so easy for people to move from one place to another, then you just have these mobility packages. **Mobility as a service is really around the corner**. The question is if it gets so much easier: will people than start moving a lot more? I still think it will not become so fast, **it is all about time: the time you want to spend travelling. That limits how far you can go**. Even if it is more convenient, travelling is still not your destination. That's how I think the energy consumption in transport will dramatically drop. Not due to technical new devices, or technology as such. That is only a slice of it. It is more about **how the service is brought to people**.

FT13.32. But who would care if there are in Uber always people who, for just a few euro, want to drive? Everywhere at every time? You need to plan now for the services that you want your spaces to fulfil. You need new profiles for stations to make them attractive, you need to ensure also in concepts as mobility-as-a-service, that you maintain mass transport. That is investments in rails and infrastructure. It is a big challenge. **Mobility as a service** is a very interesting concept in Helsinki. But how do you in such a scenario guarantee investments in urban infrastructure in spatial structuring, in spaces, etc. They say they can **win on speed**. If you look at the current market, elderly, students, there might be a lot of people that do not really care about speed. If they can **win on price**, that may also be effective.

FT11.13. There is also a lot to do with **automation**. It is a big thing in mobility, but also in other fields. At the same time it takes away those things that you don't want people to do. You might not want people to drive you: but the trend will be that **the servicing will continue** and will employ more people in something where you want them to be. There will be more people active in advising, that will be big, and it will get more personal. People like products, like the blogger, they are nothing but product pushers; all they have is their faith or integrity. We will see a lot more of that.

FT10.6. The car is now a difficulty. I would not need to own a car, but I drive. It is a difficult choice actually for me. I hate to drive. But the society is build like that: that I need to drive, for logistics, especially with kids. Without children I would not have a car. It causes me a lot of trouble. I get parking tickets, speeding tickets. And although my car is valuable in Euro's it is always messy, it has dents and scratches. I would prefer **mobility as a service**. And if there is vehicle it should be **driven by a computer**. I would love my grandchildren to ask: "Granny, how come that they let you drive yourself? It is damn dangerous!" I mean, how can you let a human drive a car?

FT13.17. If you look at the question around **new citizenship or decentralised design**, I think on the vehicle side there will still be developments. If you look at our cities cater for cyclist, they start to **cater for sub groups of cyclist**, such as people with cargo bikes, they built complex strategies that address only these cyclist. There are cities that think of asking cyclists to log into the system with their smart phone, so this creates a physical network where the municipality can help the cyclist. The problem there was that there were not really services to provide yet, but you can think that over time that there will be **service models**, e.g. If you cycle that way can you take this kid or parcel with you? I don't know what, but probably there will be innovation there.

FT11.5. Business sector is where the biggest things happen. The way that things are produced now, and how they are performing, as business will change. Mobility is getting different. You will not be sold a car. **People will want everything as a service, more and more**. Not wanting to buy anything. How far will that go? Maybe we will develop 'Marriage as a Service', with different subscriptions, and then I can see next month if I want to quit the subscription or upgrade to a premium level, or the low budget model. In all other aspects of life things will be given to us as a service. In mobility I am pretty sure that is how it is going to be. Why would you want to a vehicle: you only need it like 10% to get you everywhere. The strange thing is that it requires hard thinking to see why we would have public transport as we have it now. Trains maybe, but buses? **Why would you have a masses option in automated vehicles?**

FT11.15. In industry, which contributes energy has to do with transportation and manufacturing also. When not everything is produced in China, but locally with 3D printing. **In the whole economy there is a big trend that it is less and less physical. It is more into services**, and those consume not so much energy. We have a good starting to achieve some of the goals.

FT13.3. I think this will only increase. There is a movement for strong mayors, and maybe the smart city concept is also a result of this kind of thinking. There is a need for a vehicle, or a common understanding of how cities can play the role of being more influential. In the area of transport, by 2050 there will be a materialisation of the actual core competences of cities. The smart city concept brings along a lot of other questions for the cities, for instance to bring people home in the evening, **to help citizens find the easiest way to travel**, and we enter into a world where the cities are actually expected to solve all the problems.

FT3.4. In mobility there is already a demand to take us seamlessly from A to B, that is not new. But the technology will be increasingly there to provide it. Your behaviour will also be changing, because you are just ad hoc or just in time you will change e.g. the reservation of a meeting room when the time schedule is changing. The system is already there to make all these transactions and negotiations possible. It is possible in a very complex system to manage your own agenda, but also to make sure that agendas are aligned and more effectively combined. **Even optimising for personal travel time or optimising the average optimum travel time for all the people who want to be transported at the same time**. Those kind of management techniques will be there, and make things more efficient. The technology will give us what we want best, not to plan too much, but still allow us to be spontaneous. It is about "I want it know, I want to be with whom I want to be" and the system will make it possible.

b Sharing vehicles

FT6.12. People will accept that change. I see it with my own children, they **don't want to own a car themselves**, but they do want to use a car every now and then. They are looking for green wheels or other organisations, **to use a car when they need it**. Maybe because they live in a city where there are shortage of parking places. But if cities become more condense, then maybe for citizens it is wonderful to rent a car then to have a car. That mobility shift will be good, from a – nowadays - fossil fuel driven cars, towards **electric and shared cars**.

FT12.6. I hope the transport will change as much, but I don't believe it. There is inertia of people, so maybe in the next years. Now younger people **don't look for a car anymore as a personal belonging**. But there is still a generation that needs a car for their self-esteem for the next forty years. And before this is over there won't be a drastically change.

FT22.6. The financial and economic crisis is doing better for the environment that most of the current policies. This is a problem, because many young people live in a different way than our generation. They have minor income and they consume less. But I am not sue if they would do the same if they would have the money. In Italy **car sharing is growing**. It is growing, not only because people are more conscious to less use their private car, but it is growing because young people cannot afford to buy a car. Our generation it was the first thing you bought out of your first salary. Now that is different, but **I am not sure that that is for environmental friendliness, I think it is about economical limits**.

FT12.3. Younger people are **not as attached to personal goods anymore**. The car, like in Germany, will go from a status of semi-God, to something that you have to use, unfortunately, sometimes. I am trying to live this already; I have now less than 6000km per year in the car. Anyway, I still have a car. But I would be happy if I could live in a city and don't need a car. At least not a car as my personal belonging, but simply **a reliable system where I can get it on demand without any trouble, and I can leave it where I want**. But I think it would reduce to a minimum travelling with individual vehicles that are over dimensioned for cities – a bike is in that sense OK.

FT16.8. The city in 2050 will still look a lot like today, we still need to give place to live. We call that housing, buildings. That remains. We still need to give people means to transport themselves. Whereas I totally agree that we do not need to build as many cars as we need today, or as many owned transportation as we need today, but we probably need to build much more **collective transportation networks**. I think that will increase incredibly. If you look for instance at China, how many people have to commute there every day, and under what conditions. That will remain something very important. The new modes of transportation will probably one of the most developing sector the coming times. With all the **sharing economy**. I think that even strong transportation may go through sharing economy solution, with some experimentation from time to time, like we see today, but we may totally match that cars for goods delivery with other transformation modes.

FT7.8. **Sharing of resources is an important trend**. You see it now with Airbnb, Uber that are now multimillion companies. It shows that, if the system is there, people really want to share. That is a very important thing, and it can save lots of resources. There is a big discussion about cars, especially. **Some say people need cars. I don't think so**.

FT7.10. The **sharing of resources and products**, like Uber and Airbnb show that systems work. Such systems become more relevant and make society **more socio-democratic** and sharing. This is an important trend for cities. Somehow it will also impact sharing of energy. It will not be so conscious as with Airbnb, but in energy sharing will also take place. When you install solar cells on your house. You do it because you want to have cheap electricity, or because you want to be disconnected from the grid yourself. But it also because you want to give your surplus energy to your neighbourhood. In Norway, if you have solar cells it works that way – even if I like it or not – surplus energy will actually go to your neighbour. But that is an automated process, so I just set the parameters for it, and then it happens. The Internet of energy, or the democratisation of energy that is a huge trend. Today we see Germany, California and India as frontrunners in that, each in quite different states though.

FT24.10. What you can already see with young people today is the **shared economy**. They have other goals for their future than we had. When I turned 18 the most important thing was to get a drivers license for a car. My son makes his drivers license at 20 and says he don't need a car. That is one of the biggest changes in my personal environment.

FT10.8. It is not a long time ago here in the Nordics that we shared resources in agriculture environments, also it is a trust issue. I hope that by sharing we have less cars, and use resources wiser in everything: less whatever-the-currency-will-be, less money even is needed. I was ready for debating the sharing economy with a friend, who is actually a professor in economy. I anticipated on a two hours fight. But it was killed in five minutes. He agreed instantly that **the sharing economy makes sense: it is wiser**. As an economist he could not start from anywhere else. So forget about the money markets and economical systems and financial instruments. I was surprised.

FT6.11. For example if we think about, let's say, electric vehicles and not having your own car, but mobility as the **sharing of cars**. There **technology will greatly help**. If you want to take a trip for example at 10 o'clock and you look at your mobile phone and there is your vehicle, that brings you from A to B and then you leave your car. So as an example, the greening transport aspect will greatly benefit from technology, certainly. And so will the materials, if you don t have your own car, it will save energy, it saves resources, in every aspect it is a good thing.

FT10.5. **Sharing resources and products is becoming second nature**. Possession of goods is less important to people. I strongly belief in that. I am getting rid of things myself, to possess less, and only have the ones that I need. Did you see a documentary film of a person that started without anything by putting all his things to a garage. Then he only took out one piece or thing every day back to his apartment. In the first day he is actually naked, and starts bringing stuff back gradually. It's a Finnish guy that made the film, it is intriguing to see it. It was three years ago. It is interesting. Two years ago there was a family that tried to live without oil, so also plastic. She had to borrow mascara from her friends, not because mascara necessarily

contains oil, but because you cannot purchase it in a package that does not contain plastic. The whole family tried to live that way. Sharing resources and products also means that in the **new economies values will be different**. The next generation does not really need to possess anything. I do not really need to own anything.

c Autonomous driving, flying etc...

FT13.10. Automation is another issue, where we as a network of local operators are very curious **how the roll out of automated vehicles will link to urban networks**. Because the highways are a less complex traffic environment than busy city centres.

FT21.18. For mobility it is foreseeable that there will be **self-driving cars**, and that we will go for this **sharing economy**. I already see it in my own habits, and habits of my friends. We are not owning a car anymore, only a vintage car that you treat well, but not for the purpose of mobilisation in the city. There are car-to-go systems where you just order a car, and share a car when you need it. This will be for many other goods, not just for transportation. The sharing economy is something that makes a point.

FT13.36. This data handling is also a sort of US versus EU discussion, like the **automated car versus automated system**.

