

Society and Lifestyles in 2050: Insights from a Global Survey of Experts

by the **Institute for Global Environmental Strategies**
supported by the **United Nations Environment Programme**



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(Institute for Global Environmental Strategies)

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Society and Lifestyles in 2050:
Insights from a Global
Survey of Experts

IGES Discussion Paper

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Global Survey of Experts**

**The Institute for Global Environmental Strategies
supported by the United Nations Environment
Programme**

Authors: Caixia Mao, Ryu Koide and Lewis Akenji

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Summary of Key Messages



Foresight is to understand the wide range of possibilities in order to shape the future.

Attempting to understand what shape and form lifestyles may take in 2050 is challenging yet essential, if we are to plan and to shape the future. Lifestyles in 2050 will reflect preceding disruptions such as effects of climate change, biodiversity loss, new health issues, world migration, and a reshaped political landscape. Many disruptions are yet to come – some of which may be positive – and could have profound effects on future lifestyles. Findings from survey responses from futures experts suggest that while technological changes are easier to land within the range of expectation, it is changes in our values aspects of society that remain least understood. Yet it is these soft aspects that would be most consequential in how, as individuals and communities, we accommodate or do not accommodate the multiple ripples analysed in this report, including: **culture and social norms, governance, economy, technology and innovation, environment and natural resources, and demography.**

This report is the outcome of a survey that links futures studies with the discussions from sustainable lifestyles literature to analyse how potential changes in society could affect daily living, and how this can be incorporated towards a transformation to a sustainable future, as well as showing what potential future options society may want to nurture or avoid. The report could also serve as a basis for discussions on futures in a more participatory foresight process by different stakeholder groups and communities. The survey gathers the insights of 137 futures-oriented experts from diverse fields on a global scale, with both optimistic and pessimistic views on how our society and lifestyles will evolve over the next few decades towards 2050. Experts included researchers with backgrounds in academia, policy-making, business and non-governmental organisations (NGOs). **Naturally, future views are diverse and even contested among experts. Rather than depicting a future that is most likely to be, this report focuses on teasing out those**

contested views and the possibilities of multiple futures when thinking about the future.

Based on the survey responses, this report summarises changes affecting broader society into three themes: i) **culture and social norms and governance**; ii) **economy and technology and innovation**; and iii) **environment and natural resources and demography.** Within these three themes, we identify main messages that could particularly affect future society in 2050. The study attempts to enrich the discussion in the field of foresight studies by capturing soft changes in more people-centric areas, such as culture and social norms.

Following are the summary from the expert survey's result for changes in broader society:

(i) Culture and Social Norms and Governance: respondents consider that society would orient itself **towards the environment** as the effects of catastrophic climate change become more apparent in daily life. We could see **individuals becoming more wellbeing-oriented.** The spread of communication technology and new ways of thinking on a global scale, and also the replacement of human labour by automation would allow people more free time to ponder the meaning of life. Nevertheless, there are concerns that increasing instability due to the withdrawal of social safety nets and uncertainty over employment due to automation would develop a **survivalist atmosphere of anxiety** that would provoke nationalist tendencies. Moreover, respondents think that there would be **widening inequality**, which could have especially critical implications for the **youth population.** Poverty and inequality would widen under the current socioeconomic structure, and the changing landscape in employment due to automation will only worsen this inequality. Also, governments and other organisations would have to **cope with a fast-changing world** both in structure and decision-making processes due to the ever-accelerating rate of technological development and innovation.

Summary of Key Messages

(ii) Economy and Technology and Innovation: respondents think that changes in economic infrastructure brought about by technological innovation would likely consolidate the profits into a small number of conglomerates. Developments in information and communication technology and 3D printing would lead to more distributed production, which could also provide opportunities for smaller companies to scale up due to connectedness of individuals. In the meantime, environmental pressures and widening inequality could lead to changes in how we perceive the relationship between economic growth and the environment, which could trigger a **new economic paradigm** shift towards a post-growth system. Also, **the role of technology would expand in our daily living**, with increased options in sustainable technologies in urban infrastructure and non-human entities entering our lives, which would provide a new platform from which to ponder the meaning of being human.

(iii) Environment and Natural Resources and Demography: most experts agree that society would face a **catastrophic ecological crisis** due to rapid urbanisation, changing consumption patterns, and population growth. Although there are promising advances in sustainable technologies, there is a strong view that **ecosystems would inevitably collapse**. As a result, some respondents think that due to environmental degradation, extreme weather conditions, and natural disasters, some regions could be unsuitable for living. Mass migration within countries and across borders due to climate change would pose enormous political and socioeconomic challenges.

