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IMPACTFUL TRENDS IN EUROPE TOWARDS 2040

Related to health, health equity and the environment
following the STEEPLE (Social, Technological, Economic, Environmental, Political, Legal and Ethical) framework

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TREND
GROWING USE OF E-HEALTH SERVICES.

TREND
IMPLEMENTATION OF MIXED REALITY EXPERIENCES.

E-health refers to the appliance of information and communication technologies (ICT) in the medical sector in order to enhance health care. This trend includes the use of **mobile devices (m-health) and telemedicine**.

Mixed reality (MR) comprises **virtual reality (VR) and augmented reality** and these technologies are changing the **interaction between people and spaces.** MR advances affect how people relate emotionally with their surroundings, as information that responds to visual feedback is gathered from the external environment. It allows for the blend of voice, body, and object positioning. MR offers great possibilities for patient's treatments and prevention of diseases by adjusting the living environment to the health condition of the user.

SOME FACTS AND FIGURES

• By 2018 Europe will be the largest mHealth market worth € 6.4 billion with the highest predicted growth per year at 61.6 % (Taylor, 2015)

• E-health has the potential to save over € 59 billion globally by freeing up space, with 271.4 million square meters of urban space released for alternative use and it is expected that by 2030, 1.6 billion people will have access to E-health services (GeSI, 2015)

• A recent study across The Netherlands, UK and Germany showed that introducing home telemonitoring systems could improve survival rates by 15 %, bring a 26 % reduction in hospital days per patient and make 10 % overall cost savings through nurse telephone support (European Union, E-health plan 2012–2020)

• Some of the technologies expected to be of daily use by 2040 include Advanced User Interface Solutions (e.g. Wearable Systems, Mobile Health Apps, and Health eGame Technologies, Health Information Exchange (HIE)) with other Industries/Sectors (e.g. Banking, Security, Manufacturing, Pharma, etc.) Televideo & Home-based TeleHealth solutions interconnecting patients with health care providers, Medical Robotic devices interfaced to Health IT (HIT) systems, Open Access to Health Information & Open Data by consumers, researchers, and healthcare providers and integrative Medicine information and software modules (e.g. acupuncture, chiropractic, herbal medicine) integrated into EHR/PHR system (Groen, 2010)

SOME FACTS AND FIGURES

• The advances of this technology are so rapid that we can expect that soon AR/VR devices will have sensors that monitor brain wave activity, heart rate, and cortisol levels in the blood in order to monitor a user's stress levels. However, there is still little evidence of the effects of using these technologies (i.e. similarities to Post-Traumatic Stress Dissorder). (Virtual Reality Pop, 2016)

• It is estimated that by 2040, 70 % of couples will get together online thanks to technologies that enable from DNA and behavior matching to fully sensorial virtual dating. (Curtis, 2015)

• There is a significant increase of Apps using augmented reality for healthcare, applied mainly to help people with disabilities, from supporting doctors to illustrate procedures to facilitating visually impaired people to see and build life skills to autistic children and adults (Rothenberg, 2016)

TECHNOLOGICAL

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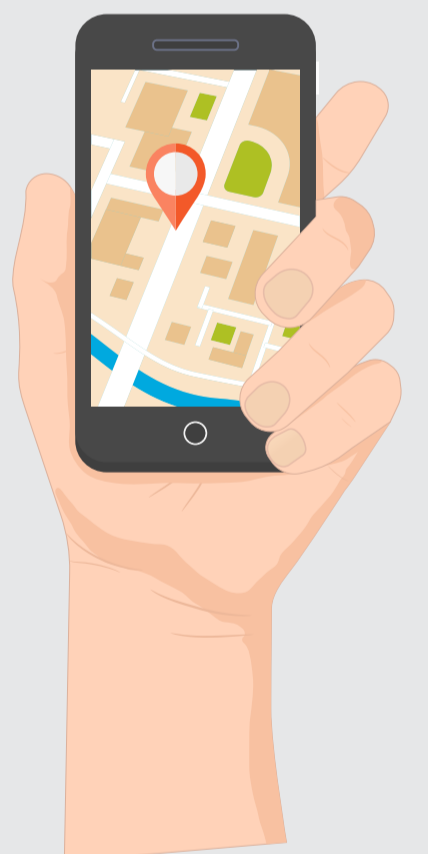
TREND
## ARTIFICIAL INTELLIGENCE FOR HEALTH CARE.

From clinical settings, where with automated assistance, the physicians could just supervise and guide the input process and to **evaluate the output of the machine** intelligence when doing diagnostics, to **healthcare analytics and healthcare robotics**, that have largely improved the quality of surgical interventions and development of orthopedic parts, AI presents itself as a low-cost solution to overcome the challenges of an aging population, offering possibilities for improving life quality conditions, providing independence to the users, personalizing health management and enhancing treatments.

SOME FACTS AND FIGURES

• It is expected that by 2018, 60 % of 30-year olds will still be living at home, yet leading individualistic lifestyles (physically). The increasing number of one-person households indicates that by 2024 there will be social robots in 30 % of single-person households. (Trend monitor, 2014)

• Domestic service robots with included health-care functions (i.e. monitoring of blood/sugar levels) or energy saving functions (sensors for air quality and lighting) are another expanding market. Sales are growing rapidly, by about 15 to 20 % annually. Adoption could accelerate even further by 2025 with an estimated potential reach of personal and home robots: 25–50 % of households in advanced economies; potential productivity and value gains: 20–50 billion hours saved per year, € 9 value per hour of time saved. (McKinsey Global Insititue, 2013)

Robots: © Shutterstock / Becris
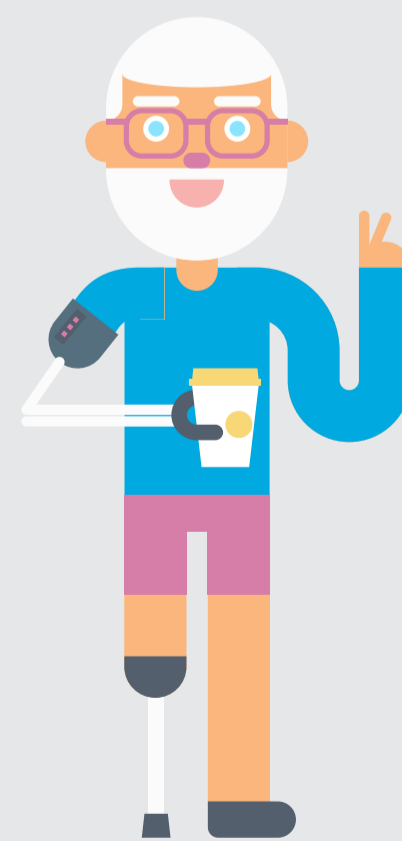
TREND
INTEGRATED TRACEABILITY PROCESSES.