FT7.13. Travellers demanding **more seamless ways of travelling** around. You see that already today: you can take an electric bike and then the train is waiting for you and connected to airplanes. Travelling will be very important for humans in the future too. We can virtually travel everywhere, but physical travel will be important too. There are huge benefits of making that smart and intelligent in cities. In 2050 the payment system should be integrated in our physical body, like with biometrics. So you don't think about the ticket and the payment is going automatically. You just go from one location to another. Combined with that I can get any car I want in the parking lot, and cars are automated and always on the move. You're not occupied with owning your own transportation, then all of this will make the traffic and the parking and the energy use of transportation much more efficient. **Automated cars** will come more or less soon: in 2050 we will have lots of automated vehicles. There will also be **flying vehicles**. 2050 is still long time. In Sao Paolo, which is a big city, you see immense helicopter traffic, because that is the fastest way of travelling in the city from rooftop to rooftop. There is not much technology required to move lots of transportation up in the air. Future helicopters or helicars, how you want to call them, are also **fully automated**. So it is not up to the driver to decide what kind of altitude you will be: there will be corridors, and it will be really safe.

FT13.11. The question of robots and the role of automation. We can expect there will be **automated vehicles** in cities by 2050. But if you look at the pressure, that is mainly coming from industry, on these concepts. There is no natural movement from road operators or even cities to go that way that is also able to set priority over energy or safety or whatever. Let's assume that there will be a development towards that. We are involved in 2 discussions in this sense. There is a discussion about **automated cars versus automated systems**. So go first for an **automated public transport system, or shared vehicle systems with automated functions**, rather than everybody has their automated car at home. The second discussion that plays then is that now the actual concept of automation where you have either a fully automated car, like the google car that can drive everywhere, at any time, using maps and sensors. Or you have connected automation, where the vehicle actual makes use of the urban environment and infrastructure intelligence. That is **connected automation**, where you actually need the infrastructure and road operators to be involved in sharing data and developing intelligence together. We are actually involved in the second view. And in practice it is also a US versus an EU discussion.

FT13.13. The question is what sort of optimisation do you actually want? Safety, energy, mobility, and also related to what will our relation be with other forms of technology? One of the fields linked to that is the way how **autonomous driving is also going to be anonymous driving**. That is part of the negative issues in mobility. You **miss out on human interaction and in traffic that is one of the key aspects**. What would that do on a large scale? There has been done research, already 10 years ago, for instance on the effect of policing from a car instead of policing on bicycles, not only on the side of the police, but also from citizens. The citizens then see these law enforcers, not by their face, but only behind a glass screen. These kind of effects: what does that do with your city and with public spaces that you actually want to be public and that are now depicted with automated vehicles?

d Resilient systems

FT13.33. The factor of **reliability** is also very important. If you look at a city of London, they have millions of trips per day, so it is not all about can we invest in a marginal system that can bring people home from the bar after 3 in the night. Or do we really want to assure the flow within the city? These systems like Uber present themselves as **resilient systems**, but if you look where the economic value is, and how do you get millions of people from A to B per day? At this moment that will not happen. They can never cater for that.

FT3.5. In essence we don't want to be thinking too much about the whole system, but want our individual needs satisfied. We hope for the **system to arrange it**. It will probably become so complex that you need to rely on the system. If want to deviate it interferes with everything else, even your own agenda, and all the other things you are planning. So **the relation between the individual needs and the global transportation needs will be in the system**. Because the individuals will be less and less capable to adjust themselves, as they cannot oversee the total system. Now the system has still some predictability, with the traffic information that is available you can plan it a little bit with your car navigation. It is not too complex to understand. But when it combines more and more, e.g. your agenda, different transport means, etc, it will be less and less transparent how the whole system is behaving, so you will **rely more on the system**. Your own cock-pit will deal with your own preferences and can also suggest better planning advice, and persuade you to change your behaviour a bit. You will be able to discuss with it.

13 Valuing public transport

In 2050, cities offer attractive, seamless mobility options: these give everyone access to everywhere. New investment structures and revenue models ensure that the city values (such as inclusiveness) are ingrained in system design. Cities actively influence operators to ensure high levels of customer satisfaction and service quality.

a Affordable, accessible, seamless and attractive

FT12.8. Travellers demand mobility that **seamlessly** takes them from A to B. This is again, if we can guarantee a **more personalised, functional and very attractive personal public transport**, than this will happen. This is the precondition actually for people to switch. Now a metro is something that people only use when you can't afford a car. It is not because it is attractive. Here in Brussels it takes you faster from A to B, but the bicycle does the same. Even if I would not like my bicycle, I would not use the car, because it takes me 40 minutes to get here, and by bike only 15 and I go through a park. So this is a precondition. The real time updates of information on travel is already there, but that is not enough. Even if I know the train is coming in 20 minutes, I do not want to wait 20 minutes on the stop. So we need **smaller sized, and more frequent transport means**. But it will use much less energy than cars do now sitting there in the rush hour.

FT13.30. One other thought line we are starting to explore is the impact of **door to door services**, the concept of **collaborative or shared mobility**. We did interviews, also in the context of the Nodes project, there were people saying: "as an operator we want to invest in shared mobility around the station and we have systems, like a card or payment systems for cars or bicycles, and we invest in that, even though we don't know how the market will develop. We are quite anxious because we do not really understand what will happen"., If you believe in this scenario to happen of the fully connected traveller, then probably the urbanite may **opt out of the mass transport systems**. He may no longer choose the bus or the metro. If you believe systems like Uber for instance, who promise door to door transport, and shared mobility services are more and more organised in a way that you do not have to bring back the car to where you got it and you can leave the bicycle close to your door, then you will be tempted away from mass transport. And if you look at the impact of such a scenario then that will be very big. Also the automation scenario will then come in, where you can order a google car. And would you then care about spatial structure when **transport becomes available at all places at all times**. That is a question where you as an authority have to think about. Here you lose your authority for influence.

FT1.14. It will become crucial to have **multi-modality implemented in the outskirts of cities**. It is not easy, because it is not dense enough to have public transport available. There we have to look for new mobility concepts, including sharing mechanisms. If this idea breaks through, not only in the city centres, but also in the outskirts it will have major impact. Now you this trend in the city: people focus less on ownership and buying cars. But not in the regions, because many people in the former more traditional villages think the car is the only option, although they are now completely sub-urbanised. People lack the information, and it is a tough behavioural change. It is more complicated than in the city, but by having better information systems we can expect that it will become easier.

FT19.5. But there are some other questions that are relevant throughout all energy related field, so not only energy, but also mobility, health, urban space. Let's take mobility – public transport – the way we look at it now with **each city having its own public transport corporation for trains, trams, buses, subways. But in a few years all this can be replaced by self-driving cars**. There is a new technology coming up, and it is going to change the way of thinking. Suppose we stop this large scale, mass public transport or we limit it to heavy trafficked areas only, and self-driving cars are just open for use by everybody who want to use them. There are already a few companies that can provide this: like Google, Apple. All this transport can be done by a few American companies. If we do that, what would be the problem? What is the kind of issue that might be coming up? These questions hook up to the question to **what kind of values do we want to design our cities in the future**. That is the most relevant question: what values do we have? One of the important values in Europe is **inclusiveness**. Public transport is now enabling people who do not have a lot of money to take part. It is these values that are important. It is the same for energy: inclusiveness is important to prevent energy poverty. The same kind of values we have in healthcare: ensure that everybody has access to good healthcare. Inclusiveness is very important.

FT20.6. One thing that pops into my mind now is also in this **inequality** is public transport and the **affordability of public transport**. We see that now in London, and increasingly in Paris. Not so much in Berlin because there is more space, Transport needs to be affordable for people, they need to be able to travel easily from A to B. It is already now not affordable anymore, and I cannot see how that can be sustainable for the future. We cannot all turn into Chinese people on bikes. We cannot go back, we have to rethink buses, trams, trains. **Make sure people can move around** in your city.

FT24.8. There are a number of trends that are already relevant now, but we are not fully there yet. For example the **seamless mobility** to go from A to B. This is one of the areas where we could improve a lot without investing too much, because the technical means are all there to provide people with better information about how to get from A to B. Unfortunately we simple don't do it. Just an example from yesterday, where a colleague had to travel from Munich to North of Frankfurt. The German railway had a problem with their commuter trains, and he had to change three times, but nobody informed them on which train to take from which platform. And these are things that should be easy. There is unwillingness of the providers to invest in those solutions. I think the reason for this is the investment that should be done in hardware – e.g. for better platforms for information. But there is of course investment needed in software, and most of the public transportation providers don't see the value of these kind of systems. It would be an investment for one of two years, and they don't get the money back in these years. But if people see that public transportation is reliable, they will choose more often for public transportation. You can see it here in Switzerland: much more people use public transportation because it is very reliable. Swiss railways consider three minutes late as a late arrival, and inform the people about what to do. And this works. In Germany the lack of information is a nightmare. If I have a train connection with only 10 minutes to change, I don't take this one. Because you cannot trust that it will be in time. In Switzerland, if you have only 5 minutes it is perfectly fine. I think this is the caused by short-sighted managers. They are only driven by quarterly results, but not by long-term vision on what they can do for their customers. The hope is that in future that big cities that really want to improve quality of life that they have the right **influence on the operator to ensure that they invest in customer satisfaction, and not only in earning money**.

FT10.11. Real time update of travel information for travellers already exists now. It can be more smooth, and it will affect our cities. It is like the **human behaviour and sharing economy** change things. It may be **a 'beam-me-up-Scotty' way of travelling**, so I can come and visit you and your university in my whole incarnation. We get more and more used to these things. Like in the movie called 'Her', it is a funny film. Before coming to the Finnish market it was recommended by three professors: that seldom happens – that university professors recommend fiction films. It is about a person that falls in love with a robot, a machine, rather than a human. I am still me, but I also believe that **I will have many avatars**. I foresee that I myself as an elderly lady can become an avatar consultant. You can have so **many identities** that you need somebody to either find yourself in them, or just make sense what will be beneficially in which avatar for work, as parent, your fifth life avatar, your fling avatar... and all the other basic needs.

