FRESHER

FORESIGHT AND MODELLING FOR EUROPEAN HEALTH POLICY AND REGULATION

Deliverable 4.2

FRESHER Scenarios Storylines and quantitative simulation results

Report Information

Title:	FRESHER Scenarios Storylines and quantitative simulation results
Authors	Andrea Ricci, Giovanna Giuffrè; Sara Baiocco (ISINNOVA); Susanne Giesecke, (AIT) Maria Smirnova (EPHA), Marion Devaux, Yevgeniy Goryankin, Alienor Lerouge, Thierry Pellegrini (OECD), Franco SASSI, Anissa Elfakir, (ICL), Jean-Paul MOATTI, Bruno Ventelou, Sophie Thiebaut (AMU).
Contributors	Stefano Vella, Benedetta Mattioli, Maria Giovanna Quaranta (ISS); Marian Zembala, Rafał Halik and Joanna Zembala-John (SCCS); Mika Gissler (THL); Carla Blazquez, David Cantarero-Prieto, Santiago Lago (GEN)
Work Package:	WP4 Scenarios
Date of publication	22/12/2017
Dissemination level	Public

Project Information

Project Acronym	FRESHER
Project Full Title:	Foresight and Modelling for European Health Policy and regulation
Grant Agreement N°:	643576
Starting Date:	01/01/2015
Duration:	36 months
Coordinator:	AMU - Jean Paul Moatti

Table of Content

Executive summary

The call for proposal to which FRESHER responded recognised foresight as a "powerful tool in providing a systematic and structured approach for understanding stress factors and facilitators affecting health and wellbeing, analysing the range of possible outcomes and for helping to define policy options".

In line with this rationale, FRESHER Scenarios - presented in the first section of this report - focus on the broader social determinants of health, exploring how changes in government policy, the economy, the environment and society at large influence citizens' behaviour, and consequently their health status. Through a highly structured and participatory foresight process, eight key trends were identified to build four FRESHER scenarios representing radically different visions of how health and well-being could be in Europe at 2050.

The FRESHER project has then evaluated the potential impact of four scenarios based on alternative hypotheses for how major societal trends may fuel, or mitigate, a further spread of chronic diseases. The microsimulation model, developed by FRESHER team, has produced quantitative forecasts of chronic diseases incidence and mortality under the different scenarios. The second section of this report highlights some of the micro-simulations results, which are fully described in the Deliverable 5.2. It emerges that disease rates may increase by up to a third relative to current levels, and health expenditures may increase by one fourth. A consistent implementation and scaling up of established public health policy approaches would lead to significant improvements in the health of the European population. However, those policies alone can, at best, bend the increasing trend of chronic diseases. Addressing the challenge of chronic diseases in Europe requires more radical and innovative solutions, only some of which may be in sight today.

The third section of the report, building on the insights accrued throughout the project, sketches possible policy interventions in five innovative "non-health" policy areas that can contribute to curbing the current NCDs trends. The innovative policies described should all be framed in the context of Health in All Policies approach and imply putting the fight against NCDs at the core of the whole international agenda in the framework of the achievement of the 17 Sustainable Development Goals adopted by the United Nations for the 2015-30 period.

This report reflects, in a structured way, the work carried out by the project team as well as the contributions and ideas elicited from more than 400 stakeholders of different disciplines and backgrounds. By combining qualitative approach with quantitative forecast, the FRESHER Scenarios aims at stimulating the political and scientific debate on future health policies by offering novel insights into the range of policy options to be considered, their possible outcomes and trade-off.

1 The FRESHER Scenarios

1.1 The FRESHER Scenarios building process

FRESHER Scenarios offer medium – long-term visions for planning future policy actions, delineating policy alternatives and potential solutions for the future of health and Non-Communicable Diseases (NCDs).

The focus of the FRESHER Scenarios is on how structural changes in governance, economy, environment and society at large influence citizens' behaviour, and consequently, their health status. The research question addressed is related to "*which main drivers are shaping the socio-economic context and will have a high impact on creating future health*".

The Scenarios building exercise followed three main steps, summarised in the table below. The process has been characterised by the adoption of a highly participatory approach and, as result, the storylines reflect the contributions and ideas elicited from stakeholders of different disciplines and background.

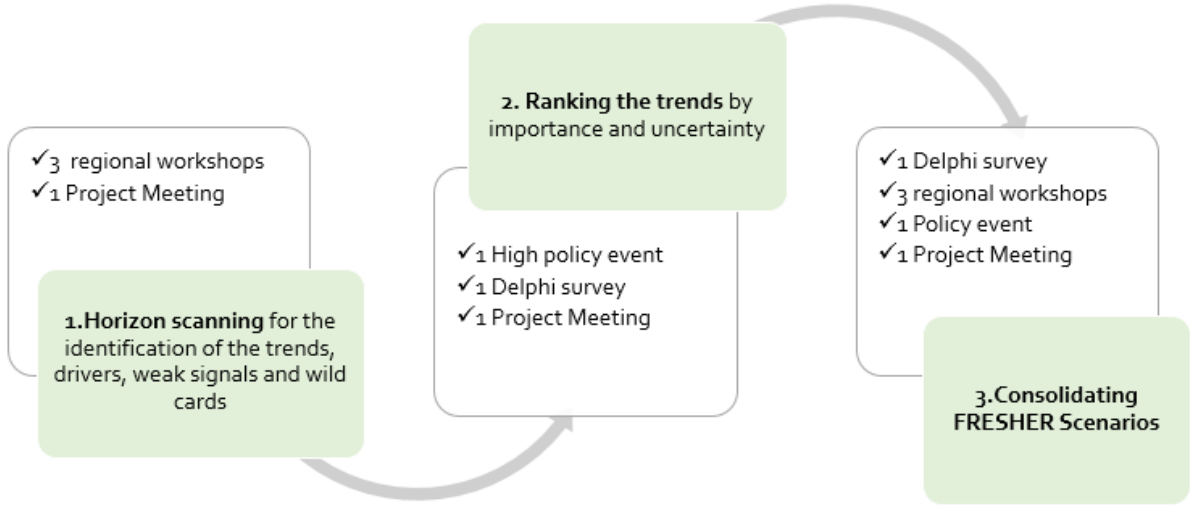

Figure 1: FRESHER Scenario Building Process

As a first step, the project team conducted a "Horizon Scanning" exercise to identify the short, medium and long-term drivers among which to select the most important related to health and NCDs. Horizon scanning was based on an extensive literature review complemented by three regional workshops (Vienna, Brussels, and Lisbon) to discuss stakeholders' observations on possible drivers and their wider implications[1].

As a second step, eight key trends were ultimately selected and fine-tuned by the project team. A

[1] The results of these consultations are included in the FRESHER report 3.1 "Horizon Scanning" available on the FRESHER website FRESHER report 3.1 "Horizon Scanning" is available at http://www.foresight-fresher.eu/en/Tools/Project-Documents/

survey was launched in June 2016 to collect stakeholders' informed opinions[2]. Participants were asked to:

- rank each trend by importance from 1 "critically important" to 5 "low importance";
- evaluate its uncertainty from 1 "fully predictable" to 5 "unpredictable".

	Importance	Uncertainty
Healthy and active ageing	1	3
Equality	2	1
Integration of health and food trade policies	2	3
Healthy European cities	2	2
Integration of health and agriculture policies	3	2
Low carbon economy	4	3
New wave of medical innovations	4	2
Citizens empowerment	4	1

Figure 2: FRESHER 8 Key trends – survey ranking results

On the basis of the comments received, the project team further reviewed the key trends in order to create the structure of the FRESHER Scenarios. A trend related to economic patterns and technology was then added to represent the dynamics of production, while the trends related to "integration of health and food trade policies" and "integration of health and agriculture policies" were merged. Each key trend was then linked to an indicator able to capture and represent their evolution and to the extent possible its impact on health.

The following 8 key trends and indicators were finally retained for building the FRESHER Scenarios:

Indicators	Trends	Indicators
Increase of GINI index	Equity	Decrease of GINI index
Stagnation, decrease of living standards	Economic pattern and tech change	Growth and higher living standards
Low cost-effectiveness in social terms	Innovation in medicine	High cost-effectiveness in social terms
Low access to info for prevention & healthy life styles	Citizens empowerment	High access to info for prevention & healthy life styles
Increase in extreme events and heat waves	Climate change & low carbon economy	Decrease in extreme events and heat waves
Decrease of healthy life years	Demographic change	Increase of healthy life years
Increased exposure to air pollution	Urbanisation	Decreased exposure to air pollution
Unhealthy diets	Agriculture and global food chains	Healthy diets

Figure 3: Final key trends considered by the FRESHER scenarios

[2] The results of the survey together with a factsheet describing the eight key trends are included in the FRESHER report 4.1 "Health Stories" available at http://www.foresight-fresher.eu/en/Tools/WP4-Scenarios/

Taking stock of the foresight literature on the identified trends and in a process of co-creation with the consortium partners, the project team then built four Health Scenarios. These Scenarios present radically different visions of how the key trends could evolve and influence our health status in the future.

FRESHER aims at integrating, as much as possible, the contributions from qualitative foresight into quantitative modelling – combining qualitative and quantitative approaches. In line with this, the second FRESHER survey "What will impact your health the most?" was launched in June 2017 in order to liaise the scenarios with the micro-simulation model. The 90 answers provided educated guesses to quantify the evolution of NCDs risk factors and determinants under each scenario. This offered an important input to the micro-simulation work.

In the third and final step, the FRESHER scenarios were refined and consolidated in light of the microsimulation model results. At the same time, three regional workshops (Finland, Poland, Spain) were held to discuss the scenario regional adaptations and possible implications. These activities offered the opportunity to analyse the four scenarios rationale, expected impacts and policy packages in order to draw FRESHER policy conclusions.

Figure 4: FRESHER workshops

1.2 Overview of the four FRESHER Scenarios

Four alternative health futures were then built, combining different dynamics of the FRESHER trends, as shown in Figure 5 below. In characterizing the four scenarios, two overarching trends were ultimately recognised as fundamental: the dynamics of equity and the progress towards a low carbon both strongly influence all other trends.

The first Scenario "The rich get healthier" shows a deterioration of the equity trend and the implementation of reactive climate change policies that focus on technology solutions. According to the stakeholders, this Scenario reflects a possible continuation of current tendencies, therefore, it is referred to as "Staying in the course" or "Business As Usual" (BAU).

In the second Scenario "We will treat you", governments and the private sector collaborate in order to maintain a healthy workforce and ensure economic growth. It is a world where decisions and healthy life-styles are imposed top down thanks to exploitation of big data and workforce surveillance. Environmental sustainability remains on the back burner as efforts are focused on producing and delivering more to everyone.

In the "Healthy together" Scenario, governments, private sector and citizens' networks work closely together to develop and experiment solutions that promote quality of life, healthy opportunities and environmental sustainability. There is paradigmatic change in the way policies are elaborated as well as implemented. It is a bottom-up world where a participatory global coalition is established to guarantee a good live for all while respecting the limits of the planet.

The fourth and last "Desolation Health" Scenario tells a story of decline of the European economic and social model, where the economic stagnation leads to social unrest.

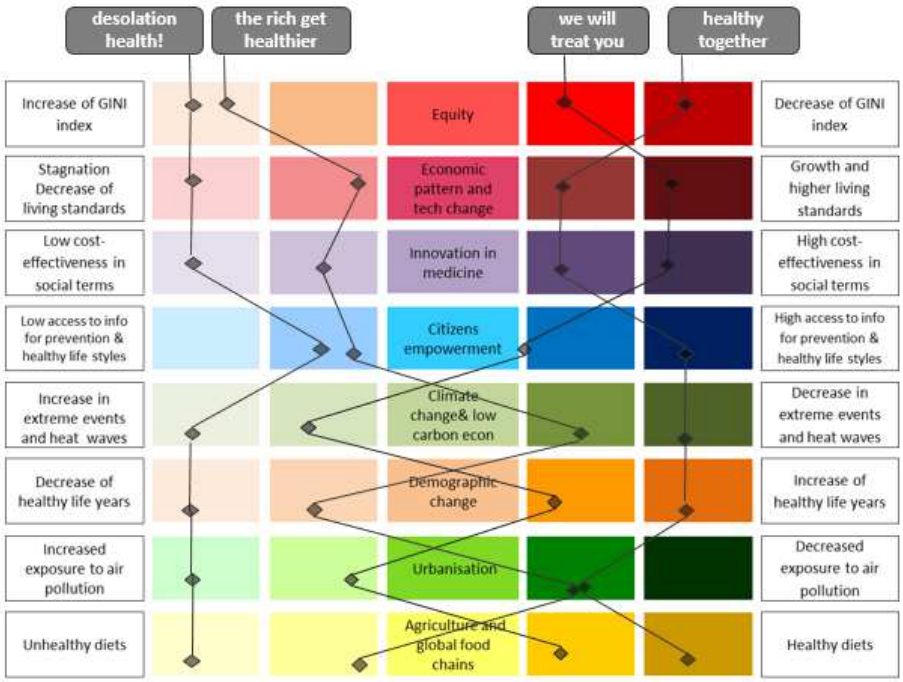

Figure 5: FRESHER Scenarios

Figure 6[3] summarises the development of the different trends and related indicators under each scenario. Under "the rich get healthier", all trends get worse except for climate change and urbanisation. The reverse situation is described under the "We will health you" Scenario where all trends have a positive evolution except for climate change and urbanisation. In "Healthy together", all trends improve but the growth is somehow lower than "We will health you" for all technology related changes (see technological change and economic innovation; innovation in medicine). "Desolation health" is defined by a deterioration of all trends.

Trends	Current level in Europe	The rich get healthier	We will health you	Healthy together	Desolation health
Equity	**Gini index**: 0.31 in 2015; **Income quintile share ratio**: 5.2 in 2015	↓↓↓	↑↑	↑↑↑	↓↓↓
Technological change and economic innovation	**GDP growth**: 2.2% (2015), 1.8% (2016), 1.6% (2017); **Unemployment rate**: 10.2% in 2014	↓	↑↑↑	↑↑	↓↓↓
Innovation in medicine	**R&D investments**: 2.2% of GDP in 2014; **Private share**: 56%; **Public share**: 32%	↓↓	↑↑↑	↑↑	↓↓
Citizen empowerment	**Health literacy rate**: 48% population with poor health literacy and 52% with sufficient or excellent health literacy; **Access to internet**: 62% population daily	↓	↑	↑↑↑	↓↓↓
Climate change and decarbonisation	**GHG emissions** (only transport sector): +21% between 1990-2012; **Global mean surface temperature**: +0.85°C between 1880-2012	↑↑	↓↓	↑↑↑	↓↓↓
Demographic Change and migration	**Healthy life years at 65**: 8.16 (men and women) in 2014; **Healthy life years at birth**: 61.8 (women); 61.4 (men) in 2014	↓↓	↑↑	↑↑↑	↓↓↓
Urbanisation	**PM2.5**: 16.9 micrograms per cubic meter in 2012 **PM10**: 24.9 micrograms per cubic meter in 2012	↑↑	↓	↑↑	↓↓↓
Agriculture and global food chains	**Consumption of fruits**: 62.2% of pop weekly in 2008 **Consumption of vegetables**: 62.4% of pop weekly in 2008	↓	↑↑	↑↑↑	↓↓↓

Figure 6: Trends evolution under FRESHER Scenarios

*Note: The arrows reflect the possible changes in each scenario, in comparison to the *status quo* of the trends **in Europe**. The indicators provide a benchmark to assess these changes.

[3] **Gini index** is 0 for maximum income equality and 100 for maximum income inequality. Data reported here are available at http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_di12; **Income quintile share ratio**: This indicator is the ratio of the total income received by 20% of the population with the highest income and total income received by 20% of population with the lowest income. Therefore, the higher the value, the higher the level of inequality. Data reported here are available at ECHI - European Core Health Indicators webpage https://ec.europa.eu/health/indicators/echi/list_en; **GDP growth:** http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?end=2015&locations=EU&start=1996; **Unemployment rate:** https://ec.europa.eu/info/business-economy-euro/economic-performance-and-forecasts/economic-forecasts_enj; **R&D investments:** http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?end=2015&locations=EU&start=1996; **Private and public share of R&D:** http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Gross_domestic_expenditure_on_R_%26_D_by_sector,_EU-28,_2005%E2%80%932015_(%25_of_GDP)_YB17.png; **Health literacy** is defined by WHO (2013: 4) "Health literacy is linked to literacy and entails people's knowledge, motivation and competences to access, understand, appraise and apply health information in order to make judgements and take decisions in everyday life concerning health care, disease prevention and health promotion to maintain or improve quality of life during the life course". Data reported here are available in WHO, 2013. **Access to internet:** Data available in EC, 2014 a.; **GHG emissions (only transport sector):** Data available in EEA, 2015; **Global mean surface temperature:** http://www.eea.europa.eu/data-and-maps/daviz/global-average-air-temperature-anomalies#tab-dashboard-01; **Healthy life years at 65 – Total, Men and Women; PM2.5 and PM10**; **Consumption of fruits and Consumption of vegetables**: https://ec.europa.eu/health/indicators/echi/list_en

1.3 How healthy your future will be? The four FRESHER Scenarios

The rich get healthier Scenario

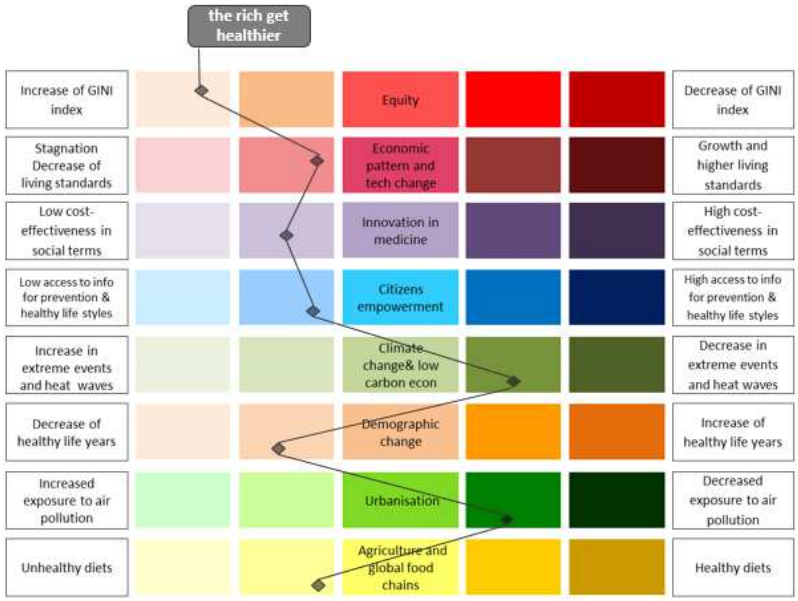

Figure 7: The rich get healthier

By 2050, market forces are dominant and a 'light government' has the main role of guaranteeing the functioning of the economic playground. Following the economic crisis at the beginning of the century, many European states have privatised their healthcare systems and education sectors to guarantee that their public debt falls in line with European thresholds, whilst also deregulating labour markets to revitalise the stagnating economy. Furthermore, welfare states have been dismantled amid cuts to public spending. At the same time, governments have followed through on their climate change commitments by introducing pricing mechanisms to protect the environment.

Image Credits: Arianna Vairo

As a result, most economies are now largely decarbonised and climate change is under control. However, the policies confer an elitist character to global governance, with a focus on achieving results with no or limited concern for the level of inclusion entailed by the solutions pursued. Amid rises in unemployment rates and a polarisation in society between the rich and poor, there is a marked rise in inequality in terms of people's material wellbeing, but also related to healthcare. In this regard, health is now just like many other services: potentially available but expensive. Accordingly, people's access to healthcare, medical innovations including new-generation biomedical devices, and information on healthy practices is dependent on their financial position. The same is also true for people's ability to follow healthy and diverse diets, with richer groups having more access to nutritious food. Overall, in this more unequal society, the life expectancy of people in richer social groups rises whilst that of less wealthy groups stagnates and declines.