Based on the above foresighted changes, this report offers three overarching observations. The first is that the rate **of change in both physical infrastructure and people's norms would accelerate due to technological disruption**. New ways of thinking and ideas could lead to growth of a more tolerant society, but could also cause further fragmentation and polarisation. The second broad observation is that future society will very likely face **more constraints compared to today due to ecological pressures, widened inequality and population increase**. This could affect everything from individual-level access to basic needs, up to macro institutions and governance. Third, expert insights show **widening gaps between aspirations of individuals (what people want) and the reality in the foresighted future (what people will have)**. While individuals could increasingly internalise environmental concerns and focus on wellbeing, the context of widening socioeconomic inequality and uncertainty in a rapidly changing world would likely direct people to develop

survivalist mindsets at the expense of others.

None of the above is certain, as these are not predictions but rather interpretations of possibilities. In that regard, this report examines the lifestyles perspective in more detail, with a view to intervening towards future directions of sustainable lifestyles – achieving wellbeing with low environmental footprint. Researchers on sustainable consumption and lifestyles typically approach consumption by analysing the key domains such as food, consumption of manufactured goods, mobility, housing, education, work, leisure, health and social connections, and relationships. As entry points to bending the future towards sustainable lifestyles, we categorised these domains into four aspects of lifestyles: consumption, infrastructure, time use and meaning of life, and physical and mental health.

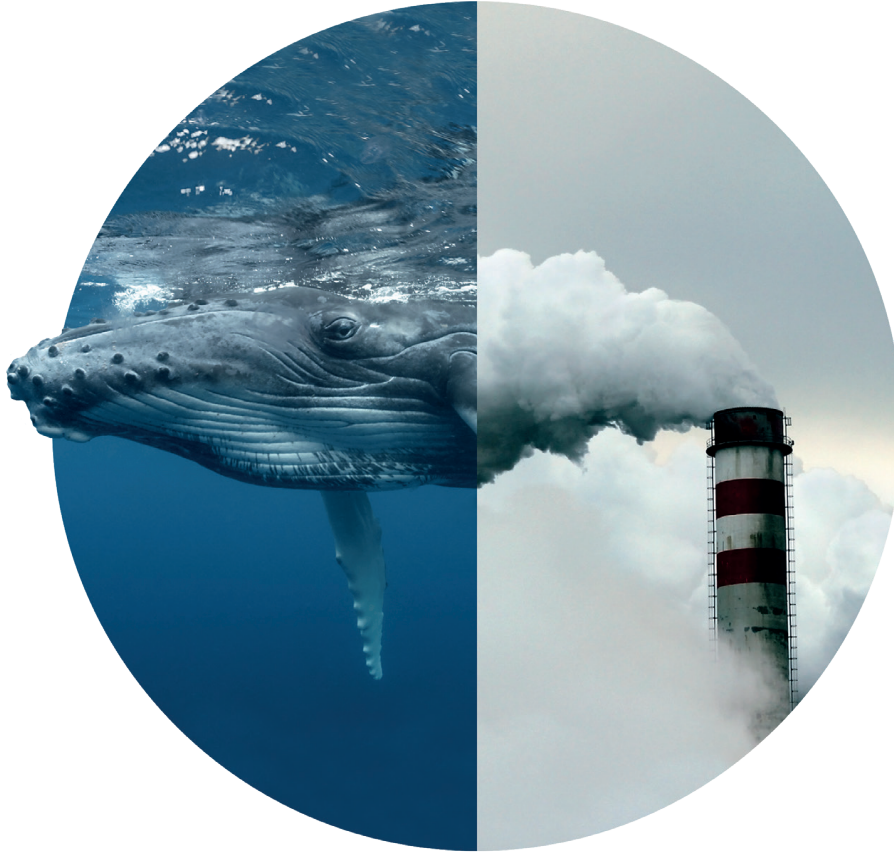
The followings are the analysis of survey responses for changes in future lifestyles:

(i) Consumption (food and consumption of manufactured goods): Constraints arising due to resource scarcity and increasing concerns over environmental and health impacts of food could lead to shifts in diets and habits. To some, this will be voluntary; to others, it will be less about choice. While supporting pro-environmental and health choices, it is important to ensure that basic needs are guaranteed for all, including those adversely affected by the changes described.

(ii) Infrastructure (mobility and housing): Technological improvements in mobility and housing could improve objective wellbeing, owing to more options that support better living conditions. However, the **cost of these technologies mean they would be accessible only to those who can afford them**, so living conditions for the poor could be worse than today. Therefore, democratisation of more sustainable technologies is important.