The technologies used for object identification, geo-referencing, measurement of specific parameters, Global Navigation Satellite Systems (GNSS), connectivity, data storage and analysis, advisory systems, robotics and autonomous navigation have applications throughout the entire supply chain, from the field (via precision agriculture) to the end consumer (QR codes in products). **Efficient precision and tracking tools** can help building consumer trust in the value chain.

SOME FACTS AND FIGURES

• The benefits of an integrated traceability process could represent approximately € 2.7 billion to the fresh foods industry as a whole. (GS1, 2013)

• Precision farming, which could serve to cap the growing divide between the demand and supply of agricultural products in the world, is expected to grow at an estimated compound annual growth rate (CAGR) of 13.4 % from 2013 to 2018, thereby acquiring a global size of € 3.33 billion by the year 2018. (Bidnessect, 2014)

• Some of the environmental gains of Precision Agriculture are 84.5 % savings in pesticides due to early and localized pest treatment, reduction of residual nitrogen in soils by 30 to 50 % as well as improvements of phosphorus recovery of 25 %, among others. (STOA, 2016)

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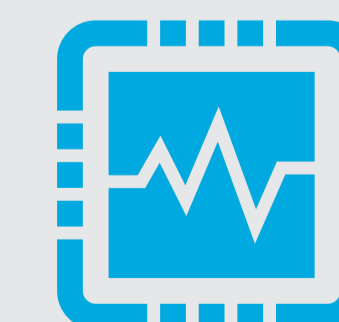

TREND
"NANO" FOR EVERYDAY LIVES.

From therapeutic use to integrated agricultural technologies, the development of the "science and technology of small things" (things that are less than 100nm in size) opens opportunities for health that range from **disease treatment** through targeted drug delivery, improve drug solubility, extend drug half-life, improve a drug's therapeutic index, and reduce a drug's immunogenicity to development of organic tissue for limb and organ reconstructions. Other application is the **Integrated Nano-Agriculture**, considered as solution to cope with the increasing demand for food worldwide. Despite of its potential benefits, the concerns related to bioavailability, toxicity of biosynthesized nanoparticles and inappropriateness of regulatory frameworks have slowed down the deployment of this technology.

SOME FACTS AND FIGURES

• Nanosensors could demonstrate their potential in managing all the phases of the food supply chain, from crop cultivation and harvesting to food processing, transportation, packaging, and distribution (Faceto, 2016)
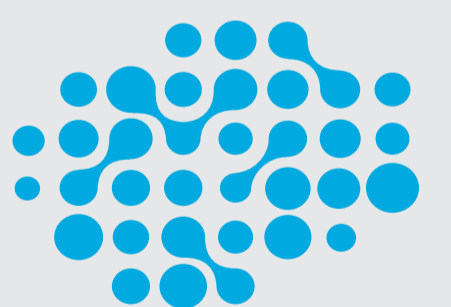
• Nanotechnology developments for health in the coming years include nano-structured drugs, gene and drug delivery systems targeted to specific sites in the body, bio-compatible replacements for body parts and fluids, self-diagnostics for use in the home, sensors for labs-on-a-chip, material for bone and tissue regeneration (OECD, 2017)

• It is expected that by 2040, Nanotechnology & Implantable Health IT Systems interfaced to EHR and PHR Systems will be fully deployed and widely used (Groen, 2010)

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SOCIAL

TREND
AGING POPULATION & INCREASE OF SINGLE-ADULT HOUSEHOLDS.

TREND
URBANIZATION.

Europe's population **is getting older**, with an average **life expectancy increase** from 75.3 in 2005–10 to 77.8 for the period 2020–25 (World Bank, 2014). The median age in the EU-28 rose from 38.3 years to 42.4 years, together with **lower fertility rates**, the proportion of people of working age in the EU-28 is shrinking while the relative number of those retired is expanding (Eurostat 2016).

The shift from rural areas to cities will continue to grow in the next decades. With higher concentrations of people in urban areas, there is an **increase on the demand for food, services, transportation and living spaces. Urban sprawl** is the leading edge of urban growth that implies little planning control and land subdivision. It leaves agricultural enclaves and most visible impacts area in countries of regions with high population density and economic activity. Some of the changes that cities are experiencing are efforts in **retrofitting and recovery of old constructions** to improve the quality of living and working spaces. **Smart cities** and **Co-housing solutions**, particularly among senior population, are also gaining relevance in many EU states.