Trend Evolution	"The rich get healthier" Snapshot 2050
⇩⇩⇩	European countries have witnessed a **rise in inequality** following the privatisation waves of the beginning of the century. Wealth is now concentrated in the hands of a few who live in gated areas. Society is stratified.
⇩	**Digitalisation of the economy has led to high structural unemployment**. Technology is owned/controlled by a limited number of private companies, pursuing profit-seeking behaviours and collecting all the productivity gains without sharing it with workers. With few exceptions, most workers have temporary jobs with severe impacts on their private life and their health.
⇩⇩	**Exclusive medical innovations.** Innovation in medicine is financed by private companies, focusing on new health solutions for diseases affecting wealthy people, to ensure high monetary returns to R&D investments.
⇩	**Citizens are overwhelmed by commercials and information tailored by companies to shape their desires and expectations. Only few people have the knowledge and time to navigate this turbulent digital world**. For example, citizens search and appraise via the internet new and affordable medical solutions as alternatives to expensive, traditional medicine. However, the lack of regulation also spurs misinformation.
⇧⇧	**Reformed international climate change panels and prices on environmental goods and services.** Production is reshaped with technologies and solutions to lower emissions and meet agreed targets. Environmental goods and services are considered high priced commodities for which citizens need to pay.
⇩⇩	Beyond differences between countries, today **the world seems divided in income categories**: **wealthy strata of the population** get very old and stay healthy in their ageing, **while the poorest** either die prematurely or experience severe conditions whilst incurring diseases and disabilities Increased global cooperation for climate and environmental issues has limited consequences on migratory flows that rise for economic reasons.
⇧⇧	**Wealthier people live in similar ways around the globe** with easy access to education, health services and healthy food, fast transport opportunities and ecosystem services (food, water, green areas). Conversely, those **who belong to less wealthy social groups struggle** to access high-level education and good health services, live in suburbs, depend on long travel to reach workplaces and have limited access to ecosystem services.
⇩	**Polarised agriculture and food system.** While rich people eat local healthy and expensive food, the rest of the population rely on junk food from global supply chains, which ignore nutritional balance.

We will health you Scenario

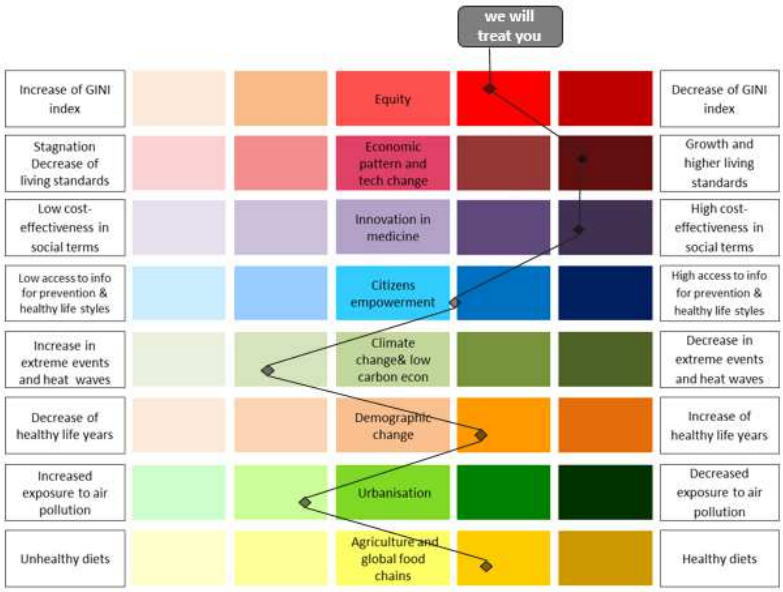

Figure 8: We will health you Scenario

In this scenario, the priority is to guarantee adequate healthcare in Europe as a means to enhance economic productivity. Governments and the private sector collaborate closely to maintain a healthy workforce and to keep non-communicable diseases (NCDs) under control. Thanks to Big Data, public and private actors effectively influence citizens' behaviours towards healthy lifestyles. This is primarily achieved through 24/7 surveillance measures of the population and a high degree of regulation and control of individual behaviour through implanted chips. In this frame, downgrading personal privacy is seen as a small sacrifice to pay for the advantages offered by tele-medicine and tailor-made diagnostics and treatment.

Image Credits: Arianna Vairo

As a result, EU countries enjoy a new era of economic growth founded on education, innovation and full employment. Redistributive measures ensure increased equality amongst workers. Environmental sustainability is given less priority as efforts are focused on producing and delivering more goods and services without any paradigmatic change in production and consumption. This leads to the continuous outbreak of environmental emergencies and the exacerbation of pandemics. At the same time, advancements in technology and medicine improve access to higher quality medical care for all citizens. Through surveillance measures, it is ensured that people follow balanced and nutritious diets.

Trend Evolution	"We will Health you" Snapshot 2050
	**In a competitive world, equity is reached in** the EU by ensuring that economic growth leads to (some) social progress. In Europe, equity is improved thanks to the **new wave of economic growth and targeted redistribution policies**.
	Europe is a **dynamic and innovative economy competing with emerging economies' cost advantage by delivering high-quality goods and services.** The European knowledge society, led by a top-down approach- makes the **most of technological advancements** although the boost in productivity does not entail **any radical changes in the production system.**
	**Breakthrough in personalised medicine.** Thanks to government- managed big data, implanted chips and gene scans personalised prevention and treatment, including tissue regeneration, are accessible.
	Uniform society in which on line **information is strictly controlled**. A new order is set in the digital world, now governed by an alliance of governments, industries and citizens' representatives **to serve public policy goals.**
	**Growth beyond environmental limits.** Increases in production and consumption put pressure on ecosystems. Green investments are only undertaken if economically profitable.
	Europeans are old but healthy and work longer to sustain themselves and to be part of the work-oriented society. Migration rises but the EU accepts only those who can match the qualification needed in the EU economy.
	Cities are the engine of growth and first and foremost place to work. **Urban planning aims at offering the optimal condition to work (housing, transport and health services) and disregard everything that is not related to productivity, including environmental issues.**
	**Industrialised agriculture.** There is widespread use of chemicals and biotechnologies to increase agricultural production. Food is produced in laboratories and diets are monitored to ensure the intake of balanced nutrients.

Healthy together

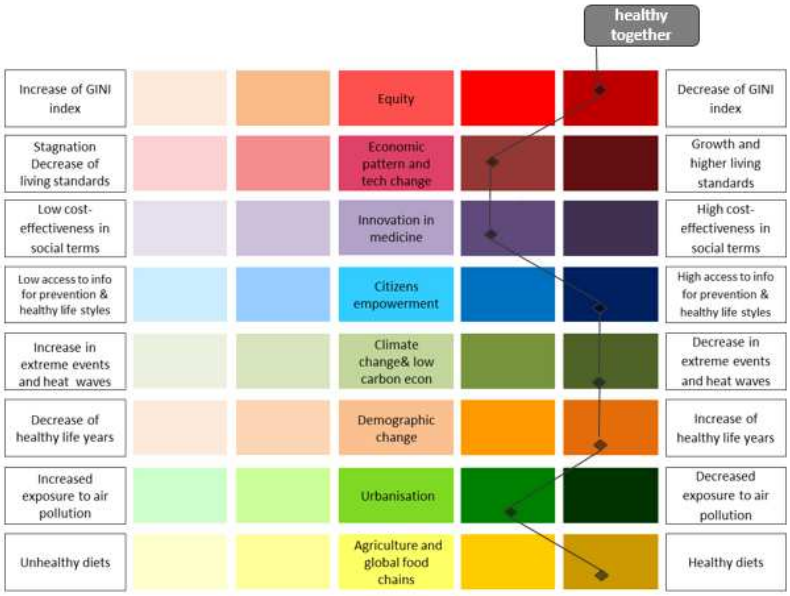

Figure 9: Healthy together

In this scenario, the main priority in society is to promote health and well-being for all. Governments, the private sector, civil society actors, and citizens' networks collaborate closely to develop and experiment with solutions that promote quality of life, healthy opportunities and efficient care while respecting the limits of the planet. Health concerns have long been included in all policies on a global level and EU strategies systematically set health targets in all relevant EU policy areas. Industries are held accountable for the health impact of their products and services, whilst labour policies actively protect workers' wellbeing. On a global level, there has been a shift from focusing on GDP growth, to prioritising human wellbeing and happiness. In this frame, Europe has shifted to a decarbonised and circular economy

Image Credits: Arianna Vairo

As a result of universal healthcare, comprehensive social policies, as well as increased automation and technological innovations, there is an increase in citizens' leisure time, sense of community, as well as people's relationship with nature. These new dynamics provide the means for individuals to take better care of their own health, whilst also being able to rely on assistance through informal networks and community projects. At the same time, medical innovations improve people's life expectancy whereas agricultural policies increase citizens' access to locally produced and nutritious products – thus diversifying people's diets.

Trend Evolution	"Healthy together" Snapshot 2050
	Equity is a global goal and goes hand in hand with sustainability goals. **Equity is fostered by highly inclusive social policies and universal healthcare,** delivered through new welfare schemes and innovative social protection programmes, New metric of development promote community engagement and explore completely new solutions
	**Digitalisation has facilitated the transition towards a circular economy** and reshaped society. **Machines are used to decrease working hours and the gains from the increase in productivity are shared among workers** through **social dialogue**.
	**Disruptive innovation and access to medical innovations enhances treatment outcomes and prevention on a personal and community level.** Progress in medicine is made thanks to new organisational practices.
	Slow society, diversity of cultures. **Citizens are well educated, connected, and aware**. Citizens have reached a level of empowerment that allows them to use social networks to enhance their public engagement and look for health support when needed.
	**Circular and decarbonised economy.** Any investment is assessed against social and environmental goals. Everybody contributes to reduced carbon emissions.
	**Elderly citizens are healthy and active in society thanks to the combined effect of individual behaviours and welfare reform.** Thanks to a new global coalition to promote the sustainable development of most of the world's regions, **there is a recognised right of free movement of people but number of migrants is reducing.**
	**Smart and environmentally and socially just cities.** Cities are greener, less congested and less polluted thanks to smart urban solutions and the engagement of citizens' networks.
	**Local production of food and urban gardening.** Sustainable agricultural practices are widespread and people prefer to consume fresh local food, due to an awareness of health benefits and the assignment of a social value to it.

Desolation health

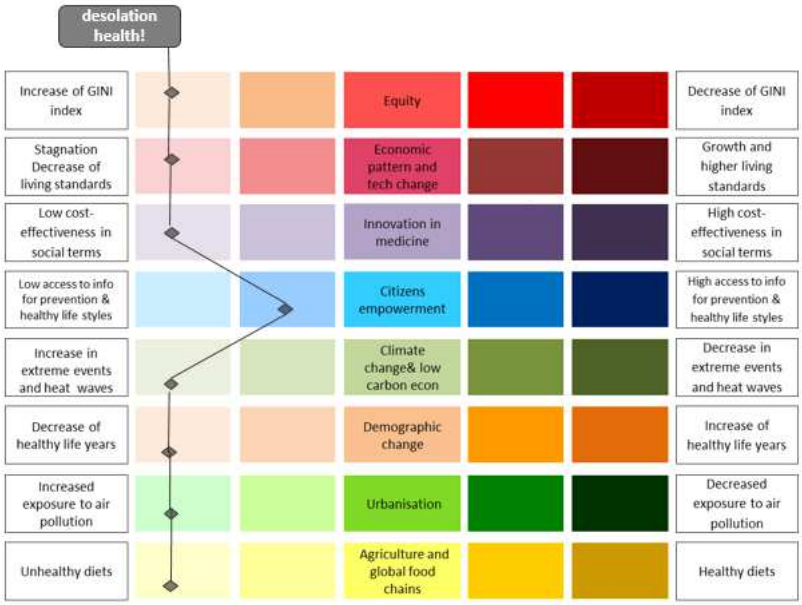

Figure 10: Desolation health

After the rise of nationalist movements and parties at the beginning of the century, the reach of European governance and the common market were scaled back. As opposed to bringing renewed stability and prosperity, the current situation sees European economies afflicted with a loss of competitiveness, low growth, and increased social inequality. Economic and social policies tend to be short-sighted as national governments plan their actions within a timeframe towards the next general election. Due to a lack of collaboration between governments, climate targets have not been met whilst environmental degradation and pollution have increased.

Image Credits: Arianna Vairo

As a result, there is a decrease in the number of citizens throughout Europe that can avail of public services due to rising medical costs. Amid high unemployment levels and low incomes, people are increasingly vulnerable to diseases and falling ill. This is exacerbated by an upsurge in extreme weather events and heat waves, whilst the proliferation of industrialised unhealthy food chains limits the capability of people to follow balanced and nutritious diets. A lack of investment hinders advancements in technology and medicine, whilst the healthcare system in most countries is collapsing. These dynamics furthermore undermine social cohesion and harmony and instead exacerbate social problems such as crime.

Trend Evolution	"Desolation health" Snapshot 2050
⇩⇩⇩	**European society is highly unequal due to the collapse of social policies, ever-lasting** economic stagnation, the inadequate organisation of public authorities and widespread corruption.
⇩⇩⇩	Technological change has continued in terms of digitalisation but most **EU countries have failed to take advantage to create new jobs and re-organise economic activities.** EU countries have lost their competitive advantage in the world market.
⇩⇩⇩	**No significant discovery in medicine.** Investments in R&D are stagnating and undertaken only by big pharma in partnership with insurance companies. These actors focus on expensive quick-fix health solutions and drugs.
⇩⇩	**Internet is used to escape reality**. More than before citizens need to live in a 'second life' on the internet and are willing to sacrifice social interactions to maintain their on-line "status". Furthermore, a black market ruled by hackers is flourishing which gives people access to services and materials that are usually too expensive or hard to find in the formal economy. There is an increase **of the use of on-line games in the health sector to help promote and test medicine and treatments**.
⇩⇩⇩	**Environmental break down and economic war over resources.** Environmental resources are scarce and cause conflicts worldwide. Climate change is worsening, causing continuous environmental emergencies and threatening human survival in many areas.
⇩⇩⇩	The European population has aged without taking any precautions with regards to health insurance, relying on the existing but failing European social security of previous decades. The **public healthcare sector is collapsing in most countries**. Europe is no longer an attractive place for migrants with a wave of migration of European citizens underway.
⇩⇩⇩	**Cities are constantly engulfed in financial crises due to the impoverishment of the population and persistent corruption. As a consequence, the provision of essential services is reduced.** People live in polluted, chaotic cities that are characterised by insecurity and violence.
⇩⇩⇩	**Proliferation of global food chains.** Few big corporations have monopolies and commercialise highly processed food. The intake of nutrients is highly unbalanced and the variety of food is low.

1.4 A day with Angela, Winston, Maya and Oliver

The rich get healthier – Angela

- ✓ My intelligent home wakes me up with an avocado and goji seeds and reads news on the world markets to me.
- ✓ I go to work by my self-driven electric car but I have to be careful because I have to pass through an unsafe district of my city.
- ✓ I am a successful real estate agent. It has been a tough career but now I can exploit others' work to ensure a very high salary.
- ✓ Climbing the social pyramid, I have changed neighbourhood, friends and hobbies. Now I live in the posh area and I am subscribed to an exclusive golf resort.
- ✓ I now can pay for a full insurance plan, to get treatment if I get sick. And I can finally afford surgery to cure my myopia! However, I also have to buy medicine for my mother's diabetes, as she was fired from her job as a secretary after computers undertook her tasks, without retirement benefits.

We will health you – Winston

- ✓ I wake up after 6-8 hours of monitored sleep, I take the company bus to go to work and when I arrive the first thing I do is download the data from my implanted microchip, to ensure that I am not negatively affecting my health status and productivity performance with my lifestyle.
- ✓ My friends are my colleagues. With them I eat healthy and nutritious food in the canteen and go spinning in the company sport centre during work breaks.
- ✓ Thanks to being highly-skilled and continuous training, I programme the fully automated assembly line of a European trucks company. I do not have much spare time, but my salary is fully satisfying and similar to that of my boss.
- ✓ When I feel sick, I first report to the company doctor, who, when necessary, refers me to the public healthcare system.
- ✓ I use the apps to sort out everyday life problems and for online training courses.

Desolation health - Oliver

- ✓ Every morning I wake up very early to check in on my company app, so that I can get assigned as many deliveries as possible.
- ✓ I am a delivery boy for a food app, but I am thinking to migrate because I cannot make a living out of this job.
- ✓ I have little time between one delivery and the other, so I stop in fast food restaurants to eat, which is always packed with unemployed people.
- ✓ Getting around the cities is becoming more and more dangerous because of the road conditions and rising criminality.
- ✓ The waiting list in the public healthcare system is always too long and I never manage to get a visit. When I get sick I search on the internet for information to get well, but it is very hard for me to find reliable websites without advertisement.

Healthy Together - Maya

- ✓ I wake up without an alarm clock as I enjoy flexible hours and my workplace is generally at a walking distance if not at home;
- ✓ I have created an on-line company to recycle plastics and am also involved in local initiatives. I furthermore share best practices in international networks. I don't earn much but why should I need more?
- ✓ I meet my extended family and friends every day. Sometimes we go together to pick and cook our own vegetables, other times we play frisbee in the park or go for a drink.
- ✓ When I feel sick, I ring my neighbourhood doctor who knows me well because I live nearby and send health data on myself on a monthly basis.
- ✓ I use apps not just for looking for information but to find people with whom I share interests. As example I use the social street apps to take care of the flowerbed down the street.

1.5 Regional adaptation of FRESHER Scenarios

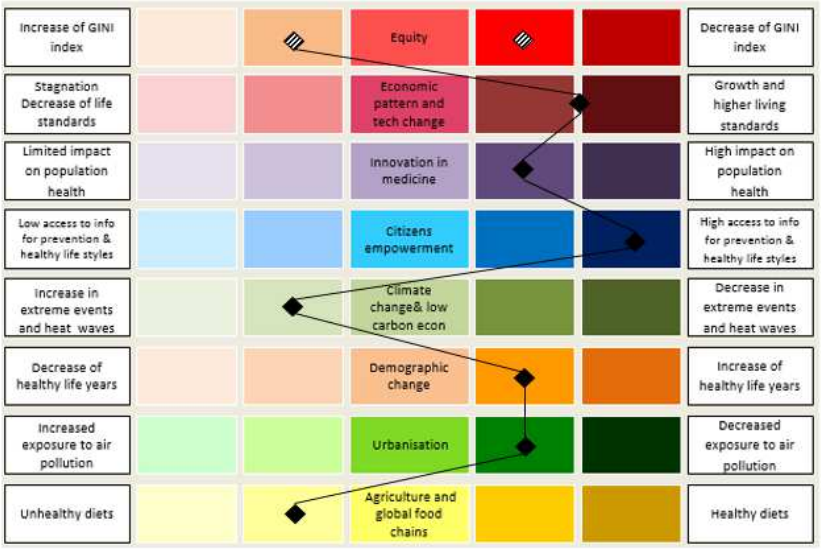

Figure 11: The scenario for Central-Eastern Europe at 2030

"How will the future of health and NCDs look like for the central-eastern EU countries? Is there any trend that is more prevalent in the area? Any FRESHER scenario that is more likely?" These questions were discussed during the FRESHER regional workshop, organised by SCCS in Warsaw on June, 13th 2017. The workshop discussion led to recognise that there is not a complete match with one of the FRESHER Scenarios. A new, mixed scenario was created - featuring aspects from 'The rich get healthier' and from 'We will health you'. On a more positive note, resemblance to 'Healthy together' is present in reference to citizen empowerement. As a result, the workshop participants envisaged the following vision for their region in 2030.

By 2030, Central-Eastern Europe has grown faster than the rest of the EU, thanks to continuous technological upgrade in many economic sectors. Therefore, all the States in the area converge together towards the rest of the EU, as aimed by the EU cohesion and regional policy, which invested considerable funds in the region. However, inequalities within States have increased. Despite this increase is not sharp in economic terms, the effect on health inequalities is deeper, with a polarisation of health conditions across educational and income strata of the population.

Following economic growth, R&D investments are high, leading to important medical breakthroughs. However, the national healthcare systems cannot deliver medical innovations equally across all social strata, at the end contributing to worsening health inequalities. By contrast, significant progresses for overall population health are made through citizen empowerment. Growing access to health-related information through internet and social media, along with higher educational levels in the region, raises awareness on healthy behaviours and prevention. Indeed, while population is aging in the area, higher living standards and better prevention due to higher awareness on healthy living make so that people live some more years in good health.

Global warming is still a major concern worldwide and particularly in Central-Eastern Europe. Since at the beginning of the century the region was still characterised by carbon-intensive industry and transport, the low-carbon transition is slow. It is urgent to tackle the level of air pollution in cities. Thus, some relevant measures are undertaken to mitigate and limit CO2 emissions in urban areas. While these interventions, such as greening and environmental-friendly urban mobility plans, are very important and visible, their impact on urban environment is still not decisive to lead to a complete recovery of the urban environment.

The dark side of the economic growth manifests on food and diets, since the changes in lifestyles foster the consumption of processed food. Industrialisation of food production is out of control. Despite some degree of awareness on food safety and national policy on food pricing, lack of multilevel coordination of these policies led to an overall increase of unhealthy diets.

Snapshot – Elzbieta's life in 2030

- ✓ I work for an international consultancy in the field of information systems, where I was hired thanks to my master degree.
- ✓ I earn much more than my parents used to do but I have to work 8-10 hours per day, thus I often consume my lunches in fast- restaurants and I buy pre-cooked dinner when I manage to get home early
- ✓ I monitor my health through a popular app and I follow a Facebook page on physical exercise during office breaks, so I can keep fit despite I have no time for sports. I have recently quit smoking thanks to an online programme by a popular you-tuber
- ✓ During the weekends, I take care of my parents, who have reduced mobility as they are growing older. We spend time in the urban park that the municipality has recently extended by closing two main roads in the city
- ✓ Every now and then, I bike with my friends on the new city cycle path. I really enjoy going around the city with more calm, but we always wear our little mask and need to be very careful as there are still many cars around.