14 Small-scale production through city logistics

In 2050, most production is by small-scale services and in the home, rather than by large, centralised corporations. Ideas are shared globally and produced locally, whether they are for physical products (by 3D printing) or for food ('urban farming'). Citizens are 'prosumers', and drive production towards more sustainable, organic processes, at the same time raising process quality. The shift from centralised to local production impacts city logistics: a backbone for resources and materials is combined with digital infrastructures and high-speed parcel delivery. Communities create sufficient social and functional diversity to make them self-sustaining.

a Local and decentralised production, citizens as prosumers

FT24.7. The whole area of manufacturing will change a part of industrialisation. Until now, and the next five years, production was always a matter of scale. The more products you can create, the cheaper they get, and the cheaper you can sell your products. In the future in a society that is highly picky about what they are buying, and where everything should be somewhat personalised – and we are going into that direction. You can see it already: every gadget, iphone, android handy, all those gadgets you can highly customise. And in the future it might even be that you customise your car, not only in terms of the interior, which are details, but also bigger things because things are printed for your car. A different bumper for example. There will pop up **a lot of small companies**, who maybe deploy four robots and three 3D printers. This might lead to **a totally different form of industrial society**. You can have a small manufacturing company in your basement. This is interesting in terms of logistics in the city for example. You have less commuters, because you work from home. But you need more transport capability, because you have get your raw material, and to get rid of your manufactured product. This could change the traffic patterns in the city dramatically. You already see a big change with all the Amazon's of the world. In the past, say 8 years ago, personally I would get a parcel two times a year. Now I get a parcel every week, because someone in the family ordered something. Also a lot of things I bought in the city a few years ago, I now buy online. With Amazon Prime you can order anything, without any shipping cost, at any time of the day. So you just think: 'Oh, I need a new headphone' or something. In the past my wife went to a drugstore to buy nail polish and whatever stuff. Now everything can be bought on the internet. And it will in the future go the other way around. You can **produce something at home, and sell this via the internet**. Then you have even more these small logistics: you don't need a big truck for that. It will also be the UPS, Fedex and DHL guys, but even more or that. Or you create a totally new system to do it. Today if you plan a new city it will be probably good to have a kind of underground tube for transporting parcels, or something similar. The whole goods logistics, whether this is raw material, fresh material, waste, whatever, will be a big issue in the future in the city. How to handle these logistics

FT3.1. There is one big trend that is in a way already building up right now: the room for **local small-scale services instead of centralised big corporations**. The possibilities are there - because of the new technologies and the new ways to organise - to be a virtual big company, distributed throughout a city. There are still some forces at play to resist, but in general there will be more room for local services, also combined with local manufacturing, design, recycling etc. This will replace the large companies, although there might still be some large scale and centralised companies. Especially when you have platform technologies with a certain guaranteed reliability and quality, e.g. 3D printing and robotics allow for more reliable and reproducible. Also as a small company you can guarantee the quality of a product. Those things will develop, and will be powerful and the whole idea of centralised production with distribution and even with marketing and the role of retail can be altered, maybe even replaced. We may not buy the handbag built by Gucci, but by your local artist, that you admire in your neighbourhood. Why should it all be global brands and marketing? We may still have some global brands. But you can even franchise products, upload designs or a formula of a medicine. Most products can be virtually transported. If you develop a new potato you can sell the license, instead of selling the seeds as companies are currently doing. You will be able to **locally produce a centralised developed product. Resources can then also be locally reused**.

FT17.5. I just came from China last week, and I was visiting a mass manufacturing facility there. In the end it is not that automated, you have people that work for 16 hours a day, doing a very minor job, whether it is computer or electronics, they do the same thing in every thing. It has a high social cost, somehow. But then the access to those means, or the knowledge of creating technology will actually allow **democratising the way people can have things**. It could be from a designer, from personal manufacturing or from more like a distributed manufacturing, facilities or smaller companies. **Cities will recover the industrial capacities in a smaller and cleaner way**: it will come back from China. And then China can be important for other things, like raw materials.

in an environmental friendly, people friendly manner. What we can see here in Switzerland for example, is that there are more and more underground waste bins. You put your waste in a bag, and every few hundred meters there are dumping stations where you can drop these bags. They are gathered underground for two weeks, so that trucks only have to drive around every two weeks, and they don't need to stop at so many places. That reduces a lot of traffic load in the city. There are really a lot of possibilities we have in the future.

FT7.9. 3D-printers, **new production lines and new value chains** will give cities a whole new way of producing something. **Ideas can be spread globally and produced locally**. So this will make a significant change on the transportation of goods and on value chains. Probably also on commercial aspects: how shops and stores will develop. Of course if you have 3D goggles with virtual reality and a 3D printer then you can sit in your apartment go virtually to any store, look at something and have it say 5 minutes later. So that can have a big impact on the city and the dynamics of the city. Still we are social beings, so we will still go in shops and big malls, because it is fun.

FT4.4. That is one important aspect and another is **urban farming**, urban guerrilla, area also examples of increasing awareness of the possibility to do more local and not depending on the global networks and markets. Although I think it has a tendency of becoming too romantic. I don't think it is going to replace completely. You can do much more local, but at the same time you also have the global system. But talking about space: temporarily, flexibility, trying to achieve a certain amount of autarchic life systems. It is a mixture. Everything you need for your daily life. From sustainability and energy perspective, that also means that where we now, for instance for garbage or waste water have now very complex and huge, often national and even international. Garbage is transported all over Europe. Probably you will see that it becomes **more local, even on a neighbourhood level**. Trying to do more local; harvesting energy, but also dealing with re-purifying water and things like that. So I see the flipping over **from central systems to decentralised system, from institutionalised governance to co-creation and bottom up**.

FT3.2. A lot of technologies are becoming more democratised in the hand of the users. They can be more easily and more intuitively used, without education of e.g. a trained designer. I do not know if more people will be creating their own stuff, but **people that want to, can create things**, also with a large impact as it can be **globally distributed in a virtual way**. This has impact on the surroundings in cities: you need space to experiment with it. It will also disrupt the current system. The problem now is that legislation hinders the experimentation with new techniques. Now you can only do things as long as it is in your own house.

FT17.3. I think this also links with the idea that everyone is a designer for me. You always have desired situations. You understand your world, but you also have ideas on how do you want it to be better – a desired state. So I think that the ability of **turning those ideas to reality** is super important. It is not staying in the idea world, but bringing it to the physical world. It is already happening on small scale, with the **access to fabrication technologies**, like 3D printing, FabLabs, maker spaces, etc. People have an idea, they develop it, they want to turn it into their business, they do a crowd funding campaign, and suddenly you are in the market. So this is on a very, very small scale, but it is propagating and massively extended.

FT13.7. That is also linked to **prosumerism**. The facts that **citizens will bring more of their own hardware and software into the city and design their own future**. This also is already happening now, we have partnered with an initiative called 'local motors', who's principle is to build vehicles within a city workshop, so in a normal shop. With parts that can be 3D printed or delivered by regular packages. They have launched a challenge in Berlin, where they created a collaborative environment, with a panel of 10.000 designers, to come to the best vehicle for an urban context and they are building vehicles in small scale workshops. This is something that will only increase.

FT13.29. On the other hand we can also start **3D printing at home** and not need anything else.

FT2.11. Basically everything is about reducing supply chains. **Localising production**, even to the point of **fabrication in the home**.

FT2.16. In 2050 a city can have, e.g. 10 miles away from the city, a 5 kilometre antenna in any wasteland. We will have multiple satellites just beaming energy down. You'll have a total abundance of power, a total abundance of water through desalination. By 2050, as **most of our transport is electrified, fabrication technologies are local, then you can eliminate maybe 90 to 95% of the external transport for supply chains**, and the remaining ones will be electric. So in that sense we reduce our need of oil for transport, reduce our need on hydrocarbon based material and reduce our need for electricity from coal. I would like to see before the end of my life, the last barrel of oil being shipped.

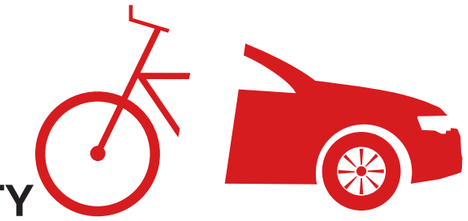
FT8.6. I think now people become more educated about what happens and more educated about what that actually means for those animals, I think that will become a very hard political sell. If people don't know then there is no problem. But even now, there is a real push pack in industrialised meat production, **small groups of people become more and more influent, supporting more sustainable and organic production, putting more quality into the process as well**. Clean water exists through increased efficiency. I think that if we can use innovative transformation technologies, and if we can also have people held more responsible for what it is they are using and understand what it is that they are using, than that will have an impact on this new generation and the consumption of energy. Especially then in a city environment, we could actually really transform a lot of things, for instance think about buildings, using solar panels. By 2050 that is very, very doable. That is not even an aspiration that is very likely to happen.

FT16.18. One of the city of tomorrow scenarios is a 'self city', which has a high level of political autonomy, makes sustainable and local development the focus of its actions, at the service of citizens who are very involved in the day-to-day life of the city. Supply channels are short, **second hand goods and recycling generate new regional business activities**. The urban fabric is structured around **eco-villages that promote social and functional diversity**. The energy and environmental profile is characterised by decentralised and pooled infrastructure supplied by renewable resources.

FT7.5. It is obvious that people get more and more information, and more hardware to work with for themselves. 3D printers will dramatically change the production, the value chain and how people work with things. I am so looking forward to my kids being to print what they invent. They can do it. We now have a very simple 3D printer at home, but my daughter is already printing covers for her mobile phone. She is super-exited about that, she just does it, and there is no question about it. In 2050 we will **print whole computers, whole mobile phones, complete electronics**. You will have different cartridges and it will be quite simple. For example the material graphene, is now exploding in use and production today. That will make the future of printable electronics very cheap. It's really interesting; I don't have the fantasy to be able to see what will be possible!

FT3.21. There will be a game-changing technology. The problem is that we cannot predict. Although it can be the use of something we already know on a larger scale. Because often the first elements can be seen already 50 years before, e.g. the internet. I expect it will have something to do with biology. E.g. **biology becoming programmable**. The simple form is the algae where you **use the biological structures to produce something**. When you combine it with electronics and you can make organisms that are currently something like mimicking a computer. But then you can make complex systems that can make biological calculations and interact with biology. If such technology also helps **the local production of food and new resources, and control the growth**. E.g. you can grow it very fast, and then slow down to harvest. Maybe energy producing plants where you can charge your mobile device on leafs. This can also lead to a new abundance and a new space for hackers. We will open up the box of Pandora even more: we are manipulating things around us without overseeing the consequences. New organisms might reproduce themselves if there is no proper 'on' or 'off' button.

SMART MOBILITY



b Sustainable logistics

FT13.27. The logistics on getting all these things to the people in the cities is also a challenge. There is a target for that: **no emission on logistics** by 2030, which is quite soon, being CO2 neutral. We are working on that with new concepts of vehicles, but also **concepts that involve even voluntary deliveries**. There are potato farmers in the Alps that offer people a kilo of potatoes for free if they can deliver 50 kilos on a certain day in the city. There are all sort of services and solutions developed there.

FT3.23. Even in the future there will be a **backbone of resources and raw materials that go through large container terminals, large harbours or large roads**. But the idea of big ports with a lot of traffic is part of the centralised thinking of systems. The scale which is now driving the development of cities, because cities want to have a certain scale because of the economy related to it, will be changed by the combination of services that can be provided in less densely populated areas. Cities do not need to be large anymore, they can be more spread. You need to combine services but it can be done with **digital infrastructures that use the same platform but do not need to be physically co-located**.

FT13.28. The main polluters in the branch, the big trucks, the smaller trucks, the freight being driven into the city, there is a lot of pollution. It might as well that citizens will say that, if we go for shopping online entirely, we will only accept deliveries on Thursday. Customer needs may prevail here. Or that they say I do not want my kids to open a parcel every day, because they get spoiled, even if it is food. To avoid the hustle we only accept on Friday. That is also the idea for **regulations in city centres**: you get **one time slot for deliveries**.