SOME FACTS AND FIGURES

• Single-adult households are the most common type in the EU28. The number of people living alone in Europe will increase to almost 46 million by 2025. (Eurostat, 2016)

• By 2025-30 single-person households will make up around 40 % or more of all households in Germany, Norway, Switzerland, Austria, England, France and the Netherlands. (OECD, 2011)

• The total cost of EU infrastructure development to match the increasing demand for transport has been estimated at over € 1.5 trillion for 2010–2030. The vehicles and infrastructure have to be elderly-friendly. (CEOS, 2013)

• One-person households consume, on average, 38 % more products, 42 % more packaging and 55 % more electricity per person than four-person households. (Euromonitor, 2007)

SOME FACTS AND FIGURES

• Urbanization in Europe is increasing from 73 % to 77 % between 2011–2030, potentially rising to 80 % by 2050 Rural population in Europe is decreasing, from 207.3 million in 1985, it is expected to be of 128.4 million in 2025. (CEPS, 2013)

• Apart from few exceptions, all capital metro regions are said to grow by 4–6 %, and faster than the respective national average in the EU countries. (European Commission, 2016)

• Energy-efficient retrofits account for 1 % of existing stock and retrofit rate is expected to reach 2.3 % per year in coming years (The Economist, 2013)

• Co-housing schemes already represent 8 % of Danish households (The Guardian, 2013)

• There is an relevance of "intelligent urbanism" and "smart cities" within the EU policy and it is estimated that smart grids and smart buildings can generate about € 50 billion in annual energy savings in the EU by 2020. (CEPS, 2013)

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SOCIAL

TREND
HIGHER APPRECIATION OF WELLBEING.

TREND
SHIFTING NUTRITION AND FOOD PRODUCTION/ CONSUMPTION PATTERNS.

Europeans are more and more engaging in actions encompassing a **more holistic definition of wellbeing**, including a different use of time and paying increasing attention to health. These actions are partially driven by increasing cultural diversity, and also supported by national and pan-European policies. Some of these give **increasing emphasis on mental health**, including preventive treatments and research on mental diseases; support healthier choices for transport and food consumption and for a **healthy work-life balance**, as well as socially-driven initiatives like wellness tourism and community gardens, for instance.

Similar to the appreciation of wellbeing, food consumption presents some strong tendencies, on the one hand, there is an alarming **increase in obesity rates** while on the other hand, there is also a **growth of vegetarian diets**. Together with the increasing **growth of organic agriculture and demand of organic foods**, Europeans are also facing rising levels of "biocultural" diversity in their diets, particularly in the urban context. Urban biocultural diversity brings together the growing practices of biological and cultural diversity in urban cities through local governments initiatives.

SOME FACTS AND FIGURES

• Increasing emphasis on mental health, including preventive treatments and more research on mental diseases (Coping and Possibilities. White Paper 19 of the Norwegian Parliament, 2016)

• Social bottom-up initiatives are on the rise. i.e. the increasing use of service-based transportation services, such as car sharing is expected to grow in Europe from about 1.7 million in 2014 to 15 million users by 2020. (Automotive News Europe, 2014)

• 15 % of the EU workforce can be described as "mobile workers" (spending more than 10 working hours per week away from home and their main place of work) and 13 % as mobile teleworkers (home-based and mobile telework as well as self-employed in co-working spaces). 40 % of the EU workforce express interest in permanent telework (where practically all working time is spent at home), 52 % in alternating telework (with at least one working day spent at home per week) and even 55 % in center-based telework (meaning workplaces provided by the employer in an office facility close to the employee's residence) (Wired, 2013)

• Combining domestic and international traveling, Europe leads the world in the number of wellness tourism trips taken annually at 202.7 million and is responsible for 39 % of all wellness tourism trips taken globally each year. (Kazanszhieva V, 2014)

SOME FACTS AND FIGURES

• Organic market has experiences a generalized and constant growth in Europe during the last years. By 2014, the growth in the EU reached 7.4 % worth € 23,963 million. Increase of per capita expenditure has also been constant throughout the 2005–2014 period, rising from € 24.4 in 2005 to € 47.4 per capita during 2014. (IFOAM, 2016)

• Local food sourcing groups, community gardens and other consumer driven initiatives are extending across the EU. At the same time, supermarkets charge a 30–40 % mark-up whereas farmers increase their prices by just 10 %. (The Guardian, 2010)

• The demand for environmentally friendly packaging keeps increasing as consumers are less willing to deal with waste originated from excessive packaging (like plastic wraps). Smaller portions of food are also a solution that many restaurants are introducing to avoid waste and minimize costs. (European Union, 2014)
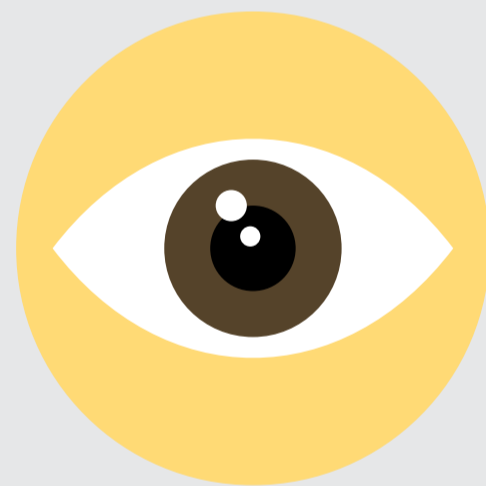
EAT WELL

ORGANIC FRUIT

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TREND
INCREASING DEMAND FOR TRANSPARENCY – THE EXTENDED PRODUCER RESPONSIBILITY.

TREND
THE BIO-ECONOMY IS ON THE RISE.

Consumers are demanding **higher transparency** regarding design, use and origin of components of the products they use. This applies to almost all industries, from energy providers to fashion and food. **Information about disposal solutions** are also part of purchasing decisions.

Although the use of fossil fuels won't disappear, the **increasing use of renewable energies is charting a new course for economic development.** Europe faces green power curbs to stop grids overloading, a situation that shows an excess of supply of renewable energy and not enough infrastructure to allow the growth of demand. To cope with this, the EU has introduced **per-unit energy tariffs** based on energy use levels and on-site renewable energy production as well as **opened new job opportunities** and consumer-driven economic models.