2 Simulating Scenarios impact

2.1 Overview of FRESHER Microsimulation Model

Within the FRESHER project a microsimulation model was developed, based on advanced OECD models in this field, to produce quantitative forecasts of the four Scenarios.

The microsimulation model is used to project the lives of people representing an entire country or a region of countries. The model simulates lives from birth to death including health events and parameters, such as behavioural risk factors, incidence of NCDs, remission and fatality (Figure 12). Behavioural risks factors include: smoking, alcohol use, BMI, physical inactivity, and blood pressure[4]. The main eight groups of NCDs included in the FRESHER model are: Diabetes, IHD, Stroke, Cancer, COPD, mental ill-health, musculoskeletal disorders, and injuries. The matrix below summarizes the existing modelled relative risks that are the relationships between risk factors and diseases (5 behavioural RFs, and 1 physiological RF, and 14 Diseases).

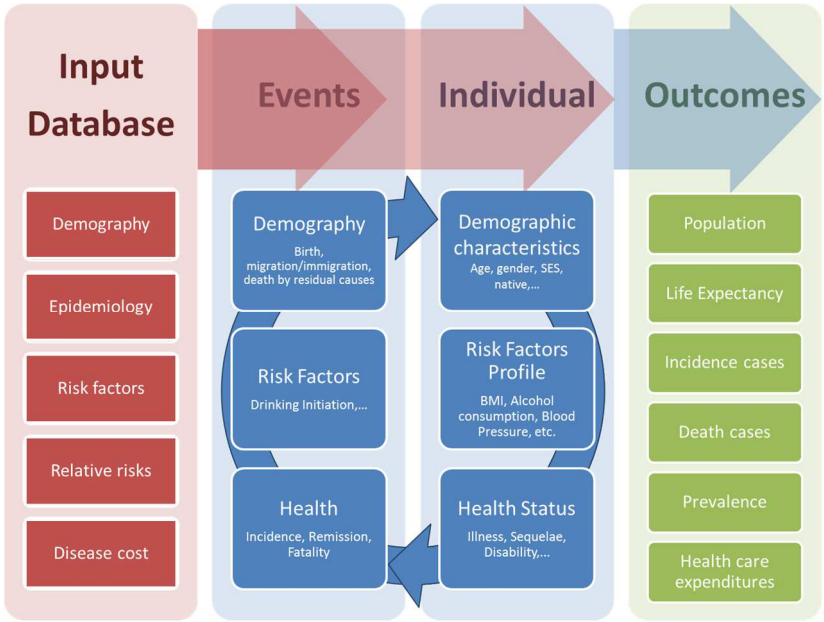

Figure 12: Illustration of the microsimulation model

Data sources and assumptions of the model are fully available in the deliverable D5.2 and D5.3 respectively. The model takes into account the socioeconomic gradient in health, using education as a factor for behavioural risk factors.

The model is developed for the *2050 time horizon* and for *three zones in Europe*:

- Southern Europe (Croatia, Cyprus, France, Greece, Italy, Malta, Portugal, Slovenia and Spain);
- Central/Eastern Europe (Bulgaria, Poland, Romania, Slovakia, Estonia, Hungary, Latvia and Lithuania);

[4] Cholesterol and salt consumption were initially selected as key behavioural risk factors, but they could not be modelled in the microsimulation model due to data issues.

- Northern Europe (Austria, Belgium, Czech Republic, Denmark, Finland, Germany, Ireland, Luxembourg, the Netherlands, Sweden and United Kingdom).

The model outputs include: measures of effectiveness such as life years, life years in good health (adjusted with DALY weights) and NCDs incidence and prevalence, and measures of expenditures (health expenditures for treating diseases when they appear). A complete set of results are available online: http://www.fresher-explorer.eu/ and in the Deliverable 5.2.

2.2 Microsimulation results of the four health Scenarios

To liaise FRESHER Scenarios, microsimulation and policies a survey was launched in June 2017. The first section aimed at collecting experts' informed inputs for quantifying the change of risk factors under each scenario, while the second section dealt with collecting inputs for policy recommendations.

The consultation elicited experts' educated guesses about the evolution of key behavioural risk factors -at the 2050 horizon- under each of the four foresight scenarios. Together with reference levels of behavioural risk factors in 2015 that allow for comparison, the table below shows the mean values for 2050 from the 91 health experts' answers.

Table 1: Experts' evaluation of future trends in risk factors (mean)

Risk Factors	Average (2015)	Worst case (Min in 2015)	Best case (Max in 2015)	The rich get healthier (2050)	Healthy together (2050)	We will health you (2050)	Desolation health (2050)
Obesity (%)	27	23	32	35.4	24.4	25.4	38.6
Phys inactivity (%)	32	12	55	35.8	28.8	30.4	38.0
Smoking (%)	23	12	35	21.1	15.3	15.5	25.4
Alcohol (g/day)	10.72	4.51	17.52	12.63	9.57	9.54	14.98
High Blood Pressure (% with SBP >140 mmHg)	20	13	30	22.74	16.30	16.63	26.80

Note: Green colour means figures are lower than the 2015 Average. Blue colour means figures are higher than the 2015 baseline. The levels of alcohol consumption as presented in this table are originally taken from the IHME data, however it has been rescaled in the model to match the OECD average per capita level.

Source: IHME 2015 data in European countries, and FRESHER Experts' survey.

The four scenarios evolve in the expected direction. The 'Rich get healthier' scenario shows a deterioration of most risk factors with the exception of smoking, compared to the 2015 Average. The 'Desolation health' scenario is associated with deterioration of all risk factors. The 'We will health you' scenario has lower risks for health compared to the 2015 Average. The 'Healthy Together' scenario is overall the most positive scenario compared to the average levels of risk factors in 2015. This scenario shows the lowest risks for health, although in most cases the difference with the values in 'We will health' is minimal.

As an example, according to Experts, smoking rates, which have been on the decline over past years, are expected to decrease at the 2050 horizon in three scenarios (from 23% in 2015 to 21% in 'The Rich Get Healthier', 15% in 'Healthy Together' and 16% in 'We will health you') and to rise in the 'Desolation Health' scenario (25% in 2050). A representation of these trends is shown in Figure 13 (right-hand side).

Obesity rates are expected to continue to grow in two scenarios, namely 'The Rich Get Healthier' and 'Desolation Health', and to decrease in two other scenarios, that is in 'We will health you' and 'Healthy together', as shown in Figure 13 (left-hand side).

In Figure 13, Expert-based predictions of risk factors are complemented with objective measures of the 'Best' and 'Worst' case scenarios that assume that all countries will converge, respectively, to the minimum (best) or maximum (worst) values as they are observed in 2015 in European countries. It is interesting to note that experts' predictions for smoking rates fall between the Best and Worst case scenarios. The picture is different for obesity. Experts predicted that in two scenarios ('The Rich Get Healthier' and 'Desolation Health'), obesity rates will significantly increase, to a higher level than what is observed today in Europe.

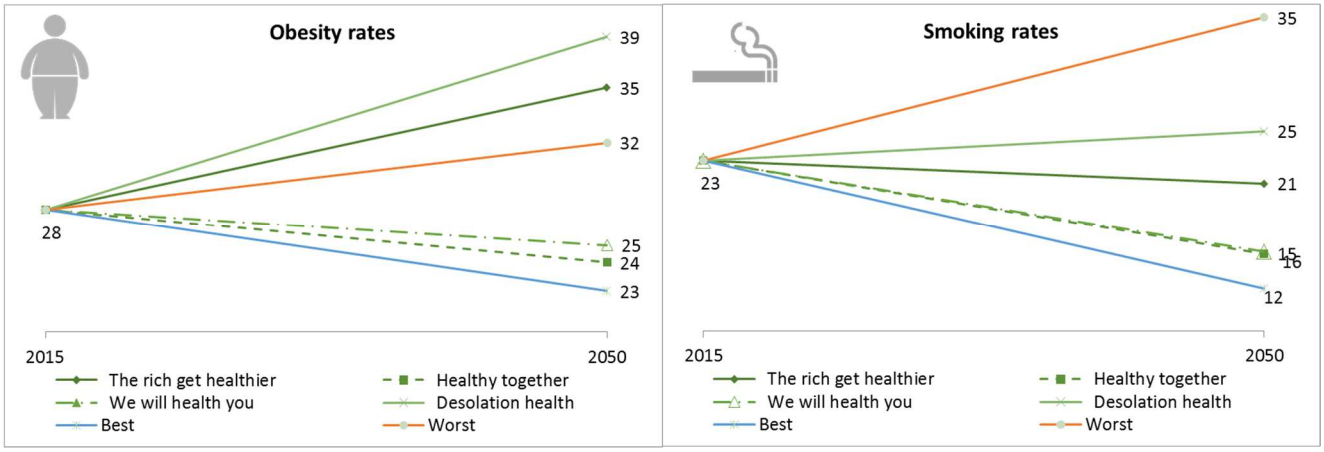

Figure 13: Expert-based predictions of risk factor levels, Europe, 2050
Source: FRESHER Experts' survey, 2017

Looking at the microsimulation results, life expectancy is projected to grow, to different extents according to the envisaged scenarios. At the 2050 horizon, women in Southern Europe are expected to live 89.5 years on average under the baseline demography-driven scenario, and this average varies by -10 months to +6 months across scenarios. Men are expected to live 84.4 years on average in the demography-driven baseline scenarios, and this average varies by -11 months to +9 months across scenarios (Figure 14). In Northern Europe, projected life expectancies are estimated at 84.3 years for men and 87.2 for women with variations ranging from -11 months to +8 months according to scenarios. In Eastern-Central Europe, projected life expectancies are estimated at 77.7 years for men and 83.5 for women with variations ranging from -12 months to +8 months according to scenarios. This indicates that the possible improvements –expected by the experts- in the living environment of people can result in sizeable gains in the life expectancy of Europeans.

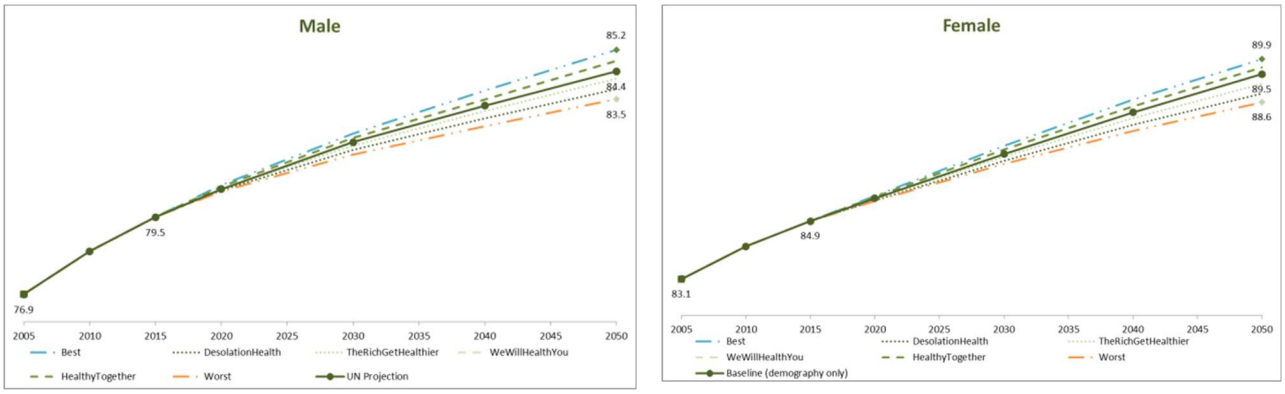

Figure 14: Life expectancy according to the different foresight scenarios, men and women, Southern Europe

Source: Analysis based on a new model developed by OECD for the FRESHER project, 2017

Figure 15 shows the incidence of diseases in different scenarios at the 2050 horizon. 'The Rich Get Healthier' and 'Desolation Health' scenarios lead to increased numbers of new cases of chronic diseases (like diabetes, cancers, COPD, IHD, Stroke), while 'Healthy Together' and 'We will health you' scenarios lead to reduced numbers of these diseases. The Best and Worst case scenarios are positioned at the two extremes, as one can expect. Interestingly, the effect on dementia is reversed: as people live older in the healthier scenarios ('Healthy Together', 'We will health you' and 'Best'), they are more likely to suffer from dementia than in the other scenarios.

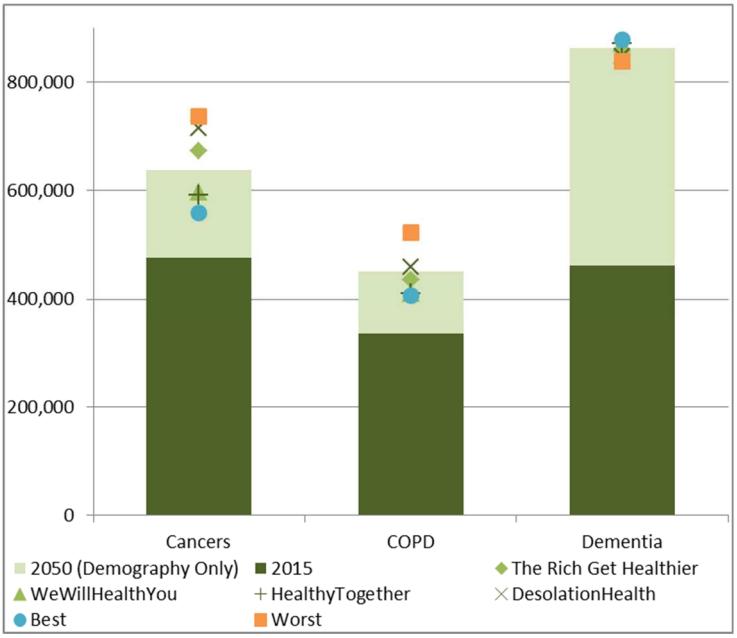

Figure 15: **New cases of chronic diseases according to the different foresight scenarios, Southern Europe**

Source: Analysis based on a new model developed by OECD for the FRESHER project, 2017

All in all, the effects of scenarios on diseases are consistent –i.e. in the expected direction– although relatively small compared to the effect of demography. None of the scenarios is projected to counter-balance the effects of the baseline demography-driven scenario. Consistently, the model results show that health expenditure does not significantly vary across scenarios.

Indeed, as the population gets older with more chronic diseases, health expenditure is expected to grow by 26% in constant price in 2050 under the baseline demographic-driven scenario. For example,

in Southern Europe, health care costs are estimated to grow roughly from 1450 € per capita in 2015 to 1835 € per capita in 2050. While these figures are calculated for the baseline demography-driven scenario – i.e. with no change in risk factors nor in the epidemiology of the diseases, the four FRESHER scenarios are modelled to deal with alternative assumptions on future trends of these parameters. Besides the fact that the burden of chronic diseases differs to a relatively small extent from one scenario to another, as described above, healthcare costs evolve with even a smaller change across different scenarios. Considering Southern Europe, the impacts of scenarios are relatively minor compared to the projection of a 25% increase in health expenditure driven by the sole effect of population ageing. Figure 16 shows that in Southern Europe, health care cost per capita will vary by -2% to +3% across different scenarios. In fact, regarding health care expenditures, counteracting forces minimize even the improvements of risk factors trends in some of the scenarios modelled: the incidences of diseases decline, with decreasing effect on expenditures, but, at the same time, the (resulting) gains in life expectancy necessarily push up the expenditures with a larger number of elders in the population.

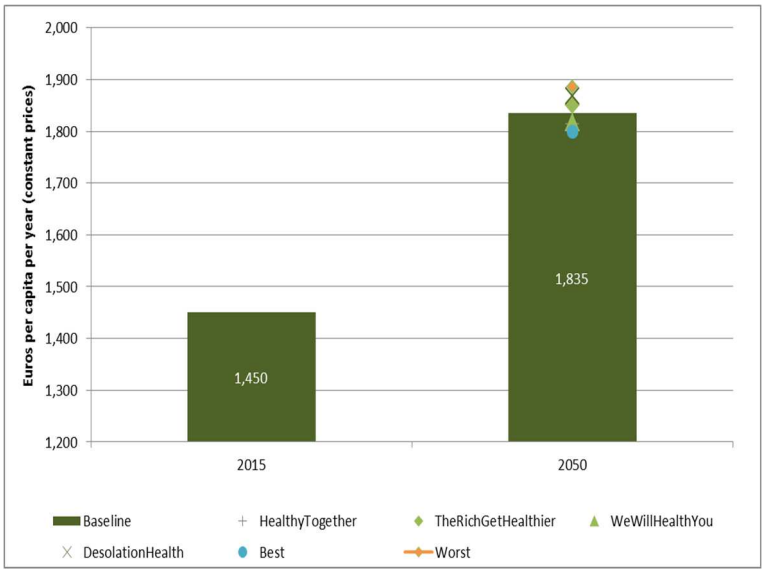

Figure 16: Impacts of scenarios on health expenditures, Southern Europe
Source: Analysis based on a new model developed by OECD for the FRESHER project, 2017

The model results, in terms of NCDs incidence and health expenditures, show a consistency in the scenarios projections but a modest change across scenarios and thus point out that the sole effect of population ageing is expected to lead to an increased number of chronic diseases and, consequently, higher health expenditure, that could not be lessened whatever the future will look like, *if no new disruptive policies or breakthroughs are implemented*.

3 Which policies can reduce the future burden of Non-Communicable diseases?

3.1 Linking scenarios and policy

"Healthy together" and "we will health you" Scenarios produce better health outcomes, specifically concerning NCDs, and are clearly more *desirable* than the others. This is already evident, to some extent, from the storylines and it is confirmed from the micro-simulation model outcomes, as described and shown above.

Among the FRESHER scenarios, *"The richer get healthier" has been considered as the Business As Usual (BAU)*. This means that it describes how Europe will look like in the future if all the trends considered continue following the current path. To a certain extent, the description of this scenario is based on current evidence regarding these trends and results from the assumption that there will be no significant major changes in policy, because the EU and its Member States will perpetuate the current strategy inspiring policy measures in all the fields considered in the FRESHER scenarios.

By contrast, the scenarios *"We will health you" and "Healthy together" are considered "response" scenarios to the current BAU*. This means that these two scenarios represent what will happen in Europe if novel elements are introduced by policy makers to act on relevant trends. "We will health you" represents a future where important actions have been taken with a rather centralised top-down approach to preserve workforce health and enhance productivity and growth trends I Europe. In this scenario, Governments are the key actors for change and mainly responsible for positive outcomes on health and NCDs situation. "Healthy Together", on the other hand, requires disruptive policy actions, which are able to involve the society at large, allowing for a systemic change in people's attitudes, beliefs and values to improve life quality in Europe. Being policy crucial to 'respond' to the current situation to move towards either one scenario or the other, it is necessary to identify explicit representations of the "new policies" that are needed to make the envisaged futures feasible and realistic.

Finally, the scenario *"Desolation Health" is considered as the worst-case scenario*. It describes a situation where EU institutions and Member States have been weakened and de-powered, with a significant limitation of their scope of action in almost all fields and thus leading to watering down policies affecting those trends that are relevant for EU people's health and NCDs.

This section presents those policy actions that emerged as priority to move toward the response scenarios during the FRESHER II survey (June 2017) and the FRESHER high policy meeting (Brussels, September 2017).

With the objective to identify viable policy options for the scenarios, the FRESHER II survey included questions concerning relevant policy areas to move towards a healthier future. The question was formulated as follow "*Imagining a change toward a healthier future, whether 'Healthy together' or 'We will health you', what do you think will be the most impactful policy areas for fighting the future burden of NCDs?"*

Table 2: Experts' evaluation of future policies

	1 Highly impactful	2 Very impactful	3 Impactful	4 Little impactful	No. total answers
Health education and information	48%	32%	10%	10%	88
Promoting universal access to healthcare	46%	25%	20%	9%	87
Behavioural risk factors and biomedical determinants	36%	35%	15%	14%	88
Ameliorating living and working conditions	33%	42%	18%	7%	88
Healthy food production	32%	41%	18%	8%	87
Healthy environment	31%	51%	12%	6%	86
Fostering innovation in medicine for both treatment and prevention	27%	29%	36%	8%	86
Fighting unemployment	22%	48%	18%	11%	87
Healthy housing	18%	41%	34%	6%	87

Health education and information stands out with the highest percentage of respondents that considered it "highly impactful". Most of respondents believe access to early, quality education is the key for inducing healthy life-choices and preventing NCDs. This observation is in line with the previous FRESHER survey where education emerged as the enabling factor for the empowerment of citizens.