(iii) Time use and meaning of life (education, work and leisure): Changes due to the large-scale replacement of human labour by automation are the critical factor. For objective wellbeing, less work could lead to increased leisure time and flexibility over time use. **This would only yield positive outcomes if benefits from automation are fairly distributed to all people in society.** One example to explore is allocating a basic income for everyone in society. On subjective wellbeing, lack of social security measures could increase stress levels due to instability and uncertainty. Analysis shows there would be a need for people to have an **alternative identity beyond work**, and that education would be based on more than training to contribute

Summary of Key Messages



to the economy. New non-economic means of meaningful engagement in society and education would be part of a new definition of wellbeing.

(iii) Physical and mental health (health and social connections, and relationships): One key factor is **longevity, as people could live much longer than currently**. The implications for subjective wellbeing would depend on whether we would still enjoy a healthy and active life at all ages, rather than simply living longer – possibly with sickness and/or loneliness. Connecting to others provides more opportunities for professional and personal encounters; and **relationships of good quality provide more satisfying (happier) living**.

Although what future societies would be like cannot be predicted with certainty, the future can be co-created by bringing those engaged in preparing for it together with opportunities, both anticipated and unanticipated, that arise. This requires deliberate efforts to understand potential changes that are ahead, and also empowering societies to map out scenarios of possible

or desired sustainable futures. Such a process would provide a readiness for change, and individuals and communities would have at hand not only a shared view of tomorrow but also possible interventions to inject when positive disruptions occur. Naturally this requires more than just awareness. It also requires concrete investments in infrastructure, organisational practices, and new institutions that can shepherd society into a future that is evidently different from that which current infrastructure and institutions are built for.

Future oriented experts, whether they are policy makers or scientists, can contribute to the realization of more sustainable futures by interpreting the future not only through the lens of hard technology and economy, but also through changes in the soft aspects of cultural and social norms. They, thereby, provide a richer and more dynamic understanding of what future lifestyles could hold, particularly on our daily living. This more “people-centred” view enables people to be better engaged on how future changes could affect their lives and how jointly a more sustainable future can be built.

1 • Introduction

Attempting foresight into the future, including in the economy, demography, culture, technology, and daily lifestyles of people, is a natural endeavour. We need to better understand what the future could bring in order to identify risks and opportunities to pursue now to have a more sustainable society tomorrow. The sum effect of today's globalised economy and continuous technological innovation has led to change that is both unprecedented and still accelerating. A gaze forward to 2050 anticipates trends such as economic power shifts to emerging economies, demographic changes, technological advancements, and pressures from climate change and ecological degradation (Hawksworth & Cookson 2011; IPCC 2013; Price Waterhouse Coopers 2017; Randers 2012; United Nations, Department of Economic and Social Affairs, 2017). Studies predict that societal changes will impact our future daily lifestyles. Changes include migration due to climate change, which are estimated at reaching one billion and affect the poorest and most vulnerable in developing countries (Christian Aid 2007) and replacement of paid jobs, about half of which could be replaced by automation by 2050 due to advancements in artificial intelligence and robotics (McKinsey Global Institute 2017). Along with the ongoing expansion of population in Africa and Asia regions, the number of those over 65 years of age is expected to double from 2010 to 2050, with life expectancy rising to 100 years for many people in developed countries (Parker 2012). With advancements in ICT technology and production systems, people's lifestyles could drastically change with wearable and Internet of Things (IoT) devices and small-sized production devices such as 3D printing. Understanding these changes now could therefore play a critical role to help policymakers and practitioners in long-term policy development and sustainability-oriented planning create a better tomorrow.

This report is developed from a study designed to draw on the knowledge and collective thinking of futures experts. The results are then applied to discussions on shaping sustainable future lifestyles. The purpose of the report is to show diverse possibilities of the future in 2050 based on current trajectory, and thus pose the question of whether such a future is desired. It thus provides a basis for discussions in more participatory foresight processes by stakeholders and citizens on visions of future lifestyles. The study aims to elicit aspects of thinking not currently well discussed in futures studies, such as 'soft' changes in culture, values and social norms in society, and how the broader changes in society will affect our daily living. This study applies an open-question oriented, selective expert survey for primary data collection, with the results analysed through a sustainable lifestyles lens.

Current futures studies, which generally apply quantitative models and scenario-based predictions, are somewhat constrained as they fail to capture transformative and dynamic changes in areas such as disruption, innovation, and nonlinear change in human behaviour (Rockström et al. 2017). Furthermore, they tend to focus on economic trends that overlook the bulk of global population in regions of lower economic contribution to global economic growth. Current models and scenarios based on technology-driven solutions aimed at sustainable lifestyles in developed economies (Global Calculator 2015; European Commission 2015) also suffer the same shortcomings in that they fail to address how, on a global scale, the necessary infrastructure and financial resources to adopt such new technology can be obtained. Technology-based solutions also constrict the scope of discourse on sustainability, i.e., they exclude systemic challenges such as inequality between and within countries, as well as the wellbeing of individuals in both developed and de-

veloping economies. In addition, even under a technology-based transition, it is acknowledged that the attitudes and values of people and companies must change for the transition to happen (World Business Council on Sustainable Development 2010). However, in current futures studies, there is still insufficient understanding of such “soft” aspects, i.e., changes in attitudes and values regarding the future, such as in changing aspirations regarding material consumption and desiring time and experiences in preference to things, new business models such as product-service models, and the access over ownership of products. What is missing are people-centric views focusing on daily living.