SOME FACTS AND FIGURES

• About 65 % of consumers want to know more about where their food comes from, but only 31 % believe food companies are transparent about food production practices. In addition, 67 % of consumers would like to see the food industry take more action to educate people on how food is produced. (FPD, 2014)

• A Study of 1,522 consumers reported that for 94 % of them it is important that the brands and manufacturers they purchase products from are transparent about what is in their food and how it is made. 86 % said they would find additional value in having access to more extensive product information. (Preparedfoods, 2016)

• In 2016, with the voluntary implementation of transparency guidelines by the European Federation of Pharmaceutical Industries and Association's (EFPIA) Disclosure Code, European companies pledge to report their processes and compliance with transparency regulations. When it comes to companies' progress regarding compliance with current European transparency requirements, 46 % are in the process of implementing a transparency solution. Only one-third (35 %) have made it to the stage where they are successfully complying with transparency requirements. 39 % of them use a combination of in-house and third-party solutions, while another 39 % leverage internal software systems for their management and reporting of transparency. (Pharmaceutical Commerce, 2015)

SOME FACTS AND FIGURES

• Given the rise of production of renewable energies and solutions for efficient energy consumption, tariffs for energy use are being adjusted to cope with costs of distribution networks. These tariffs are calculated considering the contribution of the user to the generation of the energy and its consumption. The EU estimates that for the period 2020–2050 energy consumers will have modified discount rates due to Energy Efficiency Directives (EED). (European Commission, 2013)

• There is an increasing share of renewable energy generation capacity in Europe since even private consumers are generating their own electricity, from 40 % in 2012 to 60 % in 2030. There is no capacity to fulfill the consumers' demand for environmentally friendly energy. (Blooomberg, 2015)

• There is broad consensus that the global market could almost double, with the average estimate for 2020 being around € 2 trillion a year. (European Commission, 2014)
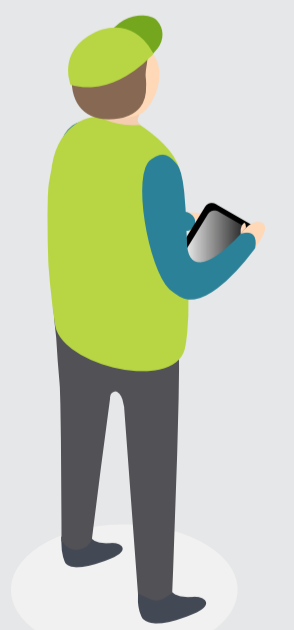
TREND
INCREASING EXPENDITURE IN HEALTH

In almost all countries, per capita healthcare spending is rising faster than per capita income, meaning that by 2060 public expenditure on health care and long-term care would have grown by one third. There is an **increase in expenditure for prediction, diagnosing and monitoring disease rather than treating.**

SOME FACTS AND FIGURES
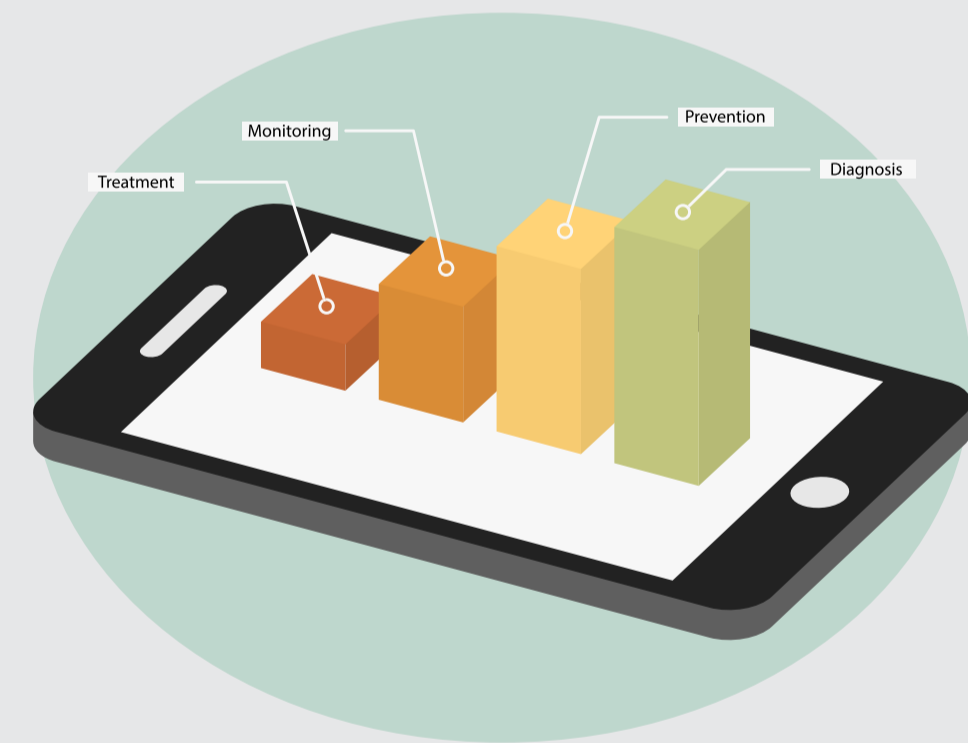
• Dementia, which costs and accounts for more disability adjusted life years than any other disease, is expected to double in prevalence every 20 years to 66 million by 2030 and 115 million by 2050. (EHN, 2015)

• By 2050, it is expected that 65 % of expenditure in health will be for prevention (22 %), diagnose (27 %) and monitoring (16 %) rather than for treatment, which in 2015 accounted for 60 % of the expenditure in health. (Frost & Sullivan, 2015)

• Across all the OECD nations, public health care spending is projected to rise from 5.7 % in 2005 to between 7.7 % and 9.6 % by 2050, and long-term care could more than double or possibly treble to between 2.4 % and 3.3 % of GDP over the same period. (Appleby, 2013)

• Global spending on health is expected to increase to € 16.37 trillion worldwide by 2040, widening the gap between countries: with high-income countries expected to spend € 8,08 per person on health in 2040; upper-middle income countries € 1,73; lower-middle income countries and low-income countries, € 454 and € 147, respectively. Moreover, many of the countries who will grapple with the largest and most complex disease burdens will spend the least on health. (IHME, 2017)

TREND
AUTOMATION OF SERVICES AND INCREASING NEED OF SKILLED PERSONNEL

Artificial Intelligent systems and automation have had the effect of both lowering the costs of many goods and services as well as a replacing people who used to do these tasks. The health sector has a shortage of people to perform tasks that machines can't do. Most European countries find it difficult to **recruit and retain people**, especially in specialist professions like midwifery, nursery, medical specialists, health technicians and elderly care.