On the other hand, when responses for "highly impactful" and "very impactful" are summed up, healthy environment policies (83%) come up first, followed by health education and information policies (80%). Impact is recognised also for policy areas such as "living and working conditions" (75%) and "healthy food" (74%). As in the previous survey, the relative low importance of innovation in medicine was stressed.

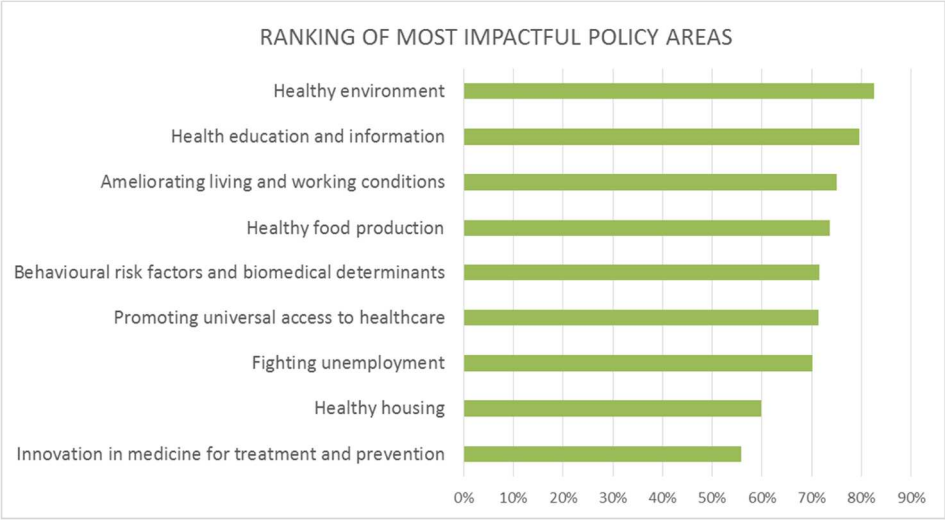

Figure 17: Ranking of most impactful policy areas according to experts' opinion

Respondents were also asked to provide examples and best practices of successful policies and several interesting examples were thus mentioned, including: North Carelia Project – Cardiovascular diseases in Finland; the Review of Best Practice in Interventions to Promote Physical Activity in Developing Countries[5]; the NAOS Strategy - for nutrition, physical activity and prevention of obesity in Spain[6], Programme Salut als barris in spain, Barcelona[7].

Finally, a third question asked for suggestions on research topics to foster the proposed policy actions. Most of respondents suggested that innovative policies could be developed only with greater collaboration among levels of government (EU, national, regional, local) and through interdisciplinary research. Being able to measure the health impact of policies emerged as one clear priority, indicating that more research is needed to measure health impacts of policies outside the health sector.

The survey results were confirmed and enriched during the FRESHER policy workshop (Brussels, September 2017) where Policy makers and experts discussed actions to move toward a different, healthier future. The role that urban environment could play for promoting healthier life-styles was debated. Notably, appropriate urban planning could encourage citizens' physical activity through walking and cycling, while on the path toward decarbonisation the massive diffusion of shared transport could significantly reduce air pollution and its negative health effects. In designing and implementing all these measures, a co-creation approach was recognised as fundamental to speed-up the transition. On the other hand, participants highlighted the fight against unemployment as a key issue to be tackled in order to preserve citizens' health and avoid that large segments of society experience social exclusion. In line with this, it was suggested to include health related-impacts analysis in all public investments directed to re-launching the European economy, along with the extension of social schemes for vulnerable groups (e.g. minorities, single-parent families, migrants).

The workshop participants discussed the new role that doctors and educators could play in helping citizens in accessing reliable information on health and healthy lifestyles. For example, schools should promote physical activity and healthy food, as well as information on harmful behaviours. Health campaigns can also support this activity, especially if coordinated at EU level, and could empower citizens in social control of unhealthy behaviours by peers. Certain is that digital devices will greatly influence the future of behaviours. On the one hand, the digital revolution fosters the information and the monitoring of individuals' health status, also promoting for remote healthcare assistance. On the other hand, these digital devices boost the potential availability of data that can be used both for health research and for policy design on NCDs. Through population profiling, local and national governments can fine-tune targeted prevention and promotion of healthy behaviours.

Food was considered by participants as a priority theme. While food labelling could raise awareness on healthy food, it was recognised crucial that policy instruments, such as the CAP, foster the production of healthy food, in line with diet prescriptions to fight NCDs.

[5] http://www.who.int/dietphysicalactivity/bestpracticePA2008.pdf
[6] http://www.aecosan.msssi.gob.es/AECOSAN/docs/documentos/nutricion/NAOS_Strategy.pdf
[7] http://193.146.189.69/quefem/docs/Diag_Gotic_final.pdf (in Catalan)

Overall, attention was markedly drawn on the importance of having a systemic health assessment of all policies in order to promote "positive side effects" on health or at least to minimise the negative ones.

3.2 Regional view on tomorrow policies

The Regional Workshop organised by GEN in La Coruña, Spain, on June 13th 2017 offered interesting policy insights for tackling health by acting on inequalities, which emerged as one of the most important factors to promote health, and specifically reduce NCDs. The workshop results drew the attention on the important recommendations that are provided by the document produced in 2011 by the Spanish Ministry of Healthcare, Social Policy and Equity "Moving towards the Equity. Proposal of Policies and Interventions to Reduce Social Inequalities in Health in Spain"[8]. In effect, Spain has placed the reduction of health inequalities at the top of its policy agenda, establishing a dedicated Commission with the aim of identifying strategic areas and formulating specific recommendations also beyond healthcare sector. The highlighted document reports the Commission's conclusions by outlining 9 key policies organised in four strategic lines.

Table 3: Policy strategy to address health inequalities in Spain

Strategic line A	**To develop Health Equity information system to guide public policies**
Policies	1. Health Equity National Monitoring System
	2. Health Impact Assessment in Public Policies
	3. Report on Health Inequalities in Spain
Strategic line B	**To promote and develop knowledge and tools for inter-sectoral work: "Health and Equity in all sectors"**
Policies	4. Creation of inter-sectoral bodies
	5. Inclusion of specific objectives in health plans
	6. Training in Health Equity for professionals of Health sector
	7. Actions to raise awareness of the importance of health inequalities
Strategic line C	**To develop a Global Plan for Childhood and Youth Health, regardless of their parents' conditions**
Policies	8. Global Support to Childhood
Strategic line D	**To develop a plan for political visibility of the National Strategy on Health Equity and Social Determinants of Health**
Policies	9. Political Visibility Plan

While the full document includes 27 major policies and 166 specific recommendations sorted by priority, here the attention is stressed on those policy areas that are most in line with policy priorities that emerged also from other FRESHER research activities, namely concerning inequality. In particular, two issues emerge as crucial: reducing overall inequalities, as these are known to be a fundamental of poor health performance, and, more generally, monitoring health inequality and its determinants.

8 https://www.msssi.gob.es/profesionales/saludPublica/prevPromocion/promocion/desigualdadSalud/docs/Moving_Forward_Equity.pdf

On the one hand, it is recommended to establish stronger and broader partnerships to promote policies that reduce inequalities specifically in health but that are to be implemented also outside the health sector. First, it is necessary to act on income inequalities by means of adequate fiscal and expenditure policies to make sure that economic growth is translated into overall improvements of population living standards and, thus, health conditions. It is then crucial to act on social determinants of health inequalities. A pivotal role is played by education. In particular, attention should be given to quality education from pre-primary to secondary school, promoting physical, social, emotional, cognitive and language development. Special efforts should be devoted to ensure accessibility of quality education especially for children from disadvantaged groups, preventing social and ethnic segregation, and ensuring universal access to preschools for 0-3 years-old children. In addition, favourable labour conditions, in terms of stability, wages, social security, working hours and permits, should be provided to households to allow parents to take care of their children and avoid attention deficit and income shortage. In general, policies to promote fair labour conditions are of key importance to reduce inequalities. Permanent contracts with decent salaries and good working conditions (e.g. safety) should be encouraged and proliferation of inequalities in the types of contracts and retributions should be limited in the labour market. Services should be increased for the care of employees and their families. Labour rights should be especially protected in those sectors characterised by informality such as domestic services and tourism. There should be an agreement on universal standards for labour markets, inspired by the International Labour Office (ILO)'s guidelines. Moving beyond the economic side of inequalities, it is also important to involve all social groups, through adequate participation and representation, in health-related decision making, in order to make these decisions more inclusive, acceptable, empowering and effective across all social and ethnic groups.

On the other hand, to ensure efficacy and maximise policy effects, it appears necessary to develop and implement a data and monitoring system to study the evolution of inequality and the impact of policy in these regards. It appears of key importance to define indicators and monitor the situation of social determinants on health and health inequalities, including for assessing the impact of the policy measure mentioned above. For example, health impact assessment should be included in all economic and labour market policies. Establishing a state network for equity monitoring, incorporating knowledge on social determinants of health as compulsory in Health Sciences education, financing research on this issue and promoting health impact assessment of all policies are central to this aim. After this framework is set, it is then important to define regular timing for reporting on the matter, e.g. every four year at maximum.

H2020 project EURO-HEALTHY: "Shaping EUROpean policies to promote HEALTH equitY"[9]
Focusing on health inequalities, EURO-HEALTHY has enhanced knowledge on policies with the highest potential to promote health and health equity across European regions and in selected metropolitan areas. The project developed a framework of analysis, integrating and quantifying key factors that impact on population health and health inequalities. A key output was a Population Health Index (PHI), which is based on a multi-criteria model that captures how different factors (e.g. economic conditions, social protection and security, education, demographic change, lifestyle

[9] For more information on the project, which was funded under the same H2020 call as FRESHER, see: http://www.euro-healthy.eu/; http://www.euro-healthy.eu/euro-healthy-news/euro-healthy-eupha-publication

and health behaviours, physical environment, built environment, road safety, healthcare resources and expenditure, healthcare performance) contribute to European population's health and wellbeing. The PHI model integrates the social elements through a participatory process, and the technical elements of a multi-criteria value model – to evaluate and monitor overall health and wellbeing, as well as interactions between health and multiple dimensions at different geographical levels. The aim was to enhance the understanding on what are the drivers of health inequalities in Europe, across different communities and policy makers and, thus, trigger an extended dialogue on what are the policies having the highest benefit in promoting more equitable and healthy environments at different levels (European, regional and local). One of the key project factsheets, which are included in the EUROHEALTHY booklet, highlights how health equity depends on different lifestyles, such as area of residence, socio-economic status and access to service provision. Taking into account the multidimensional factors that influence health is then necessary to design evidence-based policies, interventions and delivery systems to act on those factors and reduce health inequalities. An interactive overview of health inequalities in Europe as from the project results is shown through the GIS web interface https://healthyregionseurope.uc.pt/#/view/map/model?y=2014 .

3.3 Five policies areas to revert the current trend of NCDs

As posited at the outset by the FRESHER team - in line with the rationale of the H2020 call – the incidence of NCDs is strongly and primarily affected by (i) environmental quality and (ii) lifestyles and behaviours. It follows that, in addition to health policies that help tackling NCDs through targeted prevention and cure, non-health policies that have the potential to improve the quality of our environment, and to steer, or nudge, our lifestyles towards healthier behaviours, are of fundamental importance. Accordingly, this section, building on the insights accrued throughout the project, sketches possible policy interventions in five "non-health" policy areas that can contribute to curbing the current NCD trends.

Equity and labour policy

Income inequalities reflect in wider inequalities in terms of lifestyles and access to services, becoming a key driver of population's health status. Providing for the economic means and shaping a fair socio-economic system to address NCDs are central in the policy agenda. Policy addressing this issue are indeed in line with the overall SDGs framework, and in particular with SDG 1 'No poverty', SDG 8 'Decent work and economic growth' and SDG 10 'Reducing inequalities'. On the one hand, redistribution and social policy can be designed to mitigate the income inequality that is systemically generated by capitalist production systems. On the other hand, labour policy can play a pivotal role in lowering the inequalities that arise from unfair wage distribution and labour conditions[10]. In framing this policy, the fact that digitalisation is deeply transforming labour relationships, skills demand and productivity outcomes has to be taken into account as a fundamental emerging aspect[11].

[10] The differentiation of these two approaches is effectively pointed out by the economist Richard Freeman, who distinguishes between ex-post equalisation of income and ex-ante democratisation of wealth, the latter being related to fair initial distribution of physical and human capital among individuals in a society (CEPS and ISIS, 2015).
[11] EPSC, 2016.

- **Fighting unemployment and re-skilling the workforce.** For the time being, computers can perform effectively tasks that follow explicit codified procedures, while they still perform very poorly in tasks that demand flexibility, judgments and common sense[12]. However, the replacement of workers by computers for the former set of tasks is perceived as a major cause of job losses in the next decades, involving mainly low- and middle-skilled workforce. Almost half of total employment could be at high risk (70% of probability or higher) of becoming automated by 2040. Although this probability is lower for jobs requiring social intelligence, creativity, and perception and manipulation skills[13], policy is needed to re-skill the workforce in industries and tasks that complement those that are taken over by computers, to avoid long-lasting effects of the unemployment wave on less educated workers. Social safety nets and specific tailored re-training programmes should be provided for those losing their jobs in the short term to protect them from poverty. Besides, more structural policy interventions should be designed for an education system enhancing life-long learning for all, to allow workers to face numerous transitions during their career as well as continuous skills upgrading that would be required in the 'new' digitalised fast-advancing economy. Structural change is to be fostered also by policy giving a boost to the knowledge economy and promoting 'soft' sectors (e.g. cultural industry), which both require creativity and complex problem-solving skills that ICT is still lacking, to generate employment.

- **Fair labour conditions**. ICT not only performs more and more tasks, but also is able to re-organise the production. Already in 2020 'smart objects', which are able to communicate with each other and inter-operate with humans, are expected to reach 50 billion. The so-called Internet of Things (IoT) is impressively fastening communication and exchange of data, developing a linking process that deeply changes production and society organisation and interactions[14]. In particular, it allows for an extreme flexibilisation of production and, consequently, of employment relationships, raising the use of contract workers in response to continuous market signals. It creates new forms of employment and new jobs in the 'gig' economy, which has created a dynamic environment where temporary positions are continuously assigned to different workers through apps and online platforms. Labour trends show a transition from regular employment to freelancing, lean working teams and project-focused approach to work, based on performance. While the potential is high, the changing environment of 'non-standards' employment requires reforms to avoid undermining labour conditions[15], for which attentive research is needed to gain the best from self-employment/self-actualizing economy[16]. Such reforms to the labour market should ensure that workers are adequately remunerated, considering also for the high volatility of these new job positions that, if not mitigated, results in high workers' vulnerability to poverty given the increasing possibility of being unemployed between one contract and the other. Higher pay should be coupled with solid social security benefits to ensure that workers do not suffer from job insecurity, performance anxiety and job-seeking stress. If policy fails to ensure decent labour conditions to those employed in 'non-standards' relationships, casualization of the workforce and poor-quality jobs may result worse than unemployment for long-term health[17].

[12] Autor, 2014.
[13] Frey and Osborne, 2013.
[14] https://oshwiki.eu/wiki/A_review_on_the_future_of_work:_robotics
[15] EPSC, 2016.
[16] http://107.22.164.43/millennium/Work-Tech-2050-Scenarios.pdf
[17] Chandola and Zhang, 2017.

- **Healthy workplaces.** Regulation on occupational safety measures already exists and enforcement can make sure that all workers experience healthy physical working conditions. Further measures to promote employees' health are being adopted by frontrunner countries, such as Sweden, encouraging exercise and physical activity during office hours to reduce sedentary lifestyles, as well as for team building and higher productivity[18]. Also digitalisation can indeed play a role for promoting job safety and occupational health, with robots undertaking those tasks that are hazardous and detrimental to workers, especially in specific industries with noxious materials (e.g. nuclear) or for what concerns tasks that are repetitive and monotonous, undermining physical and mental workers' health. However, some caution is needed for the emerging working environment, where humans are work at close and continuous interaction with computers and machines. As human-robot collaboration reaches new forms, current approaches and technical standards aiming at protecting employees from the risk of prolonged work with robots and computers have to be revised[19], re-affirming the importance of considering mental aspects in the concept of healthy workplaces (e.g. stress, alienation, etc.).

- **Reducing working hours**. As computers, robots and machines are able to undertake most of production and thanks to productivity rise, workers can be increasingly relieved from the need to produce their livelihoods[20]. The workload *per* worker is likely to steadily decrease, if the transition is well thought and managed. Proposals arise about reducing weekly working hours to take advantage of digitalisation in terms of living standards, while simultaneously limiting unemployment. Experiments and pilot implementation are already in place in Sweden, for example, where working day is being reduced to six hours for some categories of workers[21]. With the aid of ICT, human working hours can increasingly multiply their outputs, so work time reduction could happen, in principle, with no negative effect of living standards. More free time and better work/life balance would foster people's capacity to take care of themselves, adopt healthier lifestyles and dedicate more time to community activities[22].

- **Universal basic income.** As technology increases productivity and possibly lowers down cost of living[23], governments might consider establishing a universal basic income to all working-age adults, who can then complement their income based on their earnings, if they wish, but without striving for survival in a world of scarce jobs. If thoughtful mechanisms are put in place to create virtuous circles in the society, having a solid income floor, people could indeed take better care of themselves and also afford basic healthcare more easily, acting on prevention. Experiments for universal basic income are already being discussed in Brazil, Switzerland, Finland and Spain. Other countries, especially mong developing countries, consider introducing in-cash basic income for vulnerable groups to mitigate inequalities and lever living standards in substitution of social policy

[18] http://www.su.se/english/about/2.291/press-releases/exercise-at-work-boosts-productivity-1.23633
[19] https://oshwiki.eu/wiki/A_review_on_the_future_of_work:_robotics
[20] Keynes, 1930.
[21] http://www.independent.co.uk/news/world/europe/sweden-introduces-six-hour-work-day-a6674646.html
[22] CEPS and ISIS, 2015.
[23] As robots are not paid, can work 24 hours a day for seven day a week, receive no paid vacations etc. cost of production for goods and services may dramatically decreases, lowering down cost of living and allowing governments' finances to afford universal basic income. Source: http://107.22.164.43/millennium/Work-Tech-2050-Scenarios.pdf

and services. The UK finds cash payment system indeed more efficient than complex bureaucracy linked to social policy for vulnerable groups[24]. Notwithstanding, the topic is highly controversial in terms of political debate and for the time being it would be hardly affordable. Although futuristic, promising mechanisms for making universal basic income possible may follow the road of taxation of wealth produced by robots.

Education, behaviours and digital health

It is of paramount importance to empower patients and in general citizens, increasing their capacity to process information, make decisions and take care of themselves. When it comes to NCDs, education is crucial to enhance people's material and non-material resources (e.g. income, skills, personal development), to raise their awareness on the importance of correct behaviours and lifestyles. Acting on education is in line with the framework of Sustainable Development Goals (SDGs) and specifically SDG 4 'Quality Education' to ensure inclusive and quality education for all and promote lifelong learning. While traditional action should always be enhanced (i.e. schooling), the role of increasingly widespread ICT needs to be recognised and exploited to maximise the potential of this technology. The policy focus should then be on building up a comprehensive approach to education, early in life as well as throughout the life course, to develop peoples' capabilities to gather and interpret information, to solve problems on many levels and to control events and outcomes in their life.

- **Promoting quality education**. There are already measures for educational attainment, such as proficiency scores. However, additional aspects, such as cognitive development, character development, critical thinking and problem solving , should be considered when addressing the quality of education[25]. It is then crucial to build up an educational system that enriches skill development considering both 'hard/cognitive' and 'soft/non-cognitive' skills. The former, including reading, mathematics and science, augment people's capacity to access and understand health-related information. In addition, learning English or additional languages can help people to access more and more diversified information and to develop cognitive skills in general. The latter include the 'big five' personality traits such as conscientiousness, openness to experience, extraversion, agreeableness and neuroticism/emotional stability. These 'soft' skills are associated with better socio-economic status as well as with lower mortality, because they are key to develop personal control, impacting on personal attitude and behaviours, including health behaviours[26]. Promoting quality education since pre-primary schools is important to start enhancing these skills since early childhood development, with long term impacts, especially on health, later in life. Quality education should be highly inclusive, to avoid the undesirable side-effect of fostering social inequalities based on education levels. This means making it accessible especially to children from disadvantaged and marginal groups, in particular in neglected areas, because these children may find more difficult to develop both cognitive and non-cognitive skills at home and in their social environment.

[24] http://107.22.164.43/millennium/Work-Tech-2050-Scenarios.pdf
[25] Zimmerman et al., 2015.
[26] Roberts et al., 2007.