FT13.24. Another question is how the job market will evolve and in more general how economy will evolve. I was in China 2 weeks ago and they showed graphs of **high speed parcel delivery**. So everything that Alibaba (the big internet store) has to move around is **growing exponential**. The professor presenting said that they build the high speed railway lines for passenger not to compete with planes, but to free up the normal rail for freight, so they need their normal railway network for parcels. That is why they built a high speed network for passenger.

FT22.8. All sector are involved. The **agricultural sector in Europe is totally unsustainable, in terms of transportation**, and this is not easy to manage. The problem of low costs companies is very democratic, but the impact is horrible. I try to be optimistic.

FT13.26. So we have to **reinvent certain professions, like production, farming, and retailing**. That will be a very substantial questions. The **functionality of our city centres will have an enormous impact on mobility** of course. Maybe people will still have nostalgic behaviour, and pop up shops like Hema or something will be there for a little while when the Hema itself only exists online.

15 Attractive cities with unique qualities

In 2050, cities have unique qualities that embody their own history and culture as an integral part of their DNA. The differences between them make the cities distinctive and attractive places for business and visitors. And people of different backgrounds find them good places to work and live. The cities offer a good balance in the quality of neighbourhoods and infrastructure, with affordable services for all income levels. Social needs drive city design, which is constantly and organically reshaped to meet people's changing needs. The use of spaces and buildings is always under review to deliver maximum value for users.

a Distinctive & lively

FT15.12. Probably we will have a scenario where ... Well thinking of it now, in the UK you have a secondary comprehensive school, they are now aligned, so this school teaches you everything you need to know, but this one is **aligned with art. This one with engineering, that one with sports**. So maybe we will have a scenario where the urban developers of tomorrow do the same. So London is about financial services. There is of course a lot more there, but it is recognised for that. Maybe in another place people are into technology development, and they will need another urban environment. So maybe in this scenario and **people will go where they feel they belong best.**

FT23.14. Of course in China, in India it is a completely different story. But we talk about the European. And one of the most interesting things, I think, for attraction, the **competition between cities**, is a competition between Europe and the world. The **attractiveness for our cities** should be about the attractiveness for companies and should be the quality of our cities.

FT13.25. I was told that Chinese people do not buy in stores, they buy everything online. The shops that are there only exist for branding. For European cities, who are basically used to host leisure shopping, and a bit of functional shopping, but that is on the outskirt, this basically is a nightmare. I do not how you can keep adding leisure functions, we already see at the moment that you move towards **a centre with much more pubs and restaurants**. That will increasingly reshape by 2050.

FT20.11. Zooming out a bit as globalisation is an international phenomenon. And even if people are pushed out of the city centres, they will still **want to be close by the city and attached. I call that the city space.** It is a good thing, because societal progress comes out of this. The cities need to maintain the balance, but they have the means. I am not talking at Mexico City of Bangladesh, and maybe Istanbul is also growing a bit too fast, but most of the cities can manage and create opportunities through this growing.

FT9.11. There are so many transport initiatives going on in Istanbul, like the metro and the trains, etcetera. And the traffic intelligence. So for instance there will be much less work for the police, because everything is already monitored and automatically registered. And all fees for punishments are automatically generated. Istanbul is also in urbanisation very much changing, there is renewal projects going on. And of course the transportation projects will also change the city in structure. The urbanisation around the transportation lines will change, it will **change the people's choice of where they want to go and where they will live**. If I can travel 30 kilometres in one hour, than I don't have to live in the city, I can live somewhere outside, where it is cheaper or greener, it can totally change the people perception. Also on green spaces, and also an opportunity to move out of this crowded city. They will also travel more, for instance in-between cities. In 2050 we will harvest energy from anything we do. We will try to prevent and every bit of energy in any way we can. It will be a saving kind of society in every way.

b Accessible for a diverse population

FT20.5. This also relates to the schools. Now in those areas there is a problem because there are not enough places in the good schools. But that will change when they grow older and no new people come in. So it all has to do with **flexibility**, and I think a lot of cities over-estimate their ability for flexibility and the way they **can change their infrastructure**. They need more to think about – and that is also what you are doing in this project – more the long term vision. Which isn't really about the long term, since if we want to do something about infrastructure we will probably have to take action the next 5 – 10 years. There is – and I only know the London, Paris, Berlin scenes – there is a lot of activism: "we need to act, we need to do something now", but it isn't really rigid, but there is not really a human approach to it, looking at how can we address well-being?

FT23.13. Maybe the city of the future is the city we already have now. The only thing we need to do is to **take care of the good things** we have done in the past and **make the cities work properly**. So the next years we need to work in the suburbia, we need to create connections, we need to create green infrastructures to connect to other cities and we need to make our lives better **for all level of citizens**. So I do not really see big changes on the outside.

FT23.10. Another example of policy on urban integration: in Bologna in 1970 and 1980 the local government made a **regulation about social housing which obliged private investment** if they want to make a high standard quality buildings, 20% of the budget has also to be invested in social housing in the same place. So you built high class building mixed with social housing in the city. After 30 years now it is creating a model of society which is mixed, not excluded. Which is an amazing moderator for social impact. So there are rules that can make things work. The problem is you need to think about it. In most cities they think about the energy plan as a technical tool, really think about technology and products. I think, it is not about energy, or at least not all about energy. It is 2 pillars: **green cities, green economy and green infrastructure**. That is the base.

FT20.1. The most important issues for cities in the future related to sustainability is **inequality**. When I think about cities, there is a – probably global – phenomenon that relates to the attractiveness of cities and boosts the sustainability, because people move in here and bring business, they renovate houses, the social structure gets better. But they also push out people and only a few cities have found **a good balance** between that. At the moment there is a gradient and I think slippery road and we may be able to limit the speed of, but the direction is clear: we saw it in London, Paris was earlier, we saw it in Berlin, Warschau is going down that road. This may be a 'bigger city' issue, but in southern Germany we have the same thing: **cities become more and more expensive**, so this inequality is in a double sense.

FT22.16. City planning now is very different than 10 – 20 years ago, and will also change much towards the future. Urban planning was very easy, because it was planning of growth. There was an existing city and with growing society the areas were expanded, including freeways and other infrastructures. Now it is changing, **our societies are probably growing from migrants**, but mainly are changing in terms of financial capacity of public boards and how to invest. Now urban planning is more focussed on **giving more quality to existing neighbourhoods and parts of the city**. Also the regional planning is changing very much. The climate change and weather condition is asking huge investments. I see that now the regional planning is very much changing, in terms of safety from the rivers, from the floods, in Italy from earth quakes. Cities are continuously growing but not with huge new parts, like in the past, but with new infrastructures, new malls, etcetera. Like for instance in Amsterdam the main issue is not to plan a new neighbourhood for 30.000 people, but to secure the infrastructure of Schiphol.

c Social driven city planning

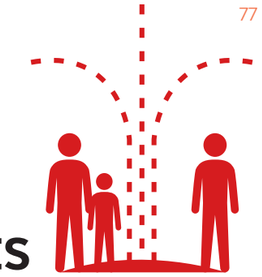
FT3.22. There are certain principles in the way cities are designed today, historically and how the landscape is developing. If bigger changes happen, it will impact the cities. There can be boxes in the city where you produce algae, or food, or something. If they are small it will not change the landscape. But if you use more biomass, you can combine rural areas with urban areas, e.g. growing stuff in the city or on rooftops, it will influence the city a lot. Flowers can improve the quality of the air, and make cities healthier. In the Netherlands we do not have a real metropole, with all the problems such as the smog. When will this be urgent enough? There are technologies that do not necessarily influence the city, because they adapt to the design of the city, and there are technologies that we do not control (yet) that dictate how cities are being developed. In general technologies develop in the direction that we can better control them, manipulate and make them more local and more adapting to our designs. **Social needs will dictate the design of the city in the future, rather than the technological or industrial needs of the city**.

FT20.3. We have now talked about bigger cities, probably smaller cities have more space to manoeuvre. If you – for example – look at smaller cities in Bavaria (Germany), that is in general a very well of city area. Good economy, good jobs, etcetera. Little bit poorer in the north, but still there are old cities, like Bamberg. There is a university there and I also think universities are the key for attracting young people to the city and have new people coming in. So Bamberg is a good example where they **strike the balance of new people coming in and remaining the quality for the people already living there**. They have an established citizenship, but also a constant move in of young people. Bamberg is highly successful, when we talk about quality of life. So it is possible, but the bigger a city gets, the harder it gets.

FT4.12. For me the city is, and that is the difference with architecture, urbanism is something you can't practice and study without **being aware of people, behaviour**. Government structures. It becomes footloose if you try that. The aesthetic state of townships is old fashioned. Hat is no longer about reality. Too much architects are too aesthetically driven.

FT20.2. First of all this **inequality creates more equality within the city**, because there will be more rich and developed people in the city that creates a more homogeneous society. Less interesting probably, and then it becomes less sustainable in a weird sense. If you look at Berlin for instance – and I now zoom into the micro level – there is a very famous district 'Prenzlauer Berg', which was the model quarter after the unification. I lived there and liked it a lot. I moved there when there was a peak, I was part of the trend of people moving in these neighbourhoods. So what happened now; space is not available anymore, people want bigger apartments and more space, so they kick out single, old ladies that have lived there for years, they kick out students, they all buy bigger properties, and it becomes too expensive for others to rent or live there anymore. And who are these people? They are all young families, very successful couples with children who can afford a good way of living. So shops are growing and business is going well. But what will happen in terms of sustainability? In 10-15 years this children will grow up, they will go to university, and even if they stay in Berlin, they will not stay with their children in Prenzlauer Berg. They will move out and the area will become segregated. It is still equal, here will probably not be much poverty, but what will it do for the market? I think it will become less interesting as a market. So in this sense is creates inequality because it pushes out people and the few that are left cannot really participate. It creates almost artificial inequality. If you look at another quarter of Berlin in the west, the whole area around Bahnhoff Zoo. They had this low phase, they were not attractive and there lived a melange of people. But now it is changing again. So it is also probably going in circles. And I think, and that is the story in this inequality, that **cities can steer this and can strike a balance between attracting enough people to bring in money but also enabling people to stay there and keep it fun and interesting diverse**.

SMART URBAN SPACES



d Re-valuing heritage & culture

FT22.17. Urban planning nowadays is more about the **reuse and reshaping of existing buildings**. In the North of Italy we face a new problem after 2008, now there are a lot of industrial buildings for SMEs that are completely empty. A lot of enterprises failed during the crisis, and disappeared. They didn't move to Romania of China, no they disappeared completely. It depends a bit on the structure of the region, but in Romania we have huge parts of industrial parts of the city, with warehouses, factories, completely empty. In Veneto or Lombardia, the have permitted companies to build everywhere and their territory is completely scattered with abandoned buildings. This is a new problem, and we do not have any experience with this. The quality of the buildings is very bad. They are full with asbestos and other dangerous materials, we just do not know what to do with them.