SOME FACTS AND FIGURES

• Tertiary education rates to reach 35–40 % in Europe by 2030, affecting how technology influences education and the labour market. As higher educated people tend to have more work related to ICT and technology, more innovation is expected although not necessarily reflected in the healthcare sector (European Commission, 2012)

• In 2016, 2,600 new online courses were announced (up from 1,800 last year), taking the total number of MOOCs to 6,850 from over 700 universities worldwide. Of these, 7.2 % of courses are related to health and medicine. Business and Management and Computer and Programming make up for 26 % of courses offered. Of the world's top 10 university course providers, only 2 are based in Europe. (Shah, 2016)

• There are an estimated of 7.3 million nurses and midwives in the WHO European Region. This number is not adequate to meet current and projected future needs. (Fullfact, 2016)
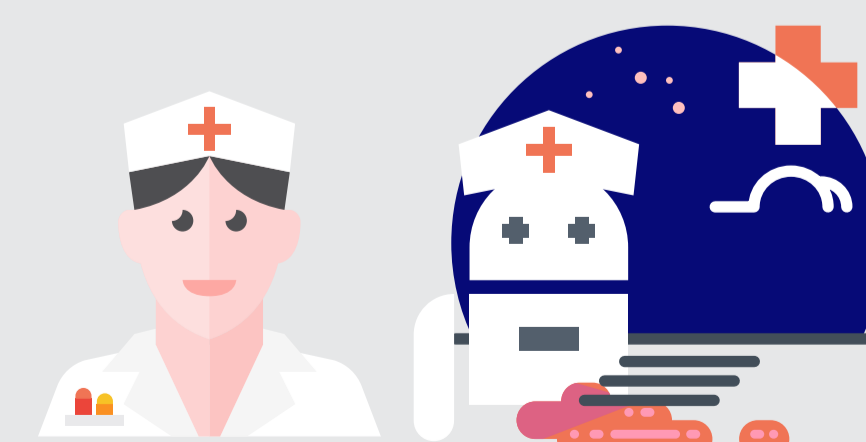
TREND
GROWTH OF THE PRIVATE HEALTH INSURANCE INDUSTRY

In 2016, the private health insurance industry surpassed € 1.3 trillion in global revenues, and this is expected to double by 2025 (Singal, et. al 2016). The growth of the industry is being fueled by a combination of trends, such as **reduced budgets for public health, minimum coverage for pharmaceuticals and treatments that require high out of pocket expenses**, etc., that are increasing the costs for healthcare consumption and shifting more spending to intermediation by private payors. A larger weight to be put on private payors is **likely to increase health inequalities** due to growing differences in access to good health care.

SOME FACTS AND FIGURES

• It is expected that in Europe, the rates of growth of private healthcare expenditures will exceed those of public outlays due to the possibility that private spending will be required to offset likely shortfalls in public-sector ability to cater to rising healthcare demand (IHS, 2016)

• The period over 2015–20 is predicted to see changes in the composition of the private market in a number of European countries, in particular leading to greater out of pocket burdens for patients (IHS, 2016)

• The insurance sector is the largest institutional investor in the EU, with almost € 9 800 billion of assets under management invested in the economy in 2015. This is equivalent to 61 % of the GDP of the EU. (Insurance Europe, 2016)

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TREND
ENERGY TRANSITION.

There is an increasing use of renewable energies and reduced dependence on fossil fuels in the EU. This is partly due to a **growing share of renewable energy production and a fluctuation of energy consumption** in all levels, from large industries to the household level.

SOME FACTS AND FIGURES
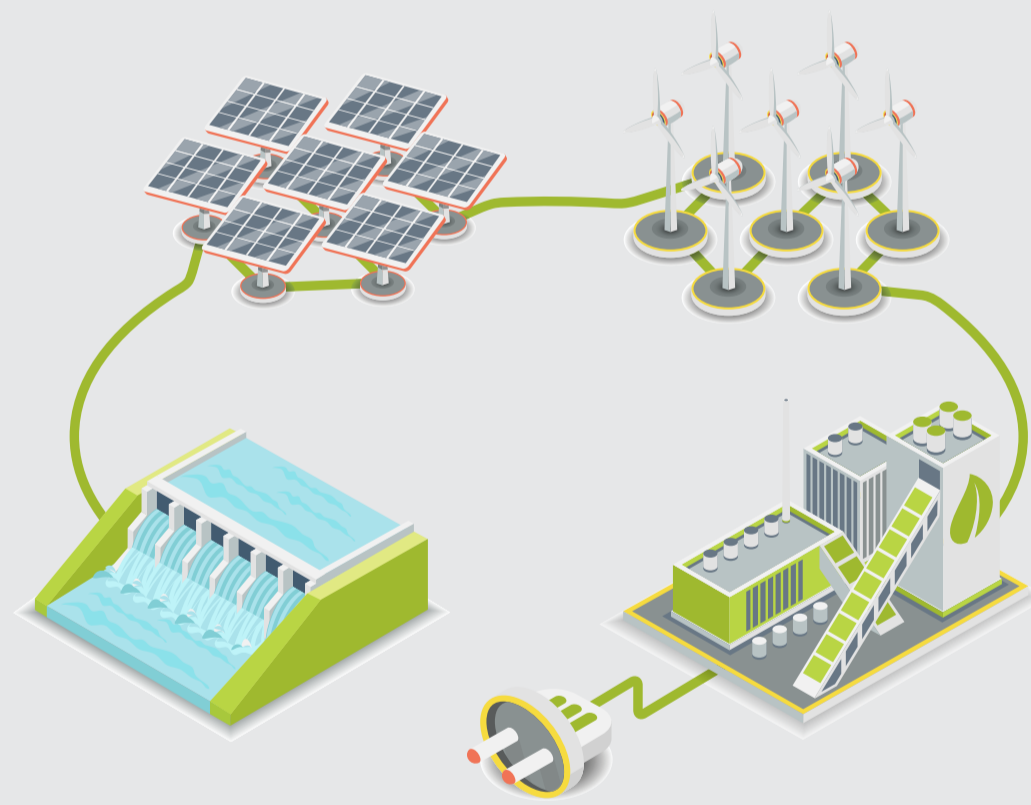
• A promising trend in the EU is the continual decrease of solid fuels as source of energy by 63 % and an 110 % increase of renewable energy sources (wind, solar, geothermal). The share of energy from renewable sources (mainly biomass) is increasing rapidly. Households now derive, on average, 14 % of their energy consumption from renewable sources. (EEA, 2016)