- **Healthy behavioural activities in schools**[27]. By intervening on children and also involving their families, schools have a huge potential of influencing healthy behaviours and lifestyles by providing appropriate knowledge, beliefs, skills, attitudes, values[28]. Schools could support the development of a better relationship with food through school gardens, raising awareness on the importance of knowing what one eats, sustainable food production and fresh food to encourage healthy diets. School gardens are indeed already common in countries such as Denmark[29], as well as in developing countries, and these best practices[30] are spreading throughout the EU. In addition, employment of dietitians, as well as involvement and collaboration with healthcare staff for specific activities, in schools would strengthen prevention capacities since early ages. The importance of physical activities and education, although already present, should be fostered. In general the role of educators, both in schools and families, should be recognised and addressed with appropriate training and awareness to exploit multiplier effects that these key actors can have on children and thus on the society as a whole.

- **Fostering health literacy and digital skills.** It appears crucial to promote health literacy, which "is linked to literacy and entails people's knowledge, motivation and competences to access, understand, appraise and apply health information in order to make judgements and take decisions in everyday life concerning health care, disease prevention and health promotion to maintain or improve quality of life during the life course"[31]. Weak health literacy skills are associated with riskier behaviour, poorer health, less self-management and more hospitalization and costs. Strengthening health literacy has been shown to build individual and community resilience, help address health inequities and improve health and well-being[32]. In the era of internet, fostering health literacy goes hands in hands with enhancing people's digital skills, not only considering the capacity to navigate and use ICT. Indeed, currently, enhancing population digital skills relates mainly to increase people's capacity to discern quality information shared online and distinguish between reliable sources and fake news and facts. Although addressing mainly the political dimension, initiatives are starting to be implemented at EU level and in some member states[33]. It would be useful to extend these initiatives for health-related information and especially in schools for training children since early age.

- **Responsible health profiling through data mining.** As apps and digital tools are increasingly developed and widespread, an enormous source of health-related data mining becomes available and could be used for major developments of personalised medicine and precision public health. However, the real challenge in this area is to provide a fair ethical and legal framework for data sharing, to make sure that this data is shared for the public good, respecting people's privacy and limiting commercial and illegal exploitation of sensible information34.

---

[27] For a comprehensive reference on what is a health promoting school see the related WHO Initiative: http://www.who.int/school_youth_health/gshi/hps/en/
[28] http://www.who.int/school_youth_health/gshi/hps/en/
[29] Dyg, 2014.
[30] http://www.fao.org/schoolgarden/showcases_en.htm
[31] http://www.euro.who.int/__data/assets/pdf_file/0008/190655/e96854.pdf (p. 4)
[32] http://www.euro.who.int/__data/assets/pdf_file/0008/190655/e96854.pdf
[33] http://www.europarl.europa.eu/RegData/etudes/ATAG/2017/599384/EPRS_ATA(2017)599384_EN.pdf
[34] http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(17)31540-4/fulltext?dgcid=etoc-edschoice_email_Dec

Urban development and environment

As the Lancet Commission on pollution and health[35] put forward, air pollution was responsible in 2015 for 19% of all cardiovascular deaths worldwide, 24% of ischaemic heart disease deaths, 21% of stroke deaths, and 23% of lung cancer deaths. In addition, ambient air pollution appears to be an important although not yet quantified risk factor for neurodevelopmental disorders in children and neurodegenerative diseases in adults. Populations in urban areas are especially vulnerable to ambient air pollution. According to the WHO's most up to date ambient air pollution database, 216 of the 235 Italian cities, 228 of the 314 French cities, 152 of the 153 Polish cities and 38 of the 41 Romanian cities in the database exceed WHO's recommended limit value for PM2.5.[3637]The latest statement by the G7 Ministers of Health explicitly mentions the necessity of addressing health impacts of air, water and soil pollution in connection with the NCDs burden and pledges to fight exposure to air pollution, including by reducing emissions in urban areas[38].

Specific urban policies such as energy, equitable urban planning, transport, and infrastructure should be designed and implemented with clear and tangible health and environmental objectives in mind[39]. Urban spaces are recognised as important social determinants for health with the potential for both negative and positive effects on physical and mental health[40]. Well-planned processes of urbanisation that facilitates active transport and provides easy access to natural, green environments can deliver better health outcomes and protection from the impacts of climate change[41].

In line with this, the EU-funded EKLIPSE project[42] dedicated to nature-based solutions (NBS) to promote climate resilience in urban areas, has produced an impact evaluation framework and synthesized its findings to put forward following key recommendations to policy-makers that are relevant for the environment-urban health nexus. As example the distribution of various types of urban green spaces in urban areas could provide health benefits and ecosystem services to people from different age group and socio-economic backgrounds.

As regards air quality, Table 4 below summarizes the policies suggested in the FRESHER D 6.3 report related to Health & Environment policies:

Table 4: Air quality policies

General policies:	• Integrate IAQ (indoor air quality) into the EPBD (energy performance of buildings directive) procedure

[35] http://www.thelancet.com/commissions/pollution-and-health
[36] http://www.lancetcountdown.org/
[37] Among the EU policy instruments tackling these and other pollutants are two key directives: Directive 2008/50/EC on ambient air quality and cleaner air for Europe; Directive 2001/81/EC on National Emission Ceilings for pollutants (NEC Directive). Despite the standard setting, many countries are still exceeding the agreed pollutant limits set to protect human health and the environment.
[38] http://www.salute.gov.it/imgs/C_17_pubblicazioni_2656_allegato.pdf
[39] Neira et al., 2017.
[40] Kleinert and Horton, 2016.
[41] Gascon et al., 2016.
[42] Nature-Based Solutions (NBS) are solutions to societal challenges that are inspired and supported by nature, which are cost-effective, provide simultaneous environmental, social and economic benefits, and help build resilience. Source: www.eklipse-mechanism.eu/ . More information: Eklipse Expert Working Group Report: An impact evaluation framework to support planning and evaluation of nature-based solutions projects, available at: http://www.eklipse-mechanism.eu/apps/Eklipse_data/website/EKLIPSE_Report1-NBS_FINAL_Complete-08022017_LowRes_4Web.pdf

	• Develop and apply European harmonized protocols for IAQ testing, reporting and labelling of building materials, equipment and products • Provide systematic documentation and operating, inspection and maintenance manuals for each building and all installations which may damage the building, deteriorate IAQ or cause health risks. Assign for each building a sufficiently qualified and trained person with control of all building documentation and responsibility for all building related tasks • Mandate radon safe construction for all new buildings
Outdoor air pollution penetration policy	• Apply tight building envelopes, balanced ventilation and air cleaning for all new/renovated buildings when ambient air quality does not meet EU air quality directives or WHO AQGs
Heating and combustion installations policy	• Ban all unflued combustion heaters, equip gas stoves with exhaust hoods and fans, mandate CO detectors and regular maintenance/inspection for all combustion devices
Ventilation and air conditioning policies	• Develop health based ventilation guidelines to control exposure to pollutants from indoor and outdoor sources, indoor moisture and ensure comfortable indoor temperature • Mandate regular inspection and maintenance for all ventilation and air conditioning systems
Water systems and dampness control policies	• Develop moisture control guidelines for building design and maintenance to prevent persistent dampness and hidden and visible mould growth • Provide kitchens, bath- and laundry rooms with controlled extract ventilation, bath- and laundry rooms also with waterproofed surfaces

Food and agriculture

Alcohol, tobacco and nutrition containing certain amounts of sugar, salt and fat are considered some of the highest risk factors for NCDs. Over-consumption of sugar is a major cause for obesity, diabetes and several other NCDs. WHO sees no added value in the intake of sugar and recommend to reduce the consumption of free sugars to less than 10% of a person's daily energy intake (equivalent to around 12 teaspoons of table sugar for adults), incl. free sugars (hones, saccharide).

As regard alcohol and tobacco, innovative policies should target especially the marketing of these products among children and young adults. Some product (e.g. wine cooler) have been especially designed for young people and are also advertised as such. This is a precarious issue because sweetened alcoholic drinks can function as a start for a severe alcohol addiction and for harder drinks in the long run. Thus the ban of alcohol and tobacco advertisement in the media, including social media, billboards, etc. and especially those advertisements designed for young consumers should be subject for EU policy-makers.[43]

[43] WHO Euro Region adopted a Framework for Alcohol Policy for the Region, available at: http://www.euro.who.int/__data/assets/pdf_file/0007/79396/E88335.pdf . This has 5 ethical principles which includes "All children and adolescents have the right to grow up in an environment protected from the negative consequences of alcohol consumption and, to the extent possible, from the promotion of alcoholic beverages".

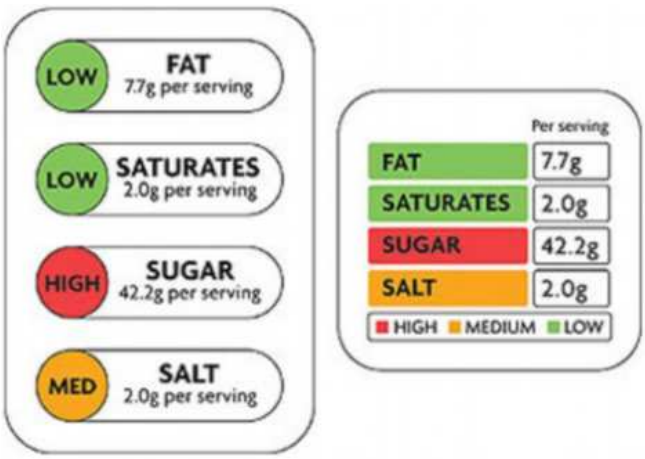

Figure 18: Food Labelling System

On the other hand, information could play an important role to reduce sugar, salt and fat consumption. Several attempts have been made in the past to introduce a mandatory labelling system for processed and packaged food that informs about the intake of sugar, salt and fat. Designed as a traffic light[44] in the colours red, green yellow the amounts relate to the daily consumption recommendations of the WHO or the official recommendations of the UK Food Standards Agency.

Another approach could it be to introduce sugars is taxation of sugary drinks. Studies on such pilot policies have shown "that a tax of 20% on sugary drinks can lead to a reduction in consumption of around 20%, thus preventing obesity and diabetes"[45]; once households have turned to sugar free alternative drinks, the consumption of sugar-added drinks decreases steadily until a plateau is reached. This intervention helps reducing health care costs in the long run, as the example of Mexico already shows.[46] A step further would be to ban sugar-added drinks from school environments and canteen and to promote healthy diets for school children. This could also include the limitation of commercials for sugar added drink in TV programmes for children (incl. social media) and any kind of product placement in that direction.

The wider context of FRESHER has shown that the goods produced by agriculture in the EU are determining to a large degree what is consumed. Thus, agriculture policy is an important field to be reconsidered if food in the EU is to be produced for making people healthier and containing NCDs. Over consumption of animal based products as well as of ultra-processed food – often containing 'empty calories' – have been undermining public health as they also contribute to obesity-related diseases.[47] Thus a reconsideration of agriculture policy and subsidies are necessary in order to make healthy food (fresh, regional) more affordable than highly processed food and hidden value chains. As evidence from 2013 showed, the percentage of people who could not afford a regular quality meal every second day ranged from "less than 3% in the Netherlands, Portugal, Spain, Sweden, Denmark and Luxemburg to 25.3% in Latvia, 32% in Hungary and a maximum co 51.9% in Bulgaria"[48]. What is needed from policy side is to set incentives also for poor people to afford and buy healthy food, such as tax incentives, promotion of direct purchase from the producer and patronage systems.

[44] Templates can be downloaded at http://invs.info/labels-on-food-packaging/labels-on-food-packaging-red-warning-labels-for-junk-food-in-traffic-light-packaging-plan-templates/
[45] http://apps.who.int/iris/bitstream/10665/250303/1/WHO-NMH-PND-16.5-eng.pdf
[46] https://www.sidint.net/content/uncapping-truth-mexican-sugar-sweetened-beverage-tax-works
[47] UNEP, 2016.
[48] http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_mdes03&lang=UK

The way forward: health in all policies

FRESHER policies can be read in the context of Health in All Policies approach, and aims to support policies able to reach Sustainable Development Goals related health, well-being and sustainability.

Health in All Policies (HiAP) is an approach to public policies across sectors that systematically takes into account the health implications of decisions, seeks synergies, and avoids harmful health impacts in order to improve population health and health equity. Building on the Alma Ata Declaration on Primary Health Care (1978) and the Ottawa Charter for Health Promotion (1986), the Helsinki Statement[49] of June 2013 acknowledged that policies made in all sectors can have a profound effect on population health and health equity. A HiAP approach is founded on health-related rights and obligations and seeks to improve accountability of policymakers for health impacts and includes an emphasis on the consequences of public policies on health systems and determinants of health and well-being.

A very general framework for country level HiAP implementation has further been elaborated by the WHO following the Helsinki declaration[50], it does however not give special guidance for tackling critical issues in the process, leaving it open to countries to adapt the framework according to their respective political and socio-economic context. On more concrete terms, the Region of the Americas emerged as the first WHO Region to adopt a regional Plan on Action on HiAP, setting a series of targets for implementation. Progress is measured according to the number of countries that have identified supportive mechanisms towards HiAP implementation such as intersectoral committees allowing the health sector to engage with other sectors or mechanisms to engage communities and civil society. However, while some countries report progress on the previous targets, monitoring and evaluation of HiAP is overall at a very nascent level and will need more attention in the future. The WHO has recently published a collection of worldwide case studies to present how the HIAP approach is used to create enabling environments for advancing health and health equity and for strengthening policy coherence in the context of sustainable development[51].

Health, well-being and sustainable development are intrinsically connected and Agenda2030 represents an excellent framework for health to engage with other sectors in the context of the SDGs. The shift in focus between the two sets of global development goals – from the MDGs to the SDGs - represents a more nuanced understanding of the factors that affect health, and lays the groundwork for action across different sectors whose activities have significant effects on health but fall outside the purview of the health sector[52]. The implementation of the SDGs and Agenda2030 can open new pathways to address several SDGs simultaneously and promote intersectoral action that addresses the underlying social, economic and environmental determinants of health. As Agenda2030 requires a pragmatic approach guided by a transformative vision, Buse and Hawkes argue[53] that success in realising the agenda requires a paradigm shift in the way we address global health to surmount five challenges: 1) ensuring leadership for intersectoral coherence and coordination on the structural (including social, economic, political and legal) drivers of health; 2) shifting the focus from treatment to prevention through locally-led, politically-smart approaches to a far broader agenda; 3) identifying effective means to tackle the commercial determinants of ill-health; 4) further integrating rights-based approaches; and 5) enhancing civic engagement and ensuring accountability.

[49] http://www.who.int/healthpromotion/conferences/8gchp/8gchp_helsinki_statement.pdf
[50] http://apps.who.int/iris/bitstream/10665/112636/1/9789241506908_eng.pdf?ua=1
[51] Also in this case the report does not provide an evaluation of where HiAP makes a difference towards health outcomes
[52] PAHO, 2015.
[53] Buse and Hawkes, 2015.

Partnerships for policy coherence (also represented through SDG Goal 17) will remain key in the implementation of HiAP. Greater coherence in a European HiAP will be defined by the creation of synergies across public policy areas and collaboration between key players from civil society and the sectors of health, finance, research and development, industry, and employment. While Article 168 of the TFEU states that "A high level of human health protection shall be ensured in the definition and implementation of all Union policies and activities", laying the groundwork for a HiAP approach, the implementation proves to be much harder in practice. Whilst policy coherence with 'more natural' partner sectors or Ministries, such as social security, family and employment, is improving at national level in the EU and best practice is being developed, the health community is still struggling to reach decision-makers in the economic and finance sectors, in trade, agriculture and foreign policy[54]. In line with this, FRESHER results aims shed a light on the distant causes of NCDs in order to support the dialogue and the understanding between experts and policy- makers from different background and departments.

Health and well- being: best Practices in the EU[55]

Wales: The Well-being of Future Generations (Wales) Act 2015 provides an enabling framework for thinking and working differently, and embeds a Health in All Policies approach through the aspiration and architecture ofthe legislation. Its seven well-being goals aim to make Wales a healthier place, where the social, economic, environmental and cultural well-being of Wales is improved. The Act requires public bodies, including local authorities, to make sure that when making their decisions they take into account the impact they could have on people's well-being, and expects them to work together better, involve citizens, and look to the future as well as focusing on the now. This places sustainable development at the centre of decision-making, and upholds Wales' long-standing commitment to ensuring a sustainable future for all.

Finland: The Finnish Government Programme has five strategic priorities, one being promoting health and well-being. Its implementation consists of 26 key projects to support these high-level objectives. A critical health and well-being project is focussing on the development of a new model for cross-sectoral work which expands action to strengthen well-being considerations into decision making, as Finland moves to a Health and Well-being in All Policies (HWiAP) approach. The new model provides a more robust framework for how all sectors of government can take into account the impact of their decisions and actions on health and well-being, and further promote equity issues.

[54] https://epha.org/wp-content/uploads/2016/04/Towards-a-European-Union-for-Health.pdf
[55] http://www.who.int/social_determinants/publications/progressing-sdg-case-studies-2017.pdf

References

Autor, D. H. (2014). Polanyi's Paradox and the Shape of Employment Growth. NBER Working Paper No. 20485.

Baumol, W. J. (2012). *The Cost Disease: Why Computers Get Cheaper and Health Care Doesn't*. Yale University Press: New Haven and London.

Bock, A.-K., Maragkoudakis, P., Wollgast, J., Caldeira, S., Czimbalmos, A., Rzychon, M., Atzel, B., and Ulberth, F. (2014). Tomorrow's Healthy Society. Research Priorities for Foods and Diets. JRC Foresight Study. Available online at: https://ec.europa.eu/jrc/sites/jrcsh/files/jrc-study-tomorrow-healthly-society.pdf

Brynjolfsson, E. and McAfee, A. (2015). Will Humans Go the Way of Horses? Labor in the Second Machine Age. *Foreign Affairs*. July/August 2015 Issue. Available online at https://www.foreignaffairs.com/articles/2015-06-16/will-humans-go-way-horses

Buse, K., and Hawkes, S. (2015). Health in the sustainable development goals: ready for a paradigm shift?. *Globalization and health*, *11*(1), 1-13.

CEPS and ISIS (2015). FLAGSHIP – Forward Looking Tools and Methods for Answering Major Societal Challenges – European Policy Brief. Authors: Alcidi, C. (CEPS), Sessa, C. and Ricci, A. (ISIS). Available online at: https://ec.europa.eu/research/social-sciences/pdf/policy_briefs/flagship_policy-brief_122015.pdf

Chandola, T. and Zhang, N. (2017). Re-employment, job quality, health and allostatic load biomarkers: prospective evidence from the UK Household Longitudinal Study. *International Journal of Epidemiology*. 10 August 2017. pp. 1-11.

Chaytor, S. and Staiger, U. (2012). Future of Healthcare in Europe – Meeting future challenges: Key issues in context. UCL Policy Briefing. Available online at: https://www.ucl.ac.uk/public-policy/for-policy-professionals/research-insights/FHE-print.pdf

De Blasio, B. (2016). Healthier Neighbourhoods Through Healthier Parks. *The Lancet,* 388 (10062), pp. 2850–2851.

Dyg, P.M. (2014). Fostering Food Literacy and Food Citizenship through Farm-School Cooperation and beyond: Theoretical Perspectives and Case Studies on Farm-School Cooperation and Food and Agriculture Education. Ph.D. dissertation, Department of Planning and Development. Aalborg University.

EEA (2006). Urban sprawl in Europe. The ignored challenge. EEA Report no. 10/2006.

EEA (2015). Air quality in Europe — 2015 report. EEA Report no. 5/2015.

EC (2012 a). Active Ageing. Special Eurobarometer 378. Available online at: http://ec.europa.eu/public_opinion/archives/ebs/ebs_378_en.pdf

EC (2012 b). Employment and Social Developments in Europe 2011. Available online at: file:///C:/Users/oem/Downloads/ESDE_2011_web_4.1.2012.pdf

EC (2014 a). Digital Skills and inclusion – Digital Agenda Scoreboard 2014. Available online at file:///C:/Users/oem/Downloads/DigitalinclusionandskillsintheEU2014PDF.pdf

EC (2014 b). Measuring Digital Skills across the EU: EU wide indicators of Digital Competence. Available online at https://ec.europa.eu/digital-single-market/en/news/measuring-digital-skills-across-eu-eu-wide-indicators-digital-competence

EC (2014 c). The 2015 Ageing Report. Underlying Assumptions and Projection Methodologies. European Economy 8|2014. Available online at: http://ec.europa.eu/economy_finance/publications/european_economy/2014/pdf/ee8_en.pdf

EC (2016 a). *EU Reference Scenario 2016. Energy, Transport and GHG Emissions. Trends to 2050.* Brussels: European Commission Publications Office.

EC (2016 b). Digital Futures. Final Report. A Journey into 2050 visions and policy challenges.