FT4.1. I think the sustainable city is increasingly seen from a humanistic point of view: an issue of the **redevelopment and the continuous development in a more or less evolutionary and organic way of the existing city** and not anymore about extensions and tabaleraza. I think that is a very important precondition: we have to deal with what we have. And also with the capital that is within that. Not just financial capital, but also the social, cultural, historical capital. For instance we have a great legacy of the industrial city, with its post-war neighbourhoods, with its fabulous green structures, with its community centres. But our life styles changed a lot and it doesn't fit anymore. Partly it has become obsolete. But it is still there, physically. And what can we do with it? Seen from a nowadays societal perspective. There are new kinds of life style, new kinds of communities; can we reload or reconnect this new life style with the existing urban landscape and architectural legacy? I think in 2050 the awareness and the emphasis on this is increasing, but in a way it is also the way we have built up in the last centuries; we made Holland. So it's **a cultural landscape**, so it is also very much in our DNA. So it's new, but it is also **a continuation of a tradition**. In that sense I am not so radical, I really believe that probably this will still be in our DNA, but of course, nowadays it is about post-war neighbourhoods and – what we call – the cauliflower neighbourhoods, and for sure in 2050 we have to deal with **more recent legacies of the existing city**. Probably we then also have to deal with changing life styles, with new technologies, with different governance approaches. For instance, in Holland there is a strong focus on the municipality as the scale of urban development and spatial planning, but for sure the region is going to be more important and even with the diminishing of the role of nations and national borders the play-field will be different. But still we have to deal – especially from the perspective of sustainability - with the capital we have.

FT22.13. Our buildings will in the future for sure be more intelligent and more green. For instance I live in an ancient house of 200 year old, which was a very bad house for the past generation. Now it is very good, with a good level of saving resources, like water and energy. One of the problems is that we need more and more space, and we live in comfortable houses, with many m2. And we consume. The problem is that a sustainable city is a very compact city, but our culture is that we expect more comfort, so the growth is going in the other direction. This is everywhere the same in Europe. Because of our incomes, we improve our quality of life, by living in the countryside in the green. The big challenge in Europe is how to stop this consumer waste. We **cannot enlarge cities anymore**. This is a challenge, both in economic measures, since the building sector is one of the most important economic sectors in all of our countries. We have to **reshape and rebuild the buildings sector from the structure to the renewal of systems**.

FT11.1. One thing I can say is that it will definitely not be based on the resources that we have now: this means everybody owning a car. The car used to be a smart way of guaranteeing mobility to everyone. But due to having information and automation it is not the most convenient and definitely not the most effective way in the future. What that brings us – I just saw a study how such a system would look like in a city of roughly about a million people – is that there is no more parking space, that provides possibilities for a lot more dense structures. But **there are lots of other ways of using the spaces that will be freed up**.

FT4.6. Physical space is therefore also important. It is nice or important to meet with somebody for some reason in some specific space. It is like dressing, I dress accordingly to the appointments in my agenda. In my personal way I do it, and it is the same with the place and the motive and the person I meet. It will even become increasingly important, because it fails the need to meet. It also has to do with emancipation. In our western world, it is in the Maslow pyramid the upper part of the pyramid. We are aware that **cultural values in food, in space, in clothing, in language, in all, that culture matters**. Economy is a thing, social networking is a basic thing, because **without strong social sense there is no economy, but culture is something extra: having the luxury of time and effort to think about it**. And it is growing, the slow movement is a beautiful example of it. Or in Holland the discussion on cultural heritage. You would say it is not new, but it is quite recent, based in the nineties. And thinking about the industrial culture and heritage is really something from the last 10-15 years, so quite recent.

16 Better living at a human scale

In 2050, urban systems and spaces are designed on a human scale. Everyday activities are within walking or cycling distance. Communal spaces strengthen social cohesion, giving people the freedom to follow the activities they value most. The city offers an excellent living environment in the European tradition, merging high-quality urban space with nature, culture, the economy and social coherence. Good living means enjoying time with friends, and social life is further supported by availability of public devices in communal space. These enable new forms of communicating, blending the virtual and real worlds in these areas.

a Respecting human scale in design of urban systems and spaces

FT4.11. In mobility you see the same sort of paradox. On the one hand the world is a global village, we travel all over the world. And at the same time you see that **young people try to reorganise their daily life smaller and smaller, because it enables them to have a better quality of life**. Spatially it is a very interesting topic of how you can accommodate that by not just focussing on the region, the nation and international networks. The only ones that matter if you talk about mobility and quality of life and the attractiveness of location when you settle, but also this **daily urban system and the human scale and the walk-ability and bike ability of it is increasingly important**. And especially how the two connect to each other. That is one of the reasons why sharing is increasingly popular, because it enables you to flip over and change easily from one mode to another mode. This is the same flexibility. It is just very practical: cheaper, no more storage, just for practical reasons. Property developers used to determine the quality and typology of the housing. What you could get. We have policies since the 80s that it should be turned and demand driven. People in charge: [Dutch: mensen, wensen, wonen] people, desire, live. That people should be in charge and desires should be central. It became very ideological debate how to organise this transformation. Lots of discussions about collectively and life style groups, very ideological. But I think the flip over for this transition now are far more practical. Practically it is just handier, affordable, etcetera. We as professionals should be far more aware of it and understand it much better. I think we should be much more into these informal processes. I was on a study trip in America to snow-white communities, for the elderly. There was a lot of attention for the physical product, in terms of the architecture, the urbanisation and even the interior: here were model houses with a complete interior, you could choose an entire style. But also on the **social level** by immediately starting with a newspaper, a radio broadcasting, associations, a community centre, so **very practical, very close to what the people themselves say that they are interested in**: why they are moving in there. Professionally we have the tendency to think in ideologies and that's the old way of thinking.

FT21.15. There are some examples that are moving in the right direction. Wherever you see some kind of reconsideration of **the human scale: it feels good**. When you go back to **the scale where you can actually cycle** and not being forced to take the car. Like Copenhagen, Barcelona, the Netherlands are good examples. In cities where human scale is completely marginalised through the scale of skyscrapers surrounding you and where the environment just tells you "you are nothing, you should be just be clearing the way as soon as possible", that is not a city worth living, and it leads to many, many problems. Not to mention the problems that we have already in these parts of the city. The way to go is where the human scale is the determining factor, with this guiding principle of regeneration the resources: **to make a space that makes us happy in the end**.

FT20.9. We already have an issue of disconnectedness in cities very often, where people do not know who their neighbour is. This can become even stronger. At the same time we have the crisis coming on, and that may even become harder, we do not know what will happen to Greece, the fall down of China. So resources will not be in abundance there. People will look at what is in their pocket, and in order to counter balance that we still need some **communal space in a quarter, where people also have an understanding of why someone else needs something**. Just to give an example: this could be, being a godfather to a child that is not related. A very old concept. There is a project in Berlin where young people, students, mentor/be the godmother of disadvantaged children. It is based in the city to actually **easy meet each other**.

FT25.2. Global systems taking over the role of traditional government and authorities. That raises an interesting question about public space. We will have similar debates about public space as we had about the internet. So for public space there will be a battle over whether there is a standard, and about **civil rights and human rights to public space**. That is already happening, but it will be much more articulate, because public space will be a utility that has political meaning, that has social meaning, that determines your access and fairness.

FT25.7. Learning will change of course; the life cycles will change, so a childhood will not be what it is today. Much of this also depends on pubic space. If **public space becomes safer, maybe because of automation and so forth, our children will be more autonomous and will be able to develop skills that we think will be important in the future: like empathy, taking responsibility and taking action, and becoming leaders**. And that stands in stark contract to public space becoming a civil right, which will always make it more diverse. The interpretation of public security and the risk we are willing to take are one of the big battles we have over our children. Now I guess almost anywhere in the developed world children no longer go to school on their own. That of course has a huge impact on whether we see our children growing up as responsible leaders, or whether everyone grows up in a bubble. It may become more extreme. Combined with mobility it means that public space basically disappears. If you have self-driving mobility, it will take your kids to school one-by-one, and will bring them back. We run the risk of creating a society where people move in very limited, and well-designed, curated circles. And we loose the **social cohesion that determines our society**. That also means our skills, in empathy will be limited, because we are only exposed to people like you. You see this already: the atomisation of services means that you have more selection, but also that you are less exposed to others. And if you are exposed to others, it is because you choose to be. Generally people will not put their children by design into more diverse experience. The biggest risk is probably around **the way we grow up and what the values are in society**.

b Safeguarding the European quality of cities and living

FT23.15. A social life, a good life is not easy to reach outside Europe. We work a lot in Africa, there it is difficult to have a social life. The point in the eastern metropolis, I do not see a good future in that. In the 90s we dreamt about mega-cities, a lot of architects wrote books about the mega-cities. I think it is a big fail. We left behind millions of people living in poverty. Forget the mega-city. So I think there are some changes in the vision about cities. And **European cities are very good: The quality of space, the quality of cities, the culture, the economy, the social coherence**, this is very good. Of course big cities give opportunities for jobs, for scaling, but European cities are big enough and have still a human scale.

FT4.2. It depends indeed if you look at the world, at Europe or at the Netherlands. In the Netherlands for a long time the classical opposition between the city and the rural area doesn't exist. It is far more an urbanised region, and urbanised landscape. With the growing awareness of this capital which we inherited, and which is there, for instance I think one of the big, big advantages internationally, globally seen, one of the big values of the Netherlands, is this small scale, fine grained urban landscape with its historical layers, with its functional diversity, it its richness: a qualitative good place. **The relaxed quality of life that lots of foreign people see in the Netherlands has a lot to do with the special quality of the place, which is that it is much more urbanised landscape, fusing all kinds of qualities, not replacing one for another**. That is also why we, in the Netherlands, do not use the term metropolis for the cities, but we go for the notion of the metropolitan region. In its aggregation of functions, in its **aggregation of social networks, of economies, it is able to compete with a metropolis, but it has a fundamentally different quality in terms of place and life**. In the sense that there is much more balance between the green and the red, between the old and new, between the big scale and the small scale, etcetera.

FT22.2. Cities development is very important. Our society is an urban society. In the future **people will even more live in big and wide open urban systems**. In the north of Italy we will live in this big metropolitanization, as in the Netherlands. It is important to pay attention to this change.

FT10.7. There are studies about luxury, and how people perceive what is luxury in different countries. In countries like Russia, China or Brazil, luxury is considered as being to buy watches and cars and stuff like that. Then you go to another group of countries or people living there, and they consider luxury is travel. And then there is a group that considers travel as luxury but also **spending time in the most pleasant ways**. And then you come to our hemispheres. Finland was not part of the study, because it is not even allowed to talk about luxury here. We are so egalitarian that we were left out of the study. It is funny. The idea is that when you go to countries like France, or Germany or England, that is no longer things that matter, but **time with your friends, and having a good time**. That could be related to travelling, and also to **where you live and how you live**. The area, or region or the surroundings is luxury. So you have pleasant and less pleasant surroundings. The closest you can get is Sweden. It is interesting. The top three was including spending time with your friends, with your loved ones. But it got even twisted in the number one thing luxury was spending time of your own. So that is almost narcissist jewellery. I was telling this to a friend that is living for seven years in Stockholm. It reminded her of taking kids to kindergarten. The system in Finland is typically: the man takes the kids to kindergarten, the woman goes early to her job around 7:30 or 8:00am, in order to be ready from her tasks at work to pick up the kids at 4:30 or 5:00pm latest. Which means that the guy sleeps longer, takes an extra cup of coffee and brings the kids to kindergarten. Then he can spend the rest of the day in the office, and can take a beer with friends and come home as late as he likes..., such as when the kids are in bed. My Swedish friend explains that in Stockholm the guys take the kids to kindergarten, at around 9:00, but they also pick up the kids in kindergarten at 4:30 or 5:00pm. It shows that a Swedish father is master of his own time. He makes his bucks in shorter time, and can even do this.