• The residential sector alone is responsible for 8.5 % of GHG emissions in the EU. Between 2000 and 2014, the final energy consumption of households in the EU decreased, reducing its primary and final energy consumption by 12.0 % and 10.9 % respectively (INHERIT Baseline Report, 2017)

• The EU energy targets for the year 2030 are binding: 40 % cuts in GHG emissions and 27 % share for renewable energy and non-binding: 27 % improvement in energy efficiency. (European Union Outlook, 2015)

Alternative energy: © Shutterstock / MSSA

TREND
ENVIRONMENTALLY FRIENDLY MOBILITY SOLUTIONS ARE ON THE RISE.

Vehicle manufactures are compelled to increase the performance of their product having **more efficient fuel use** while reducing GHG emissions. Moreover there is also an **increasing demand from consumers for affordable and environmentally friendly public transport**.

SOME FACTS AND FIGURES

• The most used modes of transport in EU-28 are: car with 54 %, public transport (19 %), walking (14 %) and biking (8 %). Passenger cars accounted for 83.2 % of inland passenger transport measured by the number of inland passenger-kilometres (INHERIT Baseline Report, 2017)

• Transport GHG emissions are expected to be reduced by 20 % from 2008 levels by 2030, and by at least 60 % from 1990 levels by 2050. The decrease is caused by different factors, among them the most relevant are the optimization of transport methods, taxes on fuels and the increased use of renewable energies. (EEA, 2014)

• Eliminating short car trips (< 4 km one way trip) and completing 50 % of them by bicycle would result in mortality declines of approximately 1295 deaths/year, including 608 fewer deaths due to improved air quality and 687 fewer deaths due to increased physical activity. The combined benefits from improved air quality and physical fitness for the region would exceed € 7.8 billion/year. (INHERIT Baseline Report, 2017)

City scene: © Shutterstock / Macrovector

TREND
INCREASING EFFORTS TOWARDS BETTER AIR QUALITY MECHANISMS.

Despite efforts undertaken to improve the quality of air, **fine particular matter in the air and ground level** still persist, presenting a threat to health. Nonetheless, there are significant advancements in the Emission Trading Systems (ETS) in the EU, and even the GHG emissions not covered by the ETS are covered under the Effort Sharing Decision, which is still a voluntary mechanism. Another sector presenting **increasing controls** contributing to Air Quality Management is the Land Use and Forestry Activities (LULUCF) that shows decreasing carbon emissions.

SOME FACTS AND FIGURES

• GHG emissions will continue to decrease from 1990 levels. Total GHG emissions are projected to be 26 % below 1990 levels in 2020, 35 % below by 2030 and 48 % by 2050. (EU reference scenario, 2016)

• Since 2012, the EU Emissions Trading System (ETS) covers GHG emissions from aviation from Member States' stationary installations decreased by 24 %, or, from 2348.59 Mt CO_2-equivalent in 2005 to 1775.18 Mt CO_2-equivalent in 2015, reaching their lowest level since the start of the scheme in 2005 (EEA, 2016)

• GHG emissions not covered by the EU ETS are covered under the Effort Sharing Decision (ESD). These emissions are from a more diverse range of sectors or activities, including road transport, energy consumption in buildings, agriculture (cattle and soils) and waste management. In 2014, ESD emissions were 13 % below 2005 levels. Preliminary estimates indicate that, in 2015, ESD emissions increased back to a level that is 11 % less than the 2005 level. (EEA, 2016)

• In 2014, the LULUCF sector represented a net carbon sink of about 308 Mt CO_2-eq. in the whole of the EU, with a decreasing trend over the last 7 years. (EEA, 2016)

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TREND
MORE EFFORTS TO HARMONIZE NATURAL RESOURCE USE WITH ECOSYSTEMS' RESILIENCE.

TREND
TOWARDS CLOSED-LOOP MODELS: URBAN MINING AND WASTE MANAGEMENT.

TREND
NEW RELATIONSHIPS WITH FOOD AND WASTE GENERATED FROM IT.

Extreme weather events have brought attention to measurements that range from the improvement of the water quality to the changes in land use. In Europe, there is an **increase of land used for organic agriculture.** At the same time, there is a European 2050 target of no land take, as efforts to stop biodiversity decline and coping with the reducing resilience of ecosystems.

Increasing costs of raw materials and unfavorable economic conditions, consumers' demands and an **overall shift in production processes**, have led companies and policy makers to find solutions for more circular models that include the entire life cycles of products and new roles within supply chains. The Zero Waste Europe 2030 targets that are part of the **Circular Economy Action Plan** are some examples on the policy level. On the implementation level, **urban mining is growing as an activity** that enables the recovery of raw material from waste. This practice is also strongly supported by the WEEE.

There is an increasing awareness about the **high levels of food waste** around the world, which has originated a series of movements to prevent it. Also, the demand for environmentally **friendly packaging** keeps increasing as consumers are less willing to deal with waste originated from excessive packaging (like plastic wraps). Smaller portions of food are also a solution that many restaurants are introducing to avoid waste and minimize costs.