EEA (2014). Waste prevention in Europe — the status in 2013. EEA No 9/2014. Available online at: file:///C:/Users/oem/Downloads/EEA%2009%202014%20Waste%20prevention%20(1).pdf

EEA (2015). Air Quality in Europe – 2015. EEA Report No 5/2015. Available online at file:///C:/Users/oem/Downloads/Air%20quality%20in%20Europe%20-%202015%20report%20(1).pdf

EPHA (2016). Agriculture and public health Agriculture's impacts on public health. Available online at: https://epha.org/wp-content/uploads/2016/05/Agriculture-and-Public-Health_EPHA_May2016-2.pdf

EPSC (2016). The Future of Work – Skills and Resilience for a World of Change. EPSC Strategic Note No. 13. Available online at: https://ec.europa.eu/epsc/sites/epsc/files/strategic_note_issue_13.pdf

ESPAS (2015). Global Trends to 2030: Can the EU meet the challenges ahead?. Available online at: http://ec.europa.eu/epsc/sites/epsc/files/espas-report-2015.pdf

EXPH (2015). Disruptive Innovation. Considerations for health and health care in Europe. EC Public Opinion. Available online at: http://ec.europa.eu/health/expert_panel/sites/expertpanel/files/012_disruptive_innovation_en.pdf

EU SCAR (2015). Agricultural Knowledge and Innovation Systems. Towards the Future – a Foresight Paper. Available online at: https://ec.europa.eu/research/scar/pdf/akis-3_end_report.pdf

Freeman, R. B. (1999). Solving the New Inequality in Cohen, J. and Rogers, J. (eds.) *The New Inequality: Creating Solutions for Poor America*. Boston: Beacon Press.

Frey, C. B. and Osborne, M. A. (2013). The future of employment: How susceptible are jobs to computerisation?. Available online at: https://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf

Gascon, M., Triguero-Mas, M., Martínez, D., Dadvand, P., Rojas-Rueda, D., Plasència, A., & Nieuwenhuijsen, M. J. (2016). Residential green spaces and mortality: a systematic review. *Environment international*. No. *86*. Pp. 60-67.

Giles-Corti, B., Vernez-Moudon, A., Reis, R., Turrell, G., Dannenberg, A. L., Badland, H., …and Owen, N. (2016). City planning and population health: a global challenge. *The Lancet,* Vol. 388, pp. 2912–2924

Hersent, O., Boswarthick, D. and Elloumi, O. (2011). *The Internet of Things: Key Applications and Protocols*. Second Edition. New York: Wiley.

Keynes, J. M. (1930). Economic Possibilities of Our Grandchildren. Available online at: https://www.marxists.org/reference/subject/economics/keynes/1930/our-grandchildren.htm

Khan, J. (2013). What role for network governance in urban low carbon transitions?. *Journal of Cleaner Production*, Vol.50, pp. 133-139.

KCE (2016). Future Scenarios about Drug Development and Drug Pricing. KCE Report 271. Available online at: https://kce.fgov.be/sites/default/files/page_documents/KCE_271_Drug__Pricing_Report.pdf

Kleinert, S. and Horton, R. (2016). Urban design: an important future force for health and wellbeing. *The Lancet,* 388 (10062), pp. 2848–2850.

Martel, S. (2012). Magnetic microrobots to fight cancer. *IEEE Spectrum,* September 25.

McKinsey&Company (2016). Being Patient-Centric in a Digitizing World. *McKinsey Quarterly*. December 2016. Available online at: http://www.mckinsey.com/industries/pharmaceuticals-and-medical-products/our-insights/being-patient-centric-in-a-digitizing-world

Neira, M., Pfeiffer, M., Campbell-Lendrum, D. and Pruss-Ustun, A. (2017). Towards a Healthier and Safer Environment. The Lancet Commission on Pollution and Health. Available online at: http://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(17)32545-X.pdf

NHS (2009). *Fit for the Future. Scenarios for low-carbon healthcare 2030*. Available online at: file:///C:/Users/oem/Downloads/1260355467_LNhx_fit_for_the_future%20(1).pdf

OECD (2016). The economic consequences of outdoor air pollution. Policy Highlights. Available online at: https://www.oecd.org/environment/indicators-modelling-outlooks/Policy-Highlights-Economic-consequences-of-outdoor-air-pollution-web.pdf

PAHO (2015). *Preparing the Region of the Americas to achieve the Sustainable Development Goal on health*. Washington, D.C.: PAHO. Available from: http://iris.paho.org/xmlui/bitstream/handle/123456789/10016/9789275118634_eng.pdf?sequence=1&isAllowed=y/

PASHMINA (2010). Pashmina Qualitative Scenarios. D1.1. Authors: ISIS (Sessa, C., Ricci, A., Enei, R. and Giuffrè, G.) and MCRIT. Available online at: http://81.47.175.201/flagship/index.php?option=com_content&view=article&id=897:pashmina-qualitative-scenarios&catid=41:trends&Itemid=22

Piketty, T. (2014). *Capital in the 21st Century*. Cambridge: Harvard University Press.

Pollan, M. (2008). *In Defence of Food: An Eater's Manifesto.* New York: Penguin.

RIVM (2014). A healthier Netherlands: Key findings from the Dutch 2014 Public Health Status and Foresight Report. Available online at: http://eurohealthnet.eu/sites/eurohealthnet.eu/files/A%20healthier%20Netherlands%2C%20PHSF-2014.pdf

Roberts, B. W., Kuncel, N. R., Shiner, R., Caspi, A., and Goldberg, L. R. (2007). The power of personality: The comparative validity of personality traits, socioeconomic status, and cognitive ability for predicting important life outcomes. *Perspectives on Psychological Science*. 2(4). Pp. 313-345.

Sandmo, A. (1975). Optimal taxation in the presence of externalities. *The Swedish Journal of Economics*, 77(1), pp. 86-98.

SPREAD Sustainable Lifestyles (2012). Scenarios for Sustainable Lifestyles 2050: From Global Champions to Local Loops. Available online at: https://www.sustainable-lifestyles.eu/fileadmin/images/content/D4.1_FourFutureScenarios.pdf

Stuckler, D. (2008) Population causes and consequences of leading chronic diseases: a comparative analysis of prevailing explanations. *Milbank Quarterly,* 86(2), pp. 273-326.

The Academy of Medical Science (2016). Improving the health of the public by 2040. Available online at: https://acmedsci.ac.uk/file-download/41399-5807581429f81.pdf

The Economist Intelligence Unit (2011). *The future of healthcare in Europe. A report from the Economist Intelligence Unit sponsored by Janssen.* London: The Economist Intelligence Unit Limited.

UNEP (2016). Food Systems and natural Resources. A Report of the Working Group on Food Systems of the International Resource Panel. Available online at: http://www.eci.ox.ac.uk/publications/downloads/-Food_systems_and_natural_resources-2016Food_Systems_and_Natural_Resources.pdf.pdf

UK Government Office for Science – Foresight (2016). *Future of an Ageing Population.* Available online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/535187/gs-16-10-future-of-an-ageing-population.pdf

UKERC (2014). Scenarios for the development of smart grids in the UK. Available online at: https://orca.cf.ac.uk/57649/1/Scenarios_for_the_Development_of_Smart_Grids_in_the_UK_Synthesis_Report%5B1%5D.pdf

Vaughan-Whitehead, D. (2017). Curbing Inequalities in Europe – How Can Social Dialogue and Industrial Relations Help to Close the Gap?. Geneva: ILO. Available Online at: http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---travail/documents/meetingdocument/wcms_544236.pdf

Vella, S. and Wilson, D. (2017). Access to Medicine: Lessons from the HIV response. *The Lancet,* 4(4), pp. e147-e149.

Walls, H. W., Cornelsen, L., Lock, K., Smith, R. D. (2016). How much priority is given to nutrition and health in the EU Common Agriculture Policy?. *Food Policy,* Vol. 59, pp. 12-23.

Watts, N., Adger, W. N., Ayeb-Karlsson, S., Bai, Y., Byass, P., Campbell-Lendrum, D., ... and Costello, A. (2016). The Lancet Countdown: tracking progress on health and climate change. *The Lancet,* November 2016.

Whitmee, S., Haines, A., Beyer, C., Boltz, F., Capon, A.G., Ferreira de Souza Dias, B., Ezeh, A., Frumkin, H., Gong, P., Head, P., Horton, R., Mace, G. M., Marten, R., Myers, S. S., Nishtar, S., Osofsky, S. A., Pattanayak, S. K., Pongsiri, M. J., Romanelli, C., Soucat, A., Vega, J. and Yach, D. (2015). Safeguarding human health in the Anthropocene epoch: report of The Rockefeller Foundation–Lancet Commission on planetary health. *The Lancet*, *386*(10007), 1973-2028.

WHO (2010 a). A conceptual framework for action on the social determinants of health. Social determinants of health Discussion Paper 2. Available online at: http://apps.who.int/iris/bitstream/10665/44489/1/9789241500852_eng.pdf

WHO (2010 b). Mental health and well-being at the workplace – protection and inclusion in challenging times. Available online at: http://www.euro.who.int/__data/assets/pdf_file/0018/124047/e94345.pdf

WHO (2012). The European health report 2012 – Charting the way to well-being. Available at: http://www.euro.who.int/__data/assets/pdf_file/0004/197113/EHR2012-Eng.pdf

WHO (2013). Health Literacy. The Solid Facts. Available online at http://www.euro.who.int/__data/assets/pdf_file/0008/190655/e96854.pdf

WHO (2016). Urban green spaces and health - a review of evidence. Copenhagen: World Health Organization Regional Office for Europe.

Zimmerman, E.B., Woolf, S. H. and Haley, A. (2015) Understanding the Relationship Between Education and Health: A Review of the Evidence and an Examination of Community Perspectives in Kaplan R., Spittel M., David D. (Eds). *Population Health: Behavioral and Social Science Insights*. AHRQ Publication No. 15-0002. Rockville, MD: Agency for Healthcare Research and Quality and Office of Behavioral and Social Sciences Research, National Institutes of Health.

Annex 1 – Full FRESHER Storylines

"The rich get healthier" Scenario

Evolution	Snapshot 2050
⇓⇓⇓	European countries have witnessed a **rise in inequality** following the privatisation waves of the beginning of the century. Wealth is now concentrated in the hands of a few who live in gated areas. Society is stratified.
⇓	**Digitalisation of the economy has led to high structural unemployment**. Technology is owned/controlled by a limited number of private companies, pursuing profit-seeking behaviours and collecting all the productivity gains without sharing it with workers. With few exceptions, most workers have temporary jobs with severe impacts on their private life and their health.
⇓⇓	**Exclusive medical innovations.** Innovation in medicine is financed by private companies, focusing on new health solutions for diseases affecting wealthy people, to ensure high monetary returns to R&D investments.
⇓	**Citizens are overwhelmed by commercials and information tailored by companies to shape their desires and expectations. Only few people have the knowledge and time to navigate this turbulent digital world**. For example, citizens search and appraise via the internet new and affordable medical solutions as alternatives to expensive, traditional mgedicine. However, the lack of regulation also spurs misinformation.

Reformed international climate change panels and prices on environmental goods and services. Production is reshaped with technologies and solutions to lower emissions and meet agreed targets. Environmental goods and services are considered high priced commodities for which citizens need to pay.

Beyond differences between countries, today **the world seems divided in income categories**: **wealthy strata of the population** get very old and stay healthy in their ageing, **while the poorest** either die prematurely or experience severe conditions whilst incurring diseases and disabilities Increased global cooperation for climate and environmental issues has limited consequences on migratory flows that rise for economic reasons.

Wealthier people live in similar ways around the globe with easy access to education, health services and healthy food, fast transport opportunities and ecosystem services (food, water, green areas). Conversely, those **who belong to less wealthy social groups struggle** to access high-level education and good health services, live in suburbs, depend on long travel to reach workplaces and have limited access to ecosystem services.

Polarised agriculture and food system. While rich people eat local healthy and expensive food, the rest of the population rely on junk food from global supply chains, which ignore nutritional balance.

Inequality rises. **European governments have implemented a series of structural reforms to relaunch growth.** The measures managed to **increase European competitiveness in the global market but ignored the rise of inequality.** Overall, these initiatives have worsened the gap between people on low and high incomes and the uneven distribution of capital income. The unequal distribution of the benefits of technological advances exacerbate this dynamic[56]. As a result, **disparities across Europe have increased and wealth and power are concentrated in the hands of a few. Polarization and social and economic stratification characterise society**. The situation is reflected on how cities are organised and structured, leading to segregating neighbourhoods next to exclusive rich areas. People's ability to access high level educational or health services, as well as their future jobs and lifestyles are increasingly determined by their place of birth.
As a consequence, the Gini Index has increased in all EU co
untries but not in the world. In the health sector, a wave of privatisation has made healthcare only accessible under private health insurance, with different services available according to the plan that one can afford.

Digitalisation splits the labour market and divides the society. Competition among private firms drives innovative efforts. Government actions has limited to regulation and allowed **structural reforms of the economy to re-launch of European industries** that are more and more concentrated and in the hands of a few. **Technological changes are focused towards maximising the profits of firms without paying attention to labour conditions.** The steady introduction of machines in manufacturing and services replace workers in routinized tasks, while increasing the demand for workers performing non-routinized tasks, either for highly educated and well remunerated workers (e.g. engineers) or for unskilled underpaid workers (e.g. delivery agents). In general, **human skills are increasingly reduced to monitoring** robots, quality check, coordination and failure control. Firms provide on the job training for those who are employed, as skill

56 EC, 2012 b.

requirements change so fast that even secondary and tertiary education cannot provide for these while those outside of the **labour market are trapped in a vicious circle without any possibility for public support or trainings**.

Social dialogue is not moderated by the government and fails to deliver benefits to workers[57]. Digitalisation has brought an **increase on the level of structural unemployment**. The **job market is flexible** and most **contracts are temporary**. Collective wage agreements and lifetime employment seems like forgotten memories of the past. Social media and the internet are used for self-organisation of low budget solutions to make it to the end of the month, such as renting rooms and sharing vehicles. The worsening of working conditions, **the lack of social support and the high competitive environment create stress, insecurity and frustration to the majority of population with indirect effects on people's health**.

Innovation in medicine is led by the private sector and highly exclusive. Public investment for medical research has fallen and been replaced by **higher investments of private firms, which are keen on offering new health solutions to the portion of the population that can pay to live longer and better**. Overall investments in R&D have risen above 3% of GDP, but with very low public participation in it. Private universities and research centres develop partnerships and financing schemes with pharmaceutical companies and the chemical industry as well as with private insurance companies. These actors orient medical research and innovation through **profit-driven logics, often ignoring the most urgent health priorities**. Significant discoveries and developments have come in the field of biomedical science and devices, human robotics, genomics, stem cells and drugs. For those that can afford them, these innovations are used also to achieve progress in aesthetic medicine. **However, these solutions are not made accessible to the majority of the population**, because big pharma companies constitute an oligopoly and keep prices high to increase profits[58]. Most people rely on drugs that are not innovative, because these are provided at less financial cost. Often, effective treatment exists, but is not accessible to the patients who cannot afford them because of very high prices. **Patent laws on new drugs are very strict** and centred on the interests of private investors, so that cheaper versions of the new drugs are not available. In poorer areas, some progress is made in the field of organisational innovation of healthcare, involving community knowledge, 'Traditional medicine' and social resources for poor patients' care. This regime ensures high monetary returns for investments in R&D. In contrast, the return to these investments in terms of human lives is rather low, resulting in a medical innovation pattern that is not cost-effective in social terms.

Digital skills divide citizen empowerment. The digital divide in Europe no longer concerns access to the internet **but relates to the capacity to obtain the right information and navigate in a turbulent digital world**. Since childhood, citizens are overexposed to direct - indirect - **content that creates consumption desires and life-style expectations**. Through the use of big data, companies know much about individuals that form and influence their behaviours and no government has the interest or the power to control the situation. To provide for some level of trust online, **users vote** on **whether they believe a given website text is correct or wrong**, and underlying algorithms, which can resort to millions of websites, calculate the probability of truth in a text. However, despite vast advances in computational text analyses the results cannot always be trusted. **Charities and**

57 Vaughan-Whitehead, 2017.

58 KCE, 2016.

district organisations help citizens to deal with the frequent internet fraud and support them in finding the right internet references and opportunities. Regarding health, **only well-educated people in wealthy groups of society can discern among the available information online**, pick reliable sources and enjoy the best service and offers. **These people can actually increase their healthy literacy rate and take care of themselves better**. However, for other groups in societal, the digital revolution has led to more risks than opportunities regarding health: misinformation leads too often to untrustworthy cure.

Environment is commodified. In Europe, environmental sustainability is pursued by **putting high prices on the use of natural resources and negative environmental externalities**, through Pigouvian taxation[59]. On one hand, reflecting the value of nature in prices of goods and services preserves the environment. On the other hand, it **limits the affordability of green products and environmental-friendly technology.** The private sector provides innovative, but expensive, solutions to face rich people's demand for green products and services. **Energy costs are raised** too, to limit fuel consumption, and green energy from renewables is expansive because of high private investments required for it, resulting eventually in a limited access of poor people to energy[60]. **Overall, the consumption pattern is polarised**, with rich people that can pay for expensive green-washed goods and services, including sustainable transportation, and poor ones that cannot afford them. Indeed, **people in lower income groups end up adopting lifestyles towards decarbonisation**, although **driven by economic struggles** rather than full environmental awareness. For example, recycling rises among these groups to cut household expenditure and energy savings are 'forced' to cut bills. **Frugal innovation** among these groups also leads to **new green technologies** that concur to lower the carbon footprint of the European economy. Apart from some non-EU countries that are still too uncertain in their development process to commit to strict environmental regulation, **global governance is enhanced to reinforce international agreements on climate change**, which is kept under control. There are still few areas of the planet that are threatened by sporadic extreme events due to worsening of climate change in previous decades. However, the planet's environment is improving overall, thus mortality and communicable diseases from environmental disasters decrease considerably. Global temperatures are kept within the set limits for human survival and heat waves do not occur in Europe, lowering the number of people suffering cardiovascular disorders linked to these causes[61].

Europeans are older, but only somewhat healthier. The old-age dependency ratio has raised, so that **it is hard for public finances to cover the rising costs of healthcare and social security resulting from the ageing of the population**. People are increasingly required to work longer in life although this is only an option for a limited number of people due to deteriorating health conditions due to ageing. **The health situation of older groups in society is not homogeneous**. **Wealthy strata of the population** get very old and stay healthy in their later life, **while the poorest** either die prematurely or experience difficulties such as diseases and disabilities. This divide in elderly citizens' health status is the result of different lifestyles between the rich and poor. Rich people act for prevention and access adequate healthcare throughout their life. By contrast, people with low income are not well educated and cannot afford appropriate prevention and care measures.

59 Sandmo, 1975.
60 UKERC, 2014.
61 Whitmee et al., 2015.

Frustration is widespread among disadvantaged groups and the effects of which are particularly noticeable amongst elderly citizens amid a rise of alienation and cases of depression. Although life expectancy has risen for Europeans overall, **this translates into an increase in the number of healthy life years for only a minority in society. For the majority of the people, especially in lagging regions, there is no prospect for a healthy longer life.** Global cooperation on climate and environmental issues has limited consequences on the migration flow. European and international migrants move towards urban areas in the search of employment, but often end up being marginalised.

***A tale of two cities*[62].** In the pursuit of economic development, local authorities attempt to attract investments of private corporations by dismantling social and environmental regulations. Suburban areas develop but with a dual pattern, which differentiates according to the level of income of residents. **The same city seems divided in two**. **In one part, citizens live in eco-efficient buildings, consume renewable energies provided by solar panels, and move in electric cars in districts shaped by eco-friendly infrastructures, green areas and urban gardens.** In these wealthy neighbourhoods, essential services are at walking distance and gated parks ensure a green space to socialize and practise physical activities. However, **access is strictly reserved** to people that can afford living there and private consortia finance and regulate these areas. **In the other part of the city, citizens face fuel poverty and have not enough money to carry out renovation works on their buildings. In these areas, mobility is a challenge** as public transport capacities are reduced significantly after the privatization process, with private cars representing an expensive alternative. In addition, the absence of green areas, inadequate waste disposal systems, as well as frequent traffic jams make streets an unpleasant and unsafe place to walk or cycle. In some cases, sharing initiatives such as car-sharing, car-pooling, and co-working create valid opportunities although most citizens lack the necessary trust and social skills to be part of them. Inadequate response of public and private actors to migrants' resettlements in these areas trigger competition, frustration and social tension. Due to increased frustration of people regarding the precarious economic conditions and increased social inequality within the city itself, there is a rise in crime and insecurity in general. Due to the lack of coherent and comprehensive approach to improve the urban environment air pollution levels do not decrease considerably.