FT23.12. There is not one solution, not one green city. It is all about looking at the context, look at the resources and think about living in a better city. Which is **the goal of Europe: improve the quality of living in cities**.

FT21.13. That is the basis for answering many questions related to that. There is no harm in making our life more efficient. There is no harm in emancipating ourselves from oil companies and from the energy generation companies and become our own energy generators, and so on. But it should be **in balance with our origin: with nature**. There are very different levels to start. If you discuss Lagos, or Beijing, there are certain constitutions that find this interesting. But the people that have been forced to leave their land behind and live in the city, but not having their rights as city dwellers – which is the case in China – for them this question of 'why' is not so important. This **question of happiness** is not so important, because for them it is pure survival. Of course there are certain trends in different areas, which can't be giving a general answer for the city.

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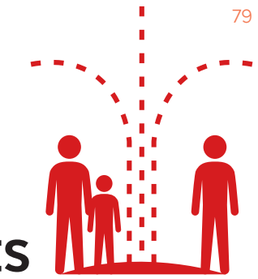

Public devices

FT20.16. The relation between the virtual and the real world. In cities people are much more physical close that in other areas. But also they are very much in the virtual world, looking on their smart phones or behind their computers. We are still now in the first step, where people are addicted to the virtual life. It is still very exotic. But also the first doubts are being spread: is this all healthy? And so on. In my future scenario people will have emancipated themselves from their own iphones and tablets. And I think **the virtual world will be much more integrated in public spaces and in city spaces**. That is not so much "Bring your own device", but it is "use the cities' device". We have this portals already, for instance at airports, where you can see people talking. This might be the future, **a new way of communicating in public space**. I cannot tell what it will exactly be, but I do think people will emancipate themselves from their iphones.

FT7.15. We don't need so much hardware with us. We are our own identification, we should not really need an identification or passport or mobile phone, because the system is recognising us through the iris, or DNA or whatever. That means that **all tools are available at the place where you are**. To use a small example: in Norway you have credit cards that has identification at the backside. I was in the United States for two weeks, and people were amazed 'this is genius', but for me it is so obvious, it saves some plastic. It is just a small example that preferable we should not need identification, we should be recognised wherever. Probably by microscopic DNA. You can make some science fiction movie on how that is misused, but it is easier to make a fake plastic card than to fake DNA. I think the imagination of science fiction makers is much broader and deeper than reality when you come to horror or misuse.

17 Connecting to ‘green’ and ‘nature’

In 2050, people’s need for ‘green’ and ‘nature’ is met by well-connected green spaces and landscapes all over the city. Soft birdsong and other nature sounds add an intangible quality and sense of well-being. Urban farming increases regeneration of resources, creating fresh, healthy foods, reconnecting with nature and mobilising local communities. People are aware of the effect of their living environment on health and well-being, and push for cleaner technologies. Advanced systems allow control of micro-climates, contributing to more resilient cities.

a Caring for nature

FT23.16. The interesting phenomena of cities is the reaction of nature in cities. You are probably not Catholics, but – if you read Pope Francis papal encyclical, it starts with “**the global eco reconciliation**”. It is fantastic. Because the ecology has a big consequence in social impact in agricultures and politics. And it is said by the Pope, who would have thought about this? There is not one politician thinking about these things. All the United Nations conference, like RIO on sustainability had zero impact. Zero Impact. Agreement, zero impact. I think it is very interesting, this global eco reconciliation between the idea of urbanism – building buildings everywhere – and nature. Now is the time of reconciliation, because **people want to live in cities together with nature**, and not just buildings. So maybe smaller cities have now a great opportunity, because agriculture is inside the cities. If you take Bologna, if you go out here, within 10 minutes there are fields of wheat and everything, you can see in Forli fields of fruits. And people are now looking for more living in the city but with relation to nature. And you cannot do that in New York. They plant some trees. So there lies an opportunity to optimise the relation between buildings and nature, and that may help with our energy problems and social problems. Maybe it is as simple as that. We should not make it more complicated. It can be this simple. Mostly simple things are still difficult to do.

FT8.10. I believe that by 2050 we are redesigning urban spaces for more peaceful living. I do think that regardless about how we think about national boundaries or local boundaries, regardless about how technology is improving our day to day life and the access to energy and food and etcetera, I think that at the end of the day humans are animals. That **there is something that we deeply need, that is met by green space, that is met by quiet sound and birds dripping, there is this very intangible effect that that kind of peacefulness has on peoples wellbeing, physical and mental**. This is not even so much in the future, this is already in the thinking of our urban spaces today, it is really understanding this need that people have for green and for active clean places without pollution that they can actually just be at peace and I can imagine that the more cities grow, the more people are inhabiting them, that will only increase their ability to just smell the flowers for a little while. And I think that some people might propose technological solutions to that, and maybe that is totally possible, I do not know enough about virtual environments, but -being someone who comes from the country side- the importance of actually the real thing will grow. I mean if we just look at Paris. Paris is a very old city, with very old architecture and infrastructure. And so it does have some very nice parks. But they are either on the edges of the city or in the more affluent parts. And in the poorer parts of the town, it is not only not green, but also dirtier. And all of the proposals that the new mayor are putting forward –and this is an extension from the last 10 years of policies- are about creating pedestrian spaces, lowering vehicle traffic, trying to create new green spaces, to take the pollution out of the air. So right now, in Paris at least, even though it is the most beautiful city in the world, there is really a real policy push to make concrete changes at **increase the amount of green space** that people have at their disposal. Which honestly, from my perspective, is hugely impressive because it is such a dense city and everybody has an interest and there is so much opposition. For instance when they closed the left river bank there was such an outcry. But they anyway did it and now it is such a success that they are also thinking of doing it also for the other bank. For me, because the left bank worked, even with the major opposition, I really believe that now after the coming election, it will be impossible to open that bank again for traffic. It has had a major impact and people are so happy about it. People come there from all over the city. So for me, I could say that is a small scale, but for a city such as Paris, that actually represents a major change in the landscape. And I do think that once people become used to it, it is impossible to take that away again. It is amazing how that is used and adopted by the people. It is a real success.

FT1.15. One aspect that could drive the process is **a stronger protection of nature**. One does not realise that immediately, but e.g. the Canary Islands were lucky that an oil company did not find oil, and only after that decided that they should protect the area. This should be the other way round. E.g. Austria is now against fracking, because it is a risk for the landscape and for the future. **If landscape protection in any form becomes more important, it will reduce the potential for the traditional, non-renewable resources and increase the price of it**. What we could experience last year when the US started with fracking the oil prices went down and even coal production has become important again. This has hampered the further growth of renewable energy. E.g. Austria embarked on wind energy really heavily. Now the growth is slowing down. Some people claim that it has reduced the diversity of birds. There have been environmental assessments, and hopefully it is not bad for the birds.

b Urban farming to enable healthy and happy living

FT15.18. It will increasingly become very important for people that live in an urban environment to feel that they are actually **consuming a freshly produced food.** The **urban farming concept with the growing vegetables and the fish is almost circular**, since the fish help grow the vegetables and they can eat the waste vegetable products again. So you grow fish to feed them, to grow the vegetables, and you feed the waste vegetable back in to the fish. And then you sell the fish with the vegetables. You capture the CO2 in the building and feed that into the greenhouse because it needs CO2 to grow. You can put up the decentralised data centre up there, for if it is too cold. So it makes perfect sense to me. Why are you growing vegetables kilometres away from where they are consumed, while instead you can grow them on the roof? If you put the right solution on your roof and people can enjoy the growing of the food, they are willing to pay some more for their lunch. There is one in Brussels right now. You need approx. 1500 square meters, you can grow 50 kilograms a square meter and you can easily make a profit. If you got more space, you can create this green field for people to sit and work in. Wouldn’t it be great if all these people working here could in lunchtime, go up to the roof, walk in the fields with the sheep there and walk through the green, go to the restaurant and enjoy their fresh lunch in pleasure.

FT2.10. For example, Sao Paolo in the next month or two is risking a water shortage. I think it is our society is only three millimetres away from revolution, if you don’t have the basics. If you think of the Maslovian hierarchy of needs. Not only a short supply of energy, but also the ubiquitous distribution and the security of availability and continuity of energy supply give us a certain level of comfort and security in our minds. If you’ve got an abundance of energy, you’ll have an abundance of desalinated water. So fresh water does not become an issue. If you’ve got energy and water and then you’ve got the ability to **create vertical farms or internal food stocks and you can mobilise the community**. You can reduce the transport burden for basic living. Literally you can take any water supply, any river and pump just any water, desalinate it in a suburb or a city block. When you’ve got controlled vertical farms you don’t need any pesticides, you have **food from completely closed and safe environments**. So you’ve got food, which is at a low cost, readily available, abundant. You can purchase organic good food, health costs will decrease. You can have a different cultural behaviour with food. So you have less fast food, less sugars and sweet stuffs. Perhaps everyone can have their organic fridge where the fridge is actually growing organic food rapidly, with different UV lights and everything, with different trays for carrots, lettuce. You can have **personal food units, even growing meat**.

FT15.7. The other big change we will see is around the **urban farming concepts**. By 2020 80% of the world population lives in an urban environment. It will become more and more important to **grow the food close to where it is going to be consumed**. That is going to be for the people who are going to consume that food. Today that can be done, there is the agro production technologies to growing in water with fish to nutrition the water, etcetera. So I think we will see more and more on that. You’ll have a building with a green house on top. It will be growing the food and vegetables that will be served at lunch time in the canteen, and maybe some fish as well. And I think that is a good move. I also think this is an opportunity to **save some urban space** as well. People want to go work, or sit on a nice day, on some grass to read a research report or something, they can go to the roof and hopefully there will be those **green spaces**. Growing food, but also providing a different work environment.

FT21.12. Our **direct connection to nature that is something that can make us happy**. You see this in cities where people are starting to farm, grow not only flowers, but also food. The **urban farming** movement is not just for the main purpose that they cannot afford to buy the food in the supermarket. For them it is making them happy, it is some kind reconnection to where we depend on and where we are from. If happiness is a determining factor, then in the future there is hope that nature or natural development will be an important part as well.

c Improving the environment

FT6.2. For example if you look at a healthy city, from e.g. minimising the risk of industrial and traffic emissions, **better technology will lead to clean vehicles, clean industry**. With respect to air pollution, noise pollution, etcetera, **emissions will greatly decrease and therefore increase the quality of living in an urban area**. That will not happen automatically, we have a quite strong technocratic steering principle in that classical environmental hygiene type of policy. So there is quite a lot of technology in that area.