SOME FACTS AND FIGURES

- Some 40 % of the world's land surface is used for the purposes of food production, and in the EU around half of the land is farmed. The vast majority of this land is used to raise animals for meat and animal products, rather than the production of grains, fruits and vegetables. (European Union, 2015)

- The growth in organic agricultural land was of 1.2 %. worldwide. Land expansion has been accompanied by market expansion. Retail sales of organic products in 2014 accounted for € 72 billion, an important rise compared to the 15.2 billion of market size in 1999. Europe accounts for 25 % of the total organically managed agricultural land, this is 12.7 million hectares (Willer, et. al 2016)

- With 49.1 % of worldwide natural disaster reported costs, Asia suffered the most damages in 2015, followed by America (36.7 %) and Europe (6.8 %). (Natural Disasters report, 2016)

- The European countries with highest chances of experiencing earthquakes, storms, floods, droughts and sea level rises are: Albania (10.01 %) The Netherlands (8.76 %) Greece (7.36 %) Turkey (5.5 %), Italy (4.88 %) based on the 2015 World Risk Report. (Smith, 2016)

SOME FACTS AND FIGURES

- Zero Waste Europe 2030 recycling targets for municipal waste and for packaging are of 70 % and 80 % respectively. Within the recycling target at least 5 % of it should be prepared for reuse. For packaging, the target for reusable packaging is of 10 % (Zero Waste Europe, 2017)

- The EU has agreed on a target to recover 85 % of the WEEE generated, this means 4 kg of WEE per capita (2 million tons a year) which will increase to 12 million tons by 2020. (European Commission, 2014)

- On average, in 2014 the EU-28 generated 1.8 tons of waste per inhabitant, excluding major mineral wastes. The quantity per inhabitant fell by 5.3 % between 2004 and 2014 though the EU's population grew over this period. (European Union, 2016)

- In terms of household waste, each person in Europe is currently producing, on average, half a ton. Only 40 % of it is reused or recycled and in some countries more than 80 % still goes to landfill (European Commission, 2016)

SOME FACTS AND FIGURES

- Around 88 million tonnes of food are wasted annually in the EU, with associated costs estimated at 143 billion euro (European Commission, 2016)

- The sectors contributing the most to food waste are households (around 47 million tonnes) and processing (around 17 million). These two sectors account for 72 % of EU food waste. Of the remaining 28 % of food waste 11 million tonnes (12 %) comes from food service, 9 million tonnes (10 %) comes from primary production and 5 million tonnes (5 %) comes from wholesale and retail. (Stenmarck, 2016)

- France became the first country to ban supermarkets from throwing away unsold food, punishing them with fines of up to € 75,000 if they refused to donate it to food banks or charities instead. (Neslen, 2016)

- Agriculture and food production contribute to 30 % of the global GHG emissions. The carbon footprint of food produced and not eaten is estimated to 3.3 Gtonnes of CO_2 (FAO, 2013)

- Local food sourcing groups, community gardens and other consumer driven initiatives are extending across the EU. Their business uses as reference the trend that the prices are comparable to supermarkets and helps residents to save money as when stock is low, or in the future when oil is expensive. (Siegle, 2012)

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CLARIFICATION

Given the nature of INHERIT and its cross-cutting approach to the areas of health, health equity and the environment, the political, legal and ethical trends were clustered into one group.
It is important to note that political trends include type of government structures, ideologies, international cooperation, policies and other factors like stability, factions, discourses and cases related to incentives and tariffs.

Legal trends include rule of law, cases, structures like IPR, competition law, minority protections, binding and non-binding international agreements, etc., that are often related to political trends.

Ethical trends are understood as a general code of ethics followed by most of people in the region, these cover highly controversial issues such as privacy of personal information in apps and cloud services, organ donation, confidentiality, cloning, human trafficking, etc.

TREND
CITIZENS AS EXPERTS AND EXPERIMENTAL GOVERNMENTS.

By supporting **citizen-driven innovation**, governments can learn new ideas and approaches, while promoting trust and inclusiveness in society. This occurs by **importing insights into government**, ie. where citizens teach courses on open government to civil servants. Countries are also **using technological tools** to catalyze citizen innovation, connecting citizen innovators with government and crowdfunded resources to find new ways to strengthen government programs. To keep up with the rapid pace of change, governments are realizing that they need to experiment with new possibilities and quickly establish which approaches work and which do not. This can mean developing new policies to allow a country to serve as a **testbed for experimentation**, leading to new legislations and interactions between governments and citizens.

SOME FACTS AND FIGURES
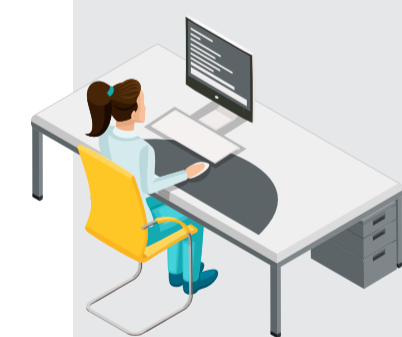
- A European citizens' initiative is an invitation to the European Commission to propose legislation on matters where the EU has competence to legislate. It has to be backed by at least one million EU citizens, coming from at least 7 out of the 28 member states. (European Commission, 2017)

- Since 2012, there have been 3 successful citizen initiatives, 14 initiatives withdrawn, 19 registered with insufficient support and 8 open initiatives with closed or ongoing deadlines for collection. (European Commission, 2017)

- With its "Place to Experiment" online platform, Finland has positioned itself as the international leader of experimental culture. The policy pilots and trials models are related to a given policy matter of theme and the comprise 3 levels: Strategic level – pilot studies selected by the Government, such as pilots for basic income, service initiatives and local government trials; Pooled pilots and partnerships level – pilot studies that promote the objectives of the Government program, executed in the regions, NGOs and business environment; and Grass-roots level – civil society. (Experimental Finland, 2017)

TREND
RETHINKING THE MACHINERY OF THE GOVERNMENT AND "SCALING" STRATEGIES.

Governments are looking "under the hood" to transform services from the inside out. To build a better foundation for innovation in the public sector, governments are coming up with **new approaches to both human and financial resource management**. These efforts range from pairing human knowledge with solutions like **machine-generated data** to the integration of technologies that enable new ways to scale government services for the public, and to revolutionize conceptions of what scale means.