The European food system is dual. Due to a big divide in demand and income levels, Europe relies on **two different parallel food systems.** In both systems, **food is a commodity like all the others in the society**, given a price by market forces and consumed as a status symbol. **On the one hand, organic farming and local, seasonal food production for diversified diets** is prevalent in Europe and has gained popularity among those that are well-informed on nutrition issues and the long-term benefits of eating well. This sector is purely market-driven, because the CAP has been largely dismantled and agricultural subsidies have fallen as a result. In addition, agricultural land is largely dedicated to the production of biofuels, which increases its price. Therefore, European food is more expensive than in the past, also because, to protect the environment, intensive agriculture is limited, avoiding chemicals and pesticides. Therefore, **organic short-chain food is very expensive and only few can afford it.** Privileged groups engage also in self-production of food, in small farms in the countryside, where they go for holidays, or undertaking urban farming activities, which have become fashionable in wealthy neighbourhoods in cities. In these areas, urban gardening practices

62 Quote from the website: https://www.theguardian.com/world/2013/sep/14/new-york-tale-of-two-cities

include the use of innovative technologies which are also used for green walls. **On the other hand, the majority of the population relies on global supply chains for affordable food and drinks**, because they cannot pay for food produced in the European countryside and they do not have access to land and green areas in cities. Food trade has been largely liberalised in Europe and few **Transnational Food Corporations provide a small variety of cheap processed junk food and industrial soft drinks.** There is no government control on food and drinks that are commercialised by these companies and largely misleading marketing activities persuade most people to consume these products. Maximising profits at the expenses of quality, these processed foods and drinks tend to exceed the recommended limits of sugar, salt and fats, but poor people still consume them largely because of lack of both money and correct information. Within this context, the impact of diets on Europeans' health is sharply differentiated, depending on the social group to which one belongs. Wealthy groups eat following healthy diets based on balanced fresh products. This leads to important long-term health benefits, which however remain a prerogative of rich people. The rest of the population consume constantly unhealthy food and drinks and thus excessive levels of salt and sugar, which undermine their health status[63]. Outside the highly liveable gated communities, life's choices are limited as a result of unequal political, social, and economic structures and people resort to tobacco, drugs and alcohol consumption as well as unhealthy nightlife to cope with the reality.

63 Stuckler, 2008.

"We will health you" Scenario

Evolution	Snapshot 2050
⇑⇑	**In a competitive world, equity is reached in** the EU by ensuring that economic growth leads to (some) social progress. In Europe, equity is improved thanks to the **new wave of economic growth and targeted redistribution policies**.
⇑⇑⇑	Europe is a **dynamic and innovative economy competing with emerging economies' cost advantage by delivering high-quality goods and services.** The European knowledge society, led by a top-down approach- makes the **most of technological advancements** although the boost in productivity does not entail **any radical changes in the production system.**
⇑⇑⇑	**Breakthrough in personalised medicine.** Thanks to government- managed big data, implanted chips and gene scans personalised prevention and treatment, including tissue regeneration, are accessible.
⇑	Uniform society in which on line **information is strictly controlled**. A new order is set in the digital world, now governed by an alliance of governments, industries and citizens' representatives **to serve public policy goals.**
⇓⇓	**Growth beyond environmental limits.** Increases in production and consumption put pressure on ecosystems. Green investments are only undertaken if economically profitable.
⇑⇑	Europeans are old but healthy and work longer to sustain themselves and to be part of the work-oriented society. Migration rises but the EU accepts only those who can match the qualification needed in the EU economy.

Cities are the engine of growth and first and foremost place to work. **Urban planning aims at offering the optimal condition to work (housing, transport and health services) and disregard everything that is not related to productivity, including environmental issues.**

Industrialised agriculture. There is widespread use of chemicals and biotechnologies to increase agricultural production. Food is produced in laboratories and diets are monitored to ensure the intake of balanced nutrients.

Europe is an equitable society. **European governments have undergone a series of structural reforms to relaunch growth.** Following the OECD "Going for Growth framework"[64], public policies have reformed the sectors related to product and labour market regulation, education and training, tax and benefit systems, trade and investment rules and innovation policies. **Measures to facilitate wage adjustments and reduce labour costs have fostered job creation**. The difference between low and very high earnings and the uneven distribution of capital income has been mitigated thanks to taxation and economic reforms[65]. **Social policy is well designed to guarantee universal access to services and public goods, such as education and healthcare**. Education represents a life-long learning process crucial to continuously enhance citizens' work skills[66]. Pay gaps have been closed and there is not much difference in salary throughout the lifetime and among professions and social groups. The gender pay gap has disappeared. Tax evasion is almost defeated thanks to high level of monitoring through digital advances, including the use of big data by the government. The unemployment rates of older people are on the same level as other age groups.
Consequently, the Gini Index has decreased for European countries, but not in all world regions. In Europe, poverty rates are low and access to health services is ensured. In addition, the national health systems are using individual health data to regularly monitor the level of public health and health research is also using such data to develop counter measures if necessary or improve treatment, prevention and care.

Robots and employees go hand in hand: The **European economy** is very **dynamic** and **innovative**, with industries gaining a lead market in some niches. Through innovation and the creation of new industries, new job opportunities emerge to offer employment opportunities to those whose jobs have been displaced through increased automation[67]. By offering high-quality goods and services, Europe enhances its global competitiveness in relation to emerging economies that exploit instead their cost advantage. Firms across all sectors of the economy are mainly **digitalised and highly interconnected**. Data collection and management on both the production and consumption side allows for **increased efficiency** and meeting an **increasing differentiated demand for goods and services.** The Internet of Things[68], which allows for connecting basically any devices to the internet, is a widespread reality and offers new opportunities for business models, products and services. The **increases in productivity** due to digitalisation **are fairly shared through a balanced social dialogue between firms and workers**, leading to better working conditions overall. For example, parental leave for both men and women is fully integrated in social security scheme for all workers and a well-planned **social safety net** deals with temporary short-term structural unemployment.

64 See the website: http://www.oecd.org/eco/growth/goingforgrowth.htm

65 EC, 2012 b; Piketty, 2014.

66 In reference to the Amartya Sen's concept of capability

67 ESPAS, 2015.

68 Hersent, 2011

The general aim is **to foster productivity and keep the workforce as healthy** as possible. However, the introduction of ICT in workplaces lead to a situation where surveillance devices do not only monitor health for workers' private use. **Many companies also monitor if their employees** have healthy life styles, stay away from drugs or abuse of alcohol, for example.

European medicine is personalised for treatment. Public budget allocation sets the target of medical R&D above 3% of GDP. **Health research is led and well-coordinated by public bodies at a European level, fostering collaboration and synergies across countries as well as partnerships with private companies.** Being oriented to meet the most urgent health priorities, significant discoveries and developments have come in the field of **'Omics' medicine[69].** Therefore, personalised healthcare since birth plays a fundamental role in prevention and in treatment, which include regeneration of tissue. **New-born babies get a gene scan** to find out what their predispositions are and the gene scan is run in a microsimulation model, taking all kinds of environmental factors into account. According to the results of the scanning, **a life-long health plan is worked out for the child and adjusted throughout life according to changing parameters**. Implanted chips help to monitor health status throughout the life course and develop **personalised treatment, including personalised drugs.** Data from chips and health apps are used by the public health sector to strengthen health research and advancements in treatment. **Virtual healthcare** has become a reality thanks to fast digitalisation. Online health visits increase to lower the pressure on hospitals and healthcare centres, allowing for daily check-ups[70]. Micro-robots allow surgery to intervene on most pathologies[71]. New drugs, micro-surgery, other treatments and medical devices are **largely affordable because the drug pricing framework has been reformed to reflect a fair balance between intellectual property and public health rights.** Capped prices, attentive regulation on patents that allows for the production of generic drugs few years after the discovery and public-private partnership to finance investment in medical research lower the monopoly and power of big pharma on medical innovation. To access public funds many companies subscribe voluntary agreements on tiered prices and short-term patents release[72]. The WHO gains a stronger role in orienting medical research and regulating equitable access to the latest innovations and key drugs[73]. In such a way, the returns to R&D investment in terms of human lives are high and also monetary returns for private investors are ensured to some extent by government funding.

High control for the good of society. After major security crises, the EU institutions has **enforced public control of what is online**, to avoid dilution or manipulation of information, but also to spread key political messages. People are not free to share or access everything online as a **government body checks for reliable information but ends up censoring to some extent**. The use of the internet is shaped to serve the social goals and priorities set at government level. **Social media is used by almost everybody** and present in every sphere of life, conveying the impression that people can access all information and knowledge. Though most people in the EU have a **high degree of digital skills,** they stick to their favourite digital communities to discuss national, regional issues

69 "Omics is the study of particular types of information (such as, for example, genomics), typically on a complete or massive scale". Definition from the website: http://precisionmedicine.ucsf.edu/content/omics-medicine

70 NHS, 2009

71 Martel, 2012

72 KCE, 2016; Vella and Wilson, 2017

73 NHS, 2009.

rather than engaging in full-blown political debates**.** Social media and all kinds of ICT are also frequently used for educational purposes for children and adults. Education is seen as life-long learning, training on and off the job is supported by employers. **An implanted chip monitors individual health.** It started as a measure to keep each citizen well informed regarding benefits and drawbacks of their lifestyles but it has transformed into a surveillance system: any unhealthy behaviour is detected and may lead to fines. **Alignment to the proper health behaviour credo is much appreciated in society and by employers**. Off-path behaviour can increase personal health costs considerably. For example, smoking or a lack of physical activity increases the social insurance contribution significantly. By law, **governments strictly control big data, the use of which for economic purpose is allowed for companies only in exceptional cases and to develop synergies between business and government actions.**

Environment is undermined by the growth paradigm. Given the focus on ensuring productivity rises, **actions to lower CO2 emissions have constantly been postponed and not given first priority.** People consume more as they are wealthier, pressuring waste and water management systems. Economic growth is pursued **without taking into consideration the limits of natural resources and environmental protection**. Environmental requirements and regulations on industrial activities have been loosened in order to allow companies to produce at a faster pace, stay competitive and invest in the improvement of working conditions. Therefore, **the industrial structure has not undergone a green transformation** for cleaner production processes. There is higher employment of machineries in production, which raises companies' energy consumption, but investments in green technologies have been hindered by the need to keep costs low and are undertaken only when these technologies effectively allow for consistent energy saving. The transport sector has grown, pulled by a steady rise in the demand, but without a significant introduction of electric vehicles and low-emission technology. Overall, energy consumption has increased, but without a substantial diffusion of renewables in the European generation profile[74]. Under the pressure of keeping growth rates high, **international agreements on climate change have been watered down**, so only minor progress is made in tackling this challenge. The effects of climate change are dramatic in certain areas of the planet, causing more and more extreme events that lead to increases in mortality in those areas and migration waves to the EU. Global warming keeps worsening and heat waves multiply in Europe, where cardiovascular diseases rise due to warmer temperatures[75].

Old happy workers. Due to **revised welfare schemes and people working longer**, the dependency ratio is kept under control and social security finances are sustainable. **Governments and private companies are keen to keep their workforce healthy and happy for as long as possible**. The **continuous control from the government and the companies** allows the protection of? citizens' health and, especially for the elders, to intervene promptly when emergency health issues, such as heart attacks or strokes, arise. The state monitors the health status of the population through microchips implanted to everyone at birth, to avoid excessive costs of having unhealthy aging populations who are not able to work. Companies have adapted work conditions and work places to the needs of elderly people. Most places have their own canteen and offer medical services, as well as sports and leisure facilities which, in turn, enhance profits through enhanced satisfaction

74 EC, 2016 a.

75 Whitmee et al., 2015.

and productivity of workers. **However, once people retire, they are not fully able to take care of themselves and to engage extensively in social life, resulting in their marginalisation and the need to refer to healthcare systems more often. Migration waves to the EU have increased, also as a result of climate change and people are forced to leave entire areas of the planet**. Europe struggles to regulate and deal with continuous emergencies. **Migration flows are very restricted** and only those who have a high level of education and match the qualifications needed at EU workplaces get a visa with work permit, enter the formal labour market and contribute to social security.

Cities, a space to work. Inspired by a **vision of offering a good work-life balance,** European, national, regional and local authorities collaborate to relaunch European cities. **Urban planning aims at guaranteeing access to housing and essential services while mobility plans regulate daily travelling, especially for commuters**. **New social houses** for workers are built on the outskirts of cities where green areas are sacrificed for building infrastructures and roads. Ensuring good transport to reach work is a top priority pursued with a strictly regulated traffic management systems and high investment in road infrastructures and public transport service. **Security and road safety is ensured through constant ambient surveillance** but there is little opportunity to enjoy public space or walk in open air. **Big indoor leisure centres and shopping malls are the core of social life** and include recreational activities like theatres, cinemas and gyms along with shops. To promote satisfaction at work, many companies and public institutions **have their own private gyms and kinder-gardens and sponsor employers transport programs** with self-driving mini-vans. **The extensive transport network is affordable but not environmentally friendly**. The social goals in housing and transport are realised without taking into consideration **air quality and environmental issues. Thus, traffic congestion is reduced while air pollution is often at dangerously high levels. Physical activity is practiced** mostly **indoors of big air-conditioned fitness centres**, which in turn further increase combustion and air pollution.

Europeans' diet is strictly regulated. European agriculture has followed the route of **industrialisation and intensification to increase production** and meet the rising demand for food while facing scarcity in land and water availability. Land productivity has increased through the use of **chemicals and innovative biotechnology** supported by public subsidies and provided by big companies. Requiring high-capital inputs, the agriculture sector is organised according to large-scale units of production. GMOs are commonly produced and consumed, although strict government controls monitor their effect on human health. To ensure the correct intake of nutrients of citizens and since the ecosystem is worsening for natural food production, **meat is produced largely in laboratories[76], along with high protein bars and vitamins pills**, and made largely affordable by government subsidies. Canteens in both private companies and public offices serve balanced meals to workers that respect the WHO/FAO dietary targets whereas the cost of this service is contained by lowering the attention paid to food provenience. Indeed, **food and drinks are given a value only as means of survival and health promotion of the workforce.** For this reason, people's diets are highly regulated and constantly monitored both by the government and by the employers. In a context of increasing globalisation, free trade agreements for food and drinks are designed to protect European agriculture and regulate global food supply chains. These chains are dominated by Transnational Food Companies, which provide affordable but highly processed food and drinks.

76 See the conference website: http://futurefood2050.com/can-lab-grown-meat-reduce-food-insecurity/

However, government regulation is attentive to discourage consumption of unhealthy products, imposing high taxes on food and drinks that are rich in sugar, salt and fats. Thanks to the government control and partnership with private companies to ensure food security to all, Europeans maintain largely healthy diets, which are balanced in terms of nutrients and limit the consumption of salt, fats and sugar[77]. Also alcohol and tobacco consumption is strictly regulated by law and thus strongly limited.

77 Stuckler, 2008.

"Healthy together" Scenario

Evolution	Snapshot 2050
↑↑↑	Equity is a global goal and goes hand in hand with sustainability goals. **Equity is fostered by highly inclusive social policies and universal healthcare,** delivered through new welfare schemes and innovative social protection programmes, New metric of development promote community engagement and explore completely new solutions
↑↑	**Digitalisation has facilitated the transition towards a circular economy** and reshaped society. **Machines are used to decrease working hours and the gains from the increase in productivity are shared among workers** through **social dialogue**.
↑↑	**Disruptive innovation and access to medical innovations enhances treatment outcomes and prevention on a personal and community level.** Progress in medicine is made thanks to new organisational practices.
↑↑↑	Slow society, diversity of cultures. **Citizens are well educated, connected, and aware**. Citizens have reached a level of empowerment that allows them to use social networks to enhance their public engagement and look for health support when needed.
↑↑↑	**Circular and decarbonised economy.** Any investment is assessed against social and environmental goals. Everybody contributes to reduced carbon emissions.
↑↑↑	**Elderly citizens are healthy and active in society thanks to the combined effect of individual behaviours and welfare reform.** Thanks to a new global coalition to promote the sustainable development of most of the world's regions, **there is a recognised right of free movement of people but number of migrants is reducing.**

Smart and environmentally and socially just cities. Cities are greener, less congested and less polluted thanks to smart urban solutions and the engagement of citizens' networks.

Local production of food and urban gardening. Sustainable agricultural practices are widespread and people prefer to consume fresh local food, due to an awareness of health benefits and the assignment of a social value to it.

Now something completely new. A completely new approach has emerged to cope with inequality challenges and the drivers of unsustainable growth. Now, governments aim at a **greater "democratisation of wealth creation"** instead of the mere **"redistribution of income"**[78]. The emphasis of this **new approach is on an ex ante democratisation of wealth creation, rather than on ex post equalisation of income, and this shifts the focus from redistributive policies to fostering new democratic wealth institutions**[79]. As a consequence, the Gini Index has decreased for all countries reaching values close to zero, disparities across the world have been strongly reduced and social cohesion is enhanced. On the one hand, the reduction of inequalities in important health determinants, such as income, employment and education, smoothens the disparities in health conditions among different social groups. As living standards rise for all, individuals are able to self-take care of their health and prevent NCDs through their lifestyles and throughout their entire life. On the other hand, universal access to healthcare fosters prevention and fair high-quality treatment for all.

Digitalisation leads to better jobs and more free time. Digitalisation has accelerated the transition towards a circular economy. As opposed to humans going 'the way of horses'[80], initial unemployment through automation has been combated through the implementation of **attentive labour policies**. Public programmes ensure workers' skill upgrade to match the needs of eco-industries based on the new circular business models. In addition, social innovation mechanisms enable the **transfer of resources from most progressive sectors to the "stagnant sectors"** such as education, health, and personal services where productivity cannot be radically improved for structural reasons[81]. In the circular economy, the importance of intangible goods is recognised with initiatives being put in place to foster cooperation amongst citizens for the provision of services that cannot be sold in the market. The result is a **renovated era of wealth for Europeans**. There is a low unemployment level, **universal basic income** that gives people the option to explore what they like and **reduction of working hours which allow** for more free time without reductions of available income. As a result, there is a **balance between work and life balance** which allows more time for people **to take care of their family, including on terms of health, and to engage in social initiatives and voluntary work**.

78 ISINNOVA, CEPS (2014) contains a number of system-wide wealth-changing proposals that have been studied to move forward this kind of policy approach. For more information visit: https://ec.europa.eu/research/social-sciences/pdf/policy_briefs/flagship-policy-brief.pdf

79 As the Harvard economist Richard Freeman (1999) states, the essential principle of such an approach entails, "Equality of income obtained in the first instance via greater equality in those assets, rather than as an after-the-fact (or earning or luck) state redistribution of income from rich to poor, would enable us to better square the circle of market efficiency and egalitarian aspiration".

80 Quote from Erik Brynjolfsson and Andrew McAfee (2015) commenting Leontieff's theory on labour and technology.

81 ISINNOVA, CEPS (2014), with reference to Baumol (2012). According to Baumol (2012) the cost disease is a structural phenomenon, by which the costs of health care, education, live performing arts, and a number of other economic activities known as 'personal services' are condemned to rise at a rate significantly greater than the economy's rate of inflation.

Disruptive innovation has revolutionised European medicine. Investments in medical R&D are undertaken by governments and private companies **in close cooperation with civil society, which participates in orienting, informing and testing medical innovations** that respond to the health priorities of society as a whole. **Health research is transdisciplinary to take into account the interaction of all health determinants**, and health outcomes are considered in researches in all other sectors. Important discoveries are made in the field of prevention and are effectively communicated to re-orient policy and people's lifestyles to avoid unhealthy situations and habits[82]. Innovation comes also from the **integration of alternative medicines** in the European health sector, which moves beyond a pure biomedical approach. This participatory approach to health research delivers **important "disruptive innovation"[83],** which allows for improved health outcomes without significant increases in health expenditures. This innovation brings about effective person-centred care, based on new technologies that allow for early diagnoses and personalised medicine[84] as well as on community-based highly decentralised health delivery. Medical skills and knowledge is exchanged to the maximum possible extent amongst all healthcare staff and whenever possible is transferred to patients. Communities are empowered to allow for home-based care and strengthened prevention[85]. Thanks to new networks, practices and organisations, involving new players and new dimensions, European medicine has become people-centred, enhancing cost-effectiveness and quality of both prevention and treatment, so that the health benefits of investments for medical innovation involve the entire European population.

Citizens believe they have the power **European citizens enjoy an experiment a new attitude towards knowledge and participation**. Access to the internet is widespread and most citizens possess high digital skills that allow them to effectively **share knowledge and start initiatives** in their cities or connect their local actions with the global community. **Citizens themselves are able to discern valuable information** on the net and use social networks for enhancing, not disrupting, their social life and public engagement[86]. **Innovative participatory methods** make extensive use of digital technology. Flash-mobs to express community are widespread, apps for live-surveys use citizens' opinions to improve public services[87]. As healthy literacy rate rises[88], **people voluntary provide data on their life parameters**, such as weight, blood pressure, blood tests, and about their habits to publicly managed apps and get feedbacks on their overall health and emerging health risks, as well as health-related recommendations for self-prevention and care[89]. **Increased awareness and self-managed monitoring of health** trigger a self-determined change towards healthy lifestyles and behaviours, including diets and mobility. In turn, through **public-private partnerships**, the **healthcare system** has been **re-structured** in order to make use of these electronic records and big data. This information is shared within a clear regulatory framework protecting privacy to develop

82 The Economist Intelligent Unit, 2011.

83 "A type of innovation that creates new networks and new organisational cultures involving new players, and that has the potential to improve health outcomes and the value of health care" (EXPH, 2015: 4).