FT3.20. We may also want to **control micro-climates**, e.g. when there is a big cultural event in the city we want sunny weather, no rain, because it is good for the event. If it is one on a local scale, to manage micro-climates it will raise new issues: you may want to ban the rain from the event in the city, but then it will fall in the neighbouring area. What will be the impact then? People expect that **computer systems will become more sophisticated and be able to predict more complex relations between subsystems**. That will also help the geo-engineering technology.

FT3.19. **Geo-engineering and climate engineering will become more important if global warming is really showing itself more and more**. We are doing a little bit but are not really trying hard to decrease the rise of the temperature. We are already at a 2 to 4 degrees rise. So if we experience more of the impact, we will be starting to think more of geo-engineering. E.g. now with the earth quakes in the north of the Netherlands due to the gas extraction we have incidents that raise awareness, and we might accept more drastic measures like geo-engineering. We want to **control the climate**, and we will see more developments in this area. Currently it is a lot about trying to influence the absorption of CO2, or increase reflectivity of clouds, but it will become more sophisticated. But it is a high investment project, that needs a global incident to raise the global willingness to invest. Will we be able to do so? It is like the 70’s, 80’s thinking in large systems to manage the cold war. But we did not foresee the power of the internet and social media to change the world. It is hard to predict, and depends on the sense of urgency.

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FT5.9. Maybe the government will manage all the things from the space. For example right now the US implemented a laser gun and in my imagination after a while they will control everything from the space. We are able to **control the weather and the rains**. And this will be together with the global water supply.

18 Self-sufficient communities

In 2050, cities and their surrounds are self-sufficient through cross-sector collaboration at local and regional levels. Strong links with the immediate environment let cities use shared resources efficiently and in environment-friendly way, with respect for nature and agricultural spaces. Socially inclusive communities are self-sufficient in foods, fresh water, renewable energy and production of tools and systems. People take responsibility for their own well-being, as well as that of the community, and co-design the physical environment and services.

a Cross-sector collaboration in the territory to become self-sufficient

FT7.20. The idea of abundance is also very intriguing. We like the idea: it is very technology optimistic. It pictures how we can solve issues around health, food, power, nutrition etc. with technology in the next decades. We believe in that scenario. When it comes to cities that means that things like algae farming in sky scrapers in cities are doable, so **cities will become much more self reliant.**

FT21.16. The ecopolis idea comes from the analysis that the origin of the city – the polis – has been very much **dependent on the immediate environment**, the agricultural goods that have been produced for this little polis. This is why we called it the agropolis, which was the ancient idea of a city. Now when you look at cities, most of them are 100% dependent on the combustion of fossil fuels: in the cars, in the energy, the materials that we use for our buildings – every thing is designed around the combustion of fossil fuels. They create the space for cars, rather than for pedestrians or people – loosing human scale. So we call that the metropolis. In the ecopolis we aim not to go back to the agropolis completely, but **make use of the findings and the technology that we developed in the last 150 years**. There are different sectors: we have the energy sector, the transport sector, the water sector, the food sector, the incorporate energy materials. We try to see this as the basis in which we have to design the different **concepts that help to use the resources efficiently**, to do this in a rather **environmental friendly way**. In these different technological sectors it has to be implemented. But in order to achieve the different changes in the sectors, you have process targets, or process fields of action, which is the governance sector and the communications sector: to tell the story, to explain to people why you have to be involved in the change. And you have the **local economy**: if you can't make the economic case, you probably should try again. Without an economic case you will not have any success with the measure. On top of that you should reach this idea of the regenerative city, which of course than is a long way to reach. It has to be determined; it has to be measured to get concrete steps to reach this ecopolis. From a certain time on you have to design from this concept.

FT4.13. One of the big assignment for my field is how to reload the "unbuilt". Not so much the public space, although in the end it is the public space. It is about the not literally the space, but the infrastructure of the city. Not just the open public space, but also the city facilities. We have built in the post-war period immensely in the public infrastructure. Since then life has changed immensely, and it increasingly clashes with what we build. If you look at recreation or sporting areas in the city that are designed for everyday recreation and needs of the inhabitants. That worked when we did not have the money to go to Turkey or other far destinations. But it doesn't work anymore. But it could still have a meaning, especially when you think about **decentralising, autarchic, self-organising communities** dealing with vegetable growing, sports, meeting, again on a local level. Then it means a lot also for the ownership of the public space. If this transition to these semi- autarchic systems, then public infrastructure is also key. Aware able to reload it and to give it a new kind of ownership, which is a kind of hybrid, local stakeholders and shareholders, but also the institutions, and also the government. Are we able to organise it and too finance it and to find legal formula's for it. Do we have the guts to start to experiment with it, before we have worked it out? Let's just do it. Quite radical, quite new. It is a bit touching on the issue of, socially it is obvious that some groups are pioneers, not the average people. But that is my point: it is interesting to make the normal people aware of the gain and to go a little bit further than "clean, unbroken, safe" [Dutch: schoon-heel-veilig]. Beyond dog shit and vandalism. If this space is yours, what would you do? You could do that as serious game. I think this will empower people, we should do that here. Public space is going to be key. How can we organise that in people's every day's life. Make it their responsibility. Make them aware: "hey this could be ours".

FT23.11. Green infrastructure is very important: **the territories need to be connected to the cities**. The concept of cities is not anymore about boundaries, it is connected, and cities are much more interrelated. But what is the connection, what is green infrastructure. It is all about making the connection better and look at quality of life.

FT2.13. The whole idea of consumer supply chains, fast moving consumer goods, and all of this big industry that is based on oil – because most of it is oil based – will experience a massive disruption. So then it is just the **availability of ubiquitous energy in a localised environment**. So you there will be massive changes of behaviour and culture. That means that you can then spring up autonomous communities. Urbanisation might then fragment, ironically, from the current trend of urbanisation to major centres, to a group of people or even individuals setting up a local community anywhere. You don't need infrastructure, because you can dial into an energy beam, whether it is from space based solar power or terrestrial cell tower. The issue of energy absorption by organic matter is not trivial. But the ability for our electronics to use less and less power, means eventually that the power from a cell phone tower is enough to trigger the utility. So you can create **communities that are self-sufficient in food production, fresh water generation, energy, fabricating tools and systems**. So you can create really **new independent cultures**.

FT21.9. Now coming to a more positive example: I think the future city will be some kind of a city that has **redefined its relationship with its immediate hinterland**. Due to the need of energy and resources the hinterland already sees this as a chance **to re-cultivate its own regions**. Energy will be produced from most surely entirely from renewable energy – by 2050 we will still be needing appliances like solar cells and wind turbines and geothermal facilities – and a big city will not be able to generate its own energy within the city borders. So the hinterland has a particular role to play: it will be delivering the city will its energy sources, water and so on.

FT16.12. We will still need some more water, and we still need more energy, but that will come from **local production and distribution**. So we see the solution there, although it is still very expensive. Many of these city needs are taken care of in a local setting. They will become much more **self-sufficient**. You can see that already in developing countries, where food is produces much more in a local network and locally production. Not even on the city as a whole, but **on district level**, local production and consumption.

FT22.14. In Italy we have the specific challenge how to **change the policy for the territory**. We have lots of risks for earthquakes and for water floods from the mountains and geological risks, during the last 50 years the governments have paid little attention to the safety and the management of the territory. Now we have to put lots of money in this. To move the building sector – public works etcetera – from the city to the territory. This is a challenge for politicians, because it is easier to make money from the buildings inside the city, as usual, than to change. I have read an interesting article about the Netherlands, stating how young people do not recognize the problems in the countryside, because they live in safe houses in cities. Making young people aware of the need for investments is also a challenge. The Netherlands has invested a lot in the safety of the country when there was no money at all. The country was poor and people were not wealthy as they are now. And now people want single family houses in the countryside, but the Netherlands cannot provide that to everybody. For us in Italy it is the same. The challenge is to **stop the waste of agricultural soil, and to work inside the existing city**.

FT18.2. The most important one is urbanisation creates new possibilities about the interpretation of quality of life, in terms of climate, water, mobility. **Cities are inherently quite resource efficient, because these services are provided more efficiently because of the concentration of population**. It is more efficient to provide energy services or water services to a dense population than to a sparsely population. Cities exhibit super linear scaling as distinct from the non-linear scaling that you see in rural areas. By that I mean that as the city size grows larger, you get more service efficiencies.

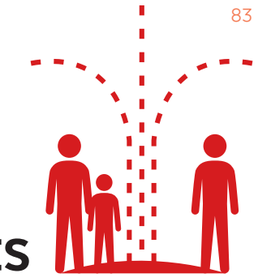
FT16.19. One of the city of tomorrow scenarios is a 'castle city', which is positioning itself in a way that **boosts economic attractiveness**, thereby protecting its population in an uncertain landscape. The inhabitants adapt their consumption practices. The city organizes quality access to resources and public services, which is primarily based on monitoring regional consumption. Regional development is aimed at **increasing urban density in order to reduce the consumption of resources**.

FT8.5. Part of that would also be about water supply. So think rethinking using biochemistry, but also using technology to produce our own food, **be more sustainable on a local level**, help out areas which have more issues and are more environmental vulnerable for crises, and so determine accurate human powers supply requirements. I think that would need to be extended also to power supply requirements of industry. Obviously, to be able to create an ecosystem that actually is much more self-sufficient than it currently is. You see limited examples of that now, such as rooftop gardening and these kind of things, I am not sure we are in 2050 going to reach cultivated meat for example, but something like more widespread consumption of insects as protein sources for instance might be a much more feasible way to go forward. In Europe there is a few initiatives around that, I think that is kind of an intriguing idea. There was some research that showed that when you do not tell children what they are eating, they are perfectly alright with it. So the idea would be that you start with this at schools or in whatever the local learning environment is and then if you grow up eating it, it is not a problem. So this is just a new generation, I can't see it become marketable to anyone growing up with a very traditional concept of what nutrition is. Even tofu is still a hard sell for some groups of people, so insects may be one step to far. But I think that if there is really a push and interesting ways of presenting it, people having it when they are young or even maybe 'sexy' it up a bit, let celebrities do something fancy, then why not? Cultivated meat. I do not know enough about the technology, is it possible to cultivate meat without using an animal? I don't know. If it is possible to grow meat, like hamburgers and steaks, then I do not see a problem, but if it is only possible to industrialise the process, where you just put the animals in small cages and pushing them up, as you see happen now in some countries.

FT1.11. We look for opportunities to **combine the slow city with the smart city concept**. With slow city we mean e.g. the issue of **nutrition and energy consumption**, and with the smart city the **logistics of distribution**. So these are two aspects of energy consumption. Based on the idea that we have on the one hand new technological possibilities, and on the other side the idea of new lifestyles that will become more important. The problem with smart city nowadays is that is only focused on technology. We are doing a project with the city of Krakov, where we look for productive and smart way to use technology. Smart as **social inclusive, including environmental objectives**. This has to be decided on a local level. The technology is available, but large enterprises are not interested in solving problems, but in making business. The city has to say what is necessary and what is the best solution. The role of the city becomes more important.