SOME FACTS AND FIGURES

- The potential cost savings for e-government and digital public services are massive. In Denmark, for example, electronic invoicing saves taxpayers € 150 million and businesses € 50 million a year. If introduced across the EU, annual savings could exceed € 50 billion. In Italy alone, e-procurement systems cut over € 3 billion in costs. (European Commission, 2017)

- Gamification and technology are making possible that, together with citizens support, governments can bring innovative practices and scale them, such as through transformation teams and innovation labs. Potential solutions are being identified at a scale not previously possible, both at the small end of the spectrum (e.g. nanotechnology) and the large (e.g. harnessing Mexico City's large population to quickly and cheaply map the city's bus routes through a GPS-enabled crowdsourcing game) (OECD, 2017)

- Public information availability, public reporting, unsolicited comments (via social media mainly), requested public input and volunteerism are among the most common interactions between governments and citizens that have been enhanced by digital services (ESRI, 2011)

INHERIT
Health | Equity | Environment

POLITICAL, LEGAL & ETHICAL

TREND
THE GENOMICS DEBATE.

Scientific and technological developments have opened the window to the studies of genomes and gave birth to the interdisciplinary field of "Genomics" which covers **complex biological systems**. Genomics study the function of genes, applications and even the phenomena of interactions between them and loci and allele within genomes. The manipulation of genetic codes among other studies, have triggered a debate about the **implications to life and the limits to research**, particularly regarding topics such as: genetic testing, gene therapy and genetic engineering, gene doping, "baby design", cloning, use of human embryos, ownership of genetic data and even unintended consequences like diseases, modification of food use of animals for research and implications of responsibility upon access to information (i.e. parents who know about a specific condition of a child are legally bound to provide for the adequate treatment).

SOME FACTS AND FIGURES

- **Pharmacogenomics (the study of how genetic variation contributes to an individual's response to drugs) are on the rise. This is particularly relevant for drugs used in HIV treatment as well as cancer drugs** (Singh, 2016)

- **By 2040 most countries are expected to have a national biorepository and genomic information system, with mandatory entry for all citizens integrated with electronic health records and personal health records. The average person will be using at least one biotechnological implant** (Fox, 2016)

- **Non-invasive cancer screenings are also developing via DNA liquid biopsy testing: a cancer-screening test based on a simple blood draw.** (Singh, 2016)

- The practice of integration of genomic data into clinical flows is allowing the identification of gene mutations like BReast CAncer gene (BRCA), leading to early preventive measures like mastectomies. This is a nascent study likely to increase in the next couple of years (Singh, 2016)

TREND
IT'S ALL ABOUT DATA: PRIVACY AND SECURITY.

The increasing reliance on **cloud computing and big data** has called for tighter measurements of security to protect information. Some of the biggest dangers are large-scale cyberattacks causing geopolitical tension and the breakdown of critical information infrastructure and networks. On the individual level, there is an ongoing debate between **personal privacy** (i.e. access to medical records and information like one's DNA) and safety, ranging from blackmailing to identity theft. The European Commission passed the General Data Protection Regulation (GDPR) in April 2016, these being a new set of privacy data and security rules to take effect in mid-2018 and it will have direct effect throughout the EU without requiring national implementation legislation.

SOME FACTS AND FIGURES

- **The worldwide public cloud services market is projected to grow by 18 % in 2017 to total € 221 billion, up from € 187.4 billion in 2016. The highest growth will come from cloud system infrastructure services (infrastructure as service [IaaS]), which is projected to grow 36.8 % in 2017 to reach € 31 billion. Cloud application services (software as service [SaaS]) is expected to grow 20.1 % to reach € 30.7 billion through 2020** (Darrow, 2017)

- At the beginning of 2017, there were 3.77 billion global internet users and 4.92 billion global mobile users. Europe's use of internet grew 3 % between 2016 and 2017 (Kemp, 2017)

- The number of health apps on iOS and Android has more than doubled in 2.5 years to over 1000,000. The factors that increase the use of health apps are: trustworthiness and accurate data (69 %), ease of use, simplicity and design (66 %), Guarantee of data security (62 %) (Taylor, 2015)

- Across the health-care applications, Internet of Things technology could have a global economic impact of € 1 trillion to € 2.2 trillion per year by 2025 (Business Innovation Observatory, 2014)

TREND
REVIEWING THE RULES OF ADVERTISING.

The primary function of advertising is to persuade people to buy something. With open access to more information and spread of ICT, advertising techniques and contents are changing too. **Children and teenagers** are the population most likely to be influenced by practices of product placement online, that in many cases lead to development of unhealthy habits. This is particularly relevant for the health sector as the advertising of many foods, medications and products (like tobacco or alcohol) can lead to unrealistic expectations, misrepresentation and false images that can have serious psychological and physical consequences (eating disorders, depression, etc.)

SOME FACTS AND FIGURES

- **From the EU15 countries, only 4 (France, Ireland, the Netherlands and the UK) do not consider advertising aimed at children as harmful, and Spain alone considers a ban on advertisement undemocratic. Swedish public opinion considers advertising to children ,not fair play'.** (Peace Pledge Union, 2017)

- **Most (77 %) EU businesses have a website and one out of four (25 %) used internet advertising in 2016. Businesses' favorite form of targeted internet advertising was to use information from the content of the webpages viewed by internet users (contextual advertising; 78 % of businesses using internet ads).** (Eurostat, 2016)

- About 50 % of clicks on mobile ads are accidental, 54 % of users don't click banner ads because they don't trust them and 3 % of internet users find display ads completely intolerable (Stec, 2015)

- A recent development for food companies is to promote their brand using "advergames"(digital games or fantasy worlds with inbuilt advertising or branding). Most major food companies have developed game-playing and fantasy video sites for young children (WHO, 2013)

INHERIT
Health | Equity | Environment

TECHNOLOGICAL TRENDS

SOCIAL TRENDS

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