Regardless of the importance of understanding what future lifestyles look like, changes to daily living are generally not emphasised in futures studies. The challenge in this type of research is that it covers a variety of fields of expertise. Therefore, one or even several researchers cannot address every aspect of lifestyles. For example, futures experts may focus on technology or macro society-level phenomena, but may not look into the implications on the daily living of the population. The study on comprehensive lifestyles can only be conducted through collaboration of futures experts via a survey or meta analysis of existing studies. Yet a problem with meta analysis is that most published futures studies focus on technology or macro-level changes and do not describe the changes in terms of daily living. Therefore, in this study, a survey of futures experts was conducted to understand the potential changes in future society and lifestyles by 2050 to better inform those engaged in strategic planning on how we could transition to sustainability.

The definition of sustainable lifestyles in this report is adopted from Akenji and Chen (2016), which highlights the following elements: a

cluster of habits and patterns of behaviour; these are embedded in a society and facilitated by institutions, norms and infrastructure that frame choices; the objective of which is to minimize the use of natural resources and generation of wastes, while supporting fairness and prosperity for all. This definition acknowledges the role of the broader socio-technical context of society in shaping lifestyles.

The expert survey, implemented by Institute for Global Environmental Strategies (IGES) with support from the United Nations Environment Programme (UN Environment), includes insights from 137 future studies experts drawn from various fields. This report investigates broad viewpoints on how future-oriented studies can be contextualised for sustainable lifestyles. It elicits insights into what changes between now and 2050 will happen in society, daily living, and amongst stakeholders. The survey had two objectives. The first is to illustrate collective expert opinions on the future with a “business as usual” assumption. This will be a baseline to explore various options and possibilities. The second is to suggest implications of future changes (ranging from wellbeing to environmental footprint perspectives) to highlight key areas for needed discussions to promote more sustainable lifestyles in the future.

This report analyses the changes in society and lifestyles informed by the futures studies expert survey and based on the literature on sustainable lifestyles to address the challenges and opportunities in a sustainable transition. It first provides an overview of the expert survey and the scope of the analysis for this report (chapter 2). The main findings from the expert survey are summarised in two parts: changes in society (chapter 3) and daily living of the population (chapter 4). Based on these findings, implications of the foresighted impacts on sustainability are discussed (chapter 5) before wrapping up the discussion (chapter 6).

2 • Overview of the Expert Survey and Analysis on this Report



This chapter provides an overview of the expert survey conducted by the Institute for Global Environmental Strategies (IGES) and supported by the United Nations Environment Programme (UN Environment). It also describes the scope of the report analysis, including the analysis of the survey results at the level of society and of lifestyles, and a review of the sustainability implications.

2.1 Survey Design

This survey was designed to enrich understanding of possible futures by exploring potential changes to societies and to lifestyles due to economic, governmental, demographic, technological and environmental changes and disruptions. It also aims to comprehend how soft transformations of **culture** and **social norms** could support more sustainable lifestyles on a global scale. The list of potential global changes is then used to analyse implications to future sustainable lifestyles. It relies on the multiple perspectives of future-oriented experts, covering a range of research fields from diverse regions.

The survey focuses on three elements of societal change:

- (a) Broader society
- (b) Daily lifestyles
- (c) Stakeholder roles

The survey starts with broad questions which are more familiar to the respondents, so as to engage them and give the survey a focus (Fowler 2009). The first part of the survey maps out critical areas of likely future changes that are often featured in studies, such as **demography, economy, environment and natural resources, and technology and innovation**. Complementing these well-researched areas, issues of **culture and social norms and governance are added to** account for changes of governance systems and soft changes.

The second part of the survey classifies lifestyles into nine domains: food, mobility, housing, consumption of manufactured goods, health, education, work, leisure, and social connections and relationships. The domains are developed from the five lifestyle domains developed by Akenji and Chen (2016) to measure consumption, and the eight dimensions identified by Stiglitz et al. (2009) for wellbeing measurement. The five consumption domains - **food, mobility, housing, consumer goods, and leisure** - are vital to understand issues around basic and material need fulfilment (Akenji and Chen 2016). For mental wellbeing