FT21.17. This is something that is valid in all parts of the world. You can go through these procedures in Lagos or in Tokyo, but the assumptions that you have to make, the available data, the quality of the data, the immediate economic environment is so different that that the design has to be really **tailored to the local DNA**. We call it the DNA of every city, where all these different factors have to be factored into the strategy. But in the end it is really about these **different sectors of energy, water, agriculture, transport and energy efficiency, where this idea of a regenerative city has to materialise**. So, last but not least, for the energy sector for example, you can then go one step further. For German cities for example: what would this mean for a city like Hamburg, for a city like Frankfurt? It is important to set an ambitious target, which the city of Frankfurt did: they set an 100% renewable energy target. And now the question is how you measure that, and what is factored into this target. Then of course every city should have a clear roadmap by when – not if – they will be reaching a **full coverage of energy generated by renewable resources**. They should have a clear idea of how they reach this, and what infrastructure measures this would mean, and what the benefit of this is. In the different sectors that we have developed in this matrix of how to reach the regenerative cities, as I mentioned the cross-sectorial parts of governance and communication are off course key to tell the story to people and to make sure that they are supported.

SMART URBAN SPACES



b Participating citizens taking responsibility for their own and the cities well-being

FT20.17. Aging will still be super important in the future, so the last things are about health and care, related to demography: the **self-management** of health. This will be very important, on city level, probably to keep health affordable. Interesting enough in cities this will not so much be the case, more in the periphery. But it is in the interest of cities that **services will be of equal quality in all places in the cities**. You already see people having to set their own shots, living in the rural areas, so I think that is something where the cities should **help the peripheries to keep up with the systems**.

FT2.14. Being a slight space nut, these same **technologies will migrate from space back down to earth to create new communities**. Because in space you have no external infrastructure, supply chains, power sources. Everything you need to **build with local resources**. I think we will have a new renaissance in different society types and culture and communities.

FT14.6. Creating an **environment with services**, whether they are transportation services, public buildings or even private buildings, I think this has significant impact on the design. I think it is going to get more democratised. Designers create the conditions, in which **consumers create their own design choices**. We have seen this already in Europe, where people are able to design – to a certain extend – their own houses, and buildings. But I think that due to the fact that people are becoming more skilful and there are less expensive resources and materials available, the options where people start to design their own built environments, is becoming more commonplace. Once the whole makers movement becomes big and in the end designers will just provide us the framework, and cheap materials and help us **to design our physical environment where we live**. Good examples already exist, but these are piecemeal. I think it will happen in the quite near future. In public space it is probably going to happen more among those type of institutions which are depending on physical business. This type of design is more important in private spaces, like housing. But we are still waiting the materials to become economic enough, and cheap sustainable solutions.

FT23.2. The tools for planning, and definitely the politicians are so far away from the reality. In Italy the distance between the policy makers and the people is so great and they are not connected. They do politics, they do tools, but people do not feel the benefits. In the last few years **a lot of communities start to discuss the problems that are created, and actually architects play a very important role in this. They play the role of coach, try to listen to people and help the discussion**. Because the problems we face are huge. To make green cities, which maybe sounds a bit poetic “planting trees”, but it can be a great **solution for the micro-climate**. Here in Bologna, it is a very ‘hard’ city, there is no policy for the urban space, and the consequence is that it is much hotter. In some way you cannot restore all the classic buildings, but you can built green space to regenerate the climate.

FT8.1. This is the level of mesa- macro level. For me there is sort of a government aspect, which is much more **joint governance**, which is **more democratic**. Which is both **more accountable**, in terms of quickly having interaction between citizens and leaders, and so being able to hold people more accountable, being able to hold institutions more accountable. But really having this **joint responsibility**, not that just institutions are responsibility. What I already see now is that citizens now take the role of keeping much more the institutions on line. This represents a shift where **citizens are also very much responsible for their own well-being and of the cities well-being**.

FT14.7. There will become more room for small-scale local services, tailored. Local and individualism becomes important. At the same time while on the other side mass movements also become more important. For the living environments people are taking more control by designing it by themselves. You have the **people that take control over their own immediate environment**, at the same time they become more powerful by grouping together, discuss and create opportunities themselves on their professional life, and interfere with public institutions that struggle with their power.

FT6.15. Part of this is also the changing role of government, businesses and science. Some people say science is so yesterday. People are more highly educated and better informed, so they have their view on things. And sometimes the **stakeholders of the renovation of an urban area**, they are really well informed. It is not only the classical scientific institutions that will have a classical scientific input role, the input comes from many sort of stakeholders. So **the relationship between science, and society and government is changing. In a positive way**, I think.

Contributions

We would like to thank the interviewees for their contribution to the Future Telling research:

- Valentine Agid-Durudaud, Engie, Paris, France
- Pallas Agterberg, Alliander, Arnhem, Netherlands
- Jens Bartholmes, European Commission, Brussels, Belgium
- Leendert van Bree, PBL (Netherlands Environmental Assessment Agency, Bilthoven, Netherlands
- Tracy Burns, OECD (Organisation for Economic Co-operation and Development, Paris, France
- Ivo Cré, Polis, Brussels, Belgium
- Mario Cucunella, MC Architects, Bologna, Italy
- Martin Curley, Intel, Dublin, Ireland
- Tomas Diez, Fab Lab, Barcelona, Spain
- Pia Erkinheimo, Digile, Espoo, Finland
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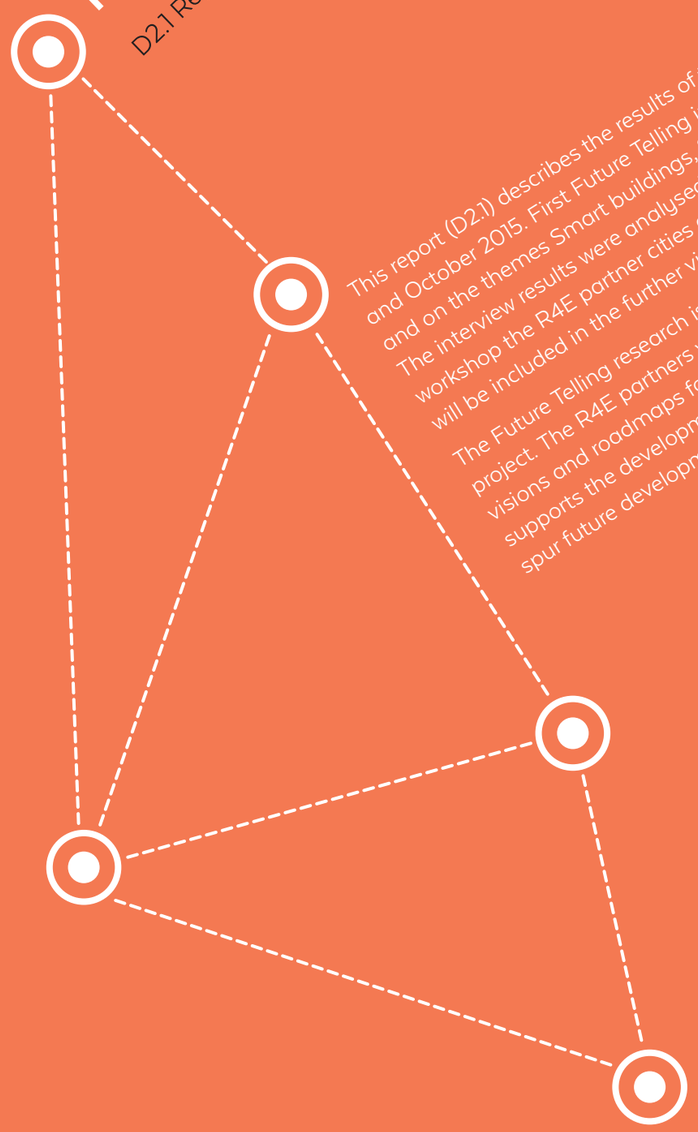
- Stephen Grant, Engie, Paris, France
- Sascha Haselmayer, CityMart, New York, USA
- Sampo Hietanen, ITS Finland, Helsinki, Finland
- Brage Johanson, Zaptec, Stavanger, Norway
- Jim Keravala, Shackleton Energy Company, USA
- Maurits Kreijveld, Rathenau Institute, The Hague, Netherlands
- Ilari Lindy, The World Bank, Washington, USA
- Peter Loeffler, Siemens, Zurich, Switzerland
- Aybike Öngel, Bahcesehir University, Istanbul, Turkey
- Halit Özen, Yildiz Technical University Istanbul, Turkey
- Stefan Schurig, World Future Council, Hamburg, Germany
- Pieter van Wesemael, Eindhoven University of Technology, Eindhoven, Netherlands
- Harald Wilkoszewski, Information Centre of Population Europe, Brussels, Belgium

The participants of the R4E Joint Ambition workshop:

- Pille Arjakas, Tallinn Energy Agency
- Bernadette Bergsma, City of Eindhoven
- Vincenza Conigliaro, City of Palermo
- Cihan Demir, Istanbul Metropolitan Municipality-IETT
- Esma Dilek, Istanbul Metropolitan Municipality
- Sharon Dolmans, TU/e
- Ugur Kizilok, Istanbul Metropolitan Municipality
- Victor Martinez, City of Sant Cugat
- Antonio Mazzan, City of Palermo
- Adrian McLoughlin, Newcastle City Council
- Delia Mitcan, City of Eindhoven
- Francesca Ravaioli, Municipality of Forli
- Gerard Riba, City of Sant Cugat
- Jan-Jaap Rietjens, Splinter
- Jaime Ruiz Huescar, Ayuntamente de Murcia
- Nunzio Salfi, City of Palermo
- Caterina Tardibuono, City of Palermo
- Bob Walrave, TU/e
- Yavuz Yalcin, Istanbul Metropolitan Municipality-IETT

FUTURE TELLING 2050

D2.1 Report - Drivers for Change



This report (D2.1) describes the results of the Future Telling research, conducted between March and October 2015. First Future Telling interviews were held on sustainable energy in general, and on the themes Smart buildings, Smart mobility and Smart urban spaces in particular. The interview results were analysed to distil the most important Drivers for Change. In a joint workshop the R4E partner cities decide together on the most important Drivers for Change that will be included in the further vision development.

The Future Telling research is part of Work Package 2 (WP2) of the Roadmaps for Energy (R4E) project. The R4E partners work together to develop a new type of energy strategy through visions and roadmaps for the 8 partners cities, in co-creation with local stakeholders. The project supports the development of visioning and roadmapping capacities within the municipalities to spur future development and implementation of innovative energy solutions.

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dr.ir. Elke den Ouden & dr.ir. Rianne Valkenburg

LIGHT HOUSE / expertise in smart lighting & smart cities @ TU/e

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