84 McKinsey&Company, 2016.

85 NHS, 2009

86 EC, 2014 b.

87 EC, 2016 b.

88 Defined as people's knowledge, motivation and competences to access, understand, appraise and apply health information in order to make judgements and take decisions in everyday life concerning health care and, disease prevention (RIVM, 2014)

89 SPREAD Sustainable Lifestyles, 2012.

precision medicine, remote healthcare services and broader research on specific diseases on large population dataset at a lower cost[90].

A circular economy for a green and clean Europe. Combined efforts, including both governments and civil society, have led to a completely restructured European socio-economic system centred on environmental sustainability in the development of a fully-fledged **circular economy**[91]. This paradigm change has replaced the concept of disposability with that of restoration, **moving away from a "take, make and dispose"** system towards sustainable **multiple product life cycles**[92]. Recycling is at its maximum and toxic materials are banned[93]. This leads to less production of waste as well as to **considerably reduce CO2 emissions** from production processes, because people consume less. Energy consumption is not only more efficient but also reduced overall, thanks to greener industrial technologies, appropriate buildings and public awareness on the environmental footprint of individuals' actions. The socio-economic system, including transport, has been decarbonised and **electricity is generated largely by renewables and distributed through smart grids**. Renewed **global commitment** around environmental sustainability has led to **enhanced international agreements to tackle climate change**, taking on board also emerging countries. Global collective efforts deliver substantial improvements to the environment. As a result, climate change and global warming has stagnated. Environmental emergencies, such as floods and tornados, are limited and heat waves are less frequent. This lowers the incidence of communicable diseases and deaths from these extreme events and cardiovascular disorders due to hot temperatures decrease[94].

Europe has grown old but healthy. Elderly are healthy and active in society thanks to the combined effect of individual behaviours and welfare reform. **People take care of their health and lifestyles** and a **strong sense of community** allows for cooperating and exchanging knowledge, experience and voluntary services between young and old. The city has been reshaped to create age friendly neighbourhoods and buildings: urban planning encourages physical activity, easy access to services and provides public spaces to socialise and work together[95]. People take care of each other, thanks to the **renewed sense of belonging, increased availability of time, and the opportunities offered by new technologies**[96]**.** Families are enlarged, open and strongly connected with their local territories and engaged with world movements. Pregnancies are well-monitored at all stages, technologically and socially supported. There is increased overall support for early child development which not? Only concerns children's health but also their social and cognitive development as well. These practices later enhance people's capabilities and drive towards healthy and active ageing. **Welfare reform supports the elderly in achieving fuller and longer lives, encouraging them to** participate in society through work or voluntary services **and ensuring life-long learning opportunities for individual re-skilling**[97]. More years in good health promotes well-

90 The Academy of Medical Sciences, 2016.

91 Whitmee et al., 2015.

92 CEPS and ISIS, 2015.

93 EEA, 2014

94 Watts et al., 2016.

95 Top three priorities identified by the Special Eurobarometer 378 when asking the question "where are improvements most needed to make your local area more "age friendly"?" (EC, 2012 a)

96 See the website: http://hogeweyk.dementiavillage.com/en/

97 UK Government Office of Science, 2016.

being and postpones dependency, retirement and health care costs. Enhanced global cooperation between different actors promotes the sustainable developments of most of the world regions resulting in **the reduced number of migrants**. **Now frontiers are open and people are able to travel and set in different world areas in a new climate that favours cooperation and integration**

Cities are reclaimed back by the people. Inspired by a **new vision of living and sharing space,** policy-makers, industries and citizens' networks collaborate closely to renovate cities. The main aim is to create **cities as well as networks of small cities**[98] **that are lively, healthy and sustainable**. The majority of European cities have approved plans to become **carbon neutral** as well as sectoral plans to **restructure the city through mix-land** use and **mobility plans that promote public transport use**. Public transport offers efficient services with zero emissions vehicles for fares adapted to citizens' income. Taxes and tolls make individual transportation, apart from bikes, very expensive with the exception of emergency services and for people with highly restricted mobility. **Renewable energies are now a common feature of the cities' skyline**: photovoltaic roofs are included in public and private buildings alike. **Buildings are retrofitted to become energy efficient and new ones are built as passive houses**. The inclusion of green walls and roof gardens and plants on balconies change the cities' skylines. Cities and citizens' networks collaborate to create and maintain inclusive and accessible green areas and public spaces. Parks represent intergenerational spaces where children go to play, seniors gather to socialise, families spend their free time and youths play sports[99]. Social innovation and participatory processes have raised **risen awareness and created a new sense of community**. The new mobility patterns have **reduced air pollution**[100]and **fostered physical activity** and **social cohesion**[101]. The accessibility of public safe spaces and green areas contribute significantly to mental, physical and social health.

Europeans "eat food, not too much, mostly plants[102]". European Agriculture is focused on the **production of local, sustainable and quality food to ensure the right intake of nutrients for all.** The Common Agricultural Policy (CAP) aligns the budget allocations to the WHO/FAO dietary targets. The same targets inspire the rationale for food trade agreements and public food procurement[103]. **Fresh vegetables, fruits, legumes and cereals constitute the bulk of Europeans' diet,** while meat consumption has declined. Accompanied by large reforestation projects, small-scale farming, largely producing organic food, gains competitiveness and is able to meet the food demand, which is contained thanks to a sharp **reduction of food waste**. **Permaculture is prevalent and people are willing to adapt food consumption to the availability of seasonal products**, which also allows for a diversified diet. Food products are fully trackable or traceable? Through the supply chains, most of which are very short because of fully developed local production systems, which provide food at fair prices for both producers and consumers, often through **farmers' markets, food cooperatives and direct selling**[104]. There is low demand for frozen products, ready-made meals and industrial soft drinks from global supply chains, because **food is given a shared social value** and people dedicate

98 PASHMINA, 2010.

99 De Blasio, 2016.

100Giles-Corti et al., 2016.

101 Kleneirt and Horton, 2016.

102 Quote from food writer Michael Pollan (2008).

103 EPHA, 2016; Walls et al., 2016.

104 Bock et al. 2014.

time to go grocery shopping, cook, prepare home-made juices and cakes, eat together, and grow some of their food, even. In fact, education on nutrition and agriculture, including in cities, is enhanced thanks to **urban gardening, on both public and private land, which is no longer only a limited trend but a widespread reality and serves social functions too**, such as the integration of migrants, marginalised communities and therapy gardens. Large school gardening projects are run by private companies, publicly-funded or managed by community cooperatives, which leads to great value in the education sector being created out of green areas devoted to farming in cities[105]. By engaging in activities like these, people become more conscious of nature, food, nutrition from an early age. On the one hand, healthy food is largely available and affordable. On the other hand, people appreciate the value of healthy nutrition and wish to pay for it over spending money for electronic devices or expensive cars. As a result, Europeans are well prepared to have healthy diets that provide for the correct intake of nutrients through natural food and drinks, reducing risk factors to non-communicable diseases (NCDs). Since processed food and drinks are not appreciated, fats, sugar and salt consumption is very low[106]. Alcohol and tobacco consumption is limited, characterised more as a social pleasure rather than an individual daily habit.

105 See the website: http://www.fao.org/schoolgarden/

106 Stuckler, 2008.

"Desolation health" Scenario

Evolution	Snapshot 2050
⇓⇓⇓	**European society is highly unequal due to the collapse of social policies, ever-lasting** economic stagnation, the inadequate organisation of public authorities and widespread corruption.
⇓⇓⇓	Technological change has continued in terms of digitalisation but most **EU countries have failed to take advantage to create new jobs and re-organise economic activities.** EU countries have lost their competitive advantage in the world market.
⇓⇓⇓	**No significant discovery in medicine.** Investments in R&D are stagnating and undertaken only by big pharma in partnership with insurance companies. These actors focus on expensive quick-fix health solutions and drugs.
⇓⇓	**Internet is used to escape reality**. More than before citizens need to live in a 'second life' on the internet and are willing to sacrifice social interactions to maintain their on-line "status". Furthermore, a black market ruled by hackers is flourishing which gives people access to services and materials that are usually too expensive or hard to find in the formal economy. There is an increase **of the use of on-line games in the health sector to help promote and test medicine and treatments**.
⇓⇓⇓	**Environmental break down and economic war over resources.** Environmental resources are scarce and cause conflicts worldwide. Climate change is worsening, causing continuous environmental emergencies and threatening human survival in many areas.

The European population has aged without taking any precautions with regards to health insurance, relying on the existing but failing European social security of previous decades. The p**ublic healthcare sector is collapsing in most countries**. Europe is no longer an attractive place for migrants with a wave of migration of European citizens underway.

Cities are constantly engulfed in financial crises due to the impoverishment of the population and persistent corruption. As a consequence, the provision of essential services is reduced. People live in polluted, chaotic cities that are characterised by insecurity and violence.

Proliferation of global food chains. Few big corporations have monopolies and commercialise highly processed food. The intake of nutrients is highly unbalanced and the variety of food is low.

Europeans are unequal in wealth and health. **EU countries have strongly limited their social policies due to economic stagnation. The gap between wealthy and low-income groups grows with more people falling below the poverty line. Inadequate organisation of public authorities, as well as widespread corruption** reduce the effective delivery of public services further. Public goods, such as education and healthcare, are exclusively provided by the private sector with the award of contracts being undermined by a lack of transparency and accountability which, in turn, fuel allegations of corruption. In turn, the private provision of healthcare services is more extensive and readily available in economically more developed areas, with poorer areas being neglected as a result. Access to public services is therefore very limited with the number of citizens contracting diseases and unable to afford treatment rising. **Internal migration is on the rise** and governments have **enacted rules to limit the circulations of workers between European countries and regions**. More and more **resources are allocated to strengthen security** to protect the remaining rich regions against the rise of criminality due to inequality and poverty. The Gini Index has worsened for all European countries reaching values close to one and in any case above 0.5. Inequalities in socio-economic conditions are reflected in inequalities in health conditions, given the difference in lifestyles, education, living and working conditions.

Technological change leads to poorer Europeans and unfavourable working conditions. Technological advancement has proceeded but has, at the same time, been concentrated in **only certain sectors** of the economy. Along with the digitalisation of the economy, technological unemployment has risen. **Economic stagnation characterises most EU regions**. The trade balance is about to turn negative and the overall macroeconomic situation is very unstable in Europe. The lack of coordinated innovation policy has failed to restructure the economy, create new sectors and generate new economic patterns. Only few large companies manage to surf the new wave of technological change and increase revenues, but, being highly computerised, do not create jobs or do so abroad, where labour is cheaper, through fully developed global production chains thanks to digitalisation. **As a result, most European firms perish in the global market under the cost-based competition of emerging countries**. Economic stagnation coupled with the unregulated technology transformation has led to a very high level of structural unemployment and underemployment and to the diffusion of informal labour. Almost all routinized tasks are undertaken by computers whilst **most workers lack the competences to run high-skill non-routinized tasks**. On the one hand, a skill shortage creates bottlenecks and hinders economic development. On the other hand, many **workers are pushed outside the formal labour market, into backward sectors**

that are characterised by low productivity and low salary. Social dialogue has broken down amid decreasing work conditions which, in turn, make citizens more vulnerable. An increase in labour insecurity – with more work hours and less protection – leads to citizens being more vulnerable to issues of stress, whilst also having less guarantees in the form of stable contracts and adequate remuneration. Following this employment pattern, social security is very sketched and on the way to disappear. Thus very few workers can afford it to have private insurance and private retirement schemes, subscribed to on a voluntary basis. Low income and shortage of leisure time prevent people from conducting healthy lifestyles. Stress and life-long instability increase mental illnesses[107].

European medicine is lagging behind Investment in R&D is below 3% of GDP in Europe, both in the private and public sector. As public health research has significantly declined, innovation in medicine is led by private companies, through a partnership between insurance and pharma companies. These actors control health data of the population. Given economic stagnation in most European countries, health R&D investments are low and this sector has not seen significant innovations nor significant medical breakthroughs in the last two decades. General public health is taken into little consideration when investing in R&D, while medical innovation has proceeded to find high-tech quick fix solutions to face health emergencies. These solutions are accessible to people who are already sick but only to those who can afford it. The returns in terms of human lives are very limited. For example, advances in personalized medicine have slowed down, due to uncertain monetary returns to investments. Big pharma companies make money thanks to existing blockbuster drugs or slightly improved drugs to treat chronic diseases. Public healthcare provides free treatment to patients in only very limited cases[108]. Financial constraints and the monopoly on health data have hindered organisational and disruptive innovation in the healthcare system, which increases the prevalence of diseases. There are low and uncertain monetary returns to investments in medical innovation, hindering progresses in this field. Also when limited progress is made, its returns in terms of human life and the overall impact on public health is low due to a lack of access of the majority of the population.

Internet as an escape from reality. Information and communication technologies have progressed considerably but Europe lags behind. Infrastructures are not updated and most of citizens don't have the money to continuously update their technological devices and required skills to handle them. More than before, however, citizens need to live in a 'second life' via the internet and are willing to sacrifice aspects of social life to maintain their on-line "status". The internet is used to escape reality. Thus, a black market is flourishing which is ruled by hackers to give access to those services and materials that are usually too expensive or hard to find in the formal economy. In this scenario, online games have taken over a large part of online activities and are increasingly used not only to provide enjoyable entertainment but to transport and spread information of various kinds, especially for the less educated population. In the health sector, online computer games allow players to undergo virtual health checks by providing health information and health parameters as part of the game. For the poor, this is often the only possibility to get a vague idea about their current health status. Often, these games are owned by private companies that use them to sponsor and sell their products.

107 WHO, 2010 b.

108 The Economist Intelligence Unit, 2011.

Europe and the World are melting down. Political instability, economic struggle, social unrest and conflicts have dampened the enthusiasm for sustainable development that characterised the beginning of the century. This has happened in the international agenda as well as in people's attitudes and lifestyles. **Instead of preserving natural resources, countries, enterprises and individuals try to grab higher shares** of the remaining resources to the maximum possible extent. Water and land are increasingly polluted and thus scarce, with significant regional differences in accessibility to these resources. **Economic stagnation in Europe has prevented transitions to industrial processes and the introduction of green technologies**. Since R&D activities are hampered by slow growth and uncertainty for investments, the transport sector has not been interested by significant innovations to make electric vehicles affordable and widespread. While steadily diminishing, **fossil fuels are still the prevalent energy source**, because energy generation from renewables has not manifested itself as a valid alternative, due to limited investments in this field, both from public and private sources. Economic war over natural resources leads to geopolitical instability and particularly exacerbates conflicts in oil-rich regions. The weakening of EU institutions has led to the **abandonment of the EU environmental policy and decarbonisation objectives.** International cooperation focuses on military agreements, whereas initiatives to halt climate change have failed. Within this framework, the consequences of climate change on human health are dramatic and start to threaten human survival. Extreme events worldwide and in Europe cause more deaths than ever before. These events cause pandemics that rapidly spread worldwide through unregulated migration waves, leading to new global health emergencies that should be, but are not, faced globally. The number of heat waves multiply and the effects in cities are hardly bearable, so cardiovascular diseases increase consequently in Europe and other affected world regions[109].

Europe has grown old and got sick. The number of **healthy years throughout life has declined as well as the overall quality of life**. **EU social security schemes have collapsed** due to decreasing birth rates that have led to a decline of the working population to support retirement schemes. Many citizens start getting sick or suffering from reduced mobility due to their unhealthy behaviours, the constant living in unhealthy stressful environments and the complete lack of preventive measures[110]. Many workers are forced to an early retirement as they are not physically fit enough for the strains of work or suffer from burn-out syndromes or depression. With low retirement pay, advanced age is characterised by illness, physical problems and social and economic poverty[111]. Having social values evolved towards individualism, **there is no or little sense of community, thus the elderly are left by themselves and cannot even rely on informal care or safety nets**. Changes in family structures that have evolved for the last decades, resulting in one-child families or even single households add to this social misery. Most of the elderly, who cannot care for themselves any more, are therefore dependent on alternative ways of living such as flat sharing communities, to secure a minimum of social care. Such shared flats may help to overcome the sense of loneliness, however, there is lack of professional care and supervision. **Europe is not anymore an attractive place for migrants, and Europeans are migrating again in search of better working and living conditions**.

The decline of European cities. In a time of economic stagnation, European cities have lost their economic status and lag behind in terms of technological and social innovation. **Smaller cities have**

109 Whitmee et al., 2015.

110 Chaytor and Staiger, 2012.

111 UK Government Office of Science, 2016.

been abandoned whereas major cities have expanded despite the lack of a coherent plan. With few exceptions, **local authorities of metropolitan areas implement scattered, short-sighted and sectoral policies and are generally unable to respond to needs resulting from increased internal migration**. Cities are consistently put under pressure due to ongoing financial crises resulting in the impoverishment of the population which, in turn, is exacerbated by corruption. Consequently, the provision of essential **services such as waste disposal or transport is suspended or reduced.** Cities are sprawling especially because of the increasing numbers of internal migrants. In these new areas, living conditions are deplorable, due to inadequate housing, poor sanitation and waste disposal infrastructure, including limited drinking water[112]. To reach amenities, citizens embark on exhaustive trips by private fuelled cars or motorbikes on badly maintained roads, often congested by traffic jams. The potential of ICT solutions, such as car-sharing, is hindered by unclear regulation, lack of people's interest and rises in crime. Walking or cycling is almost impossible, given long distances and unsafe roads. Here, life and economic activities are characterised by informal jobs and criminal activities that generate social unrest and threaten security. Richer residential neighbourhoods develop in the absence of coherent planning, following uniquely market-driven logics. Speculation is high on land and property markets and the open land owned by the community, such as parks and other green space has been gradually reclassified and sold to brokers. Air pollution in cities increases considerably and physical activity is very limited[113]. Traffic congestion and a lack of green areas and cultural spaces for leisure time increase the level of stress and insecurity in cities. Consumerism and unawareness of healthy lifestyles, as well as unregulated business, drive people to spend their spare time in night life districts.

European food security and safety are threatened. The European agricultural sector has evolved towards industrial production but has stagnated over the last decades, pressured by the competition of **free trade agreements, like CETA and TTIP[114]**. The Common Agriculture Policy (CAP) has collapsed due to the weakening of EU institutions and the exit of some countries from the EU[115]. Only big agricultural industries have survived in the market, deploying **intense agriculture and animal breeding with high greenhouse gas emissions.** While the fertile arable land is intensively farmed by agro-corporations, the less fertile land is dedicated to the agro-processing industry, as well as high-tech and low-labour agricultural towers for livestock production and greenhouse complexes. **Fertility is low because systematic soil and humus management has been ignored** for decades. Large farms cope through the **systematic use of chemicals, synthetic fertilisers and the widespread application of broad-spectrum herbicides**, which, in turn, contribute to soil pollution and put further pressure on the environment. Thus, the entire agricultural practice is not sustainable and seriously undermines biodiversity in food production and in general in the ecosystem. As a result, food security is at risk in many European countries. Under the constraint of low income, **most Europeans have a limited diet and consume mostly cheap food and drinks provided by few Transnational Food Corporations**, which constitute a world oligopoly and control the entire market. These companies manage to avoid the introduction of regulations on products' labels and ingredients percentages in the European market, through intense lobbying activities. Therefore**, it is hard to discern the origin of these products and what they are made from.** Overall, they consist

112 EEA, 2006.

113 OECD, 2016.

114 More information at: http://ec.europa.eu/trade/policy/in-focus/ceta/ceta-explained/ and http://ec.europa.eu/trade/policy/in-focus/ttip/about-ttip/

115 EU SCAR, 2015.

only to a small extent of natural ingredients, while abounding in sugar, salt, colouring and other chemicals. As a result, food safety is also very low. To cope with high food price volatility and increase their resilience, poor people engage in **informal urban gardening and subsistence farming**, where possible. There is some form of subsistence agriculture to cope with poverty and scarcity of resources. As the poor usually do not own farming land, and urban green space is scarce, people must resort to using alternative planting areas such as balconies, to cultivate vegetables or fruits. This is often the only means of getting access to unprocessed food. Most Europeans have unhealthy and unbalanced diets, based on highly processed food and drinks, exceeding the recommended levels of sugar and salt and whilst not covering the necessary amount of natural nutrients. With most people unaware about the importance of healthy diets, alcohol and tobacco consumption is high and uncontrolled. All this delivers long-term negative effects on the population's health[116].

116 Stuckler, 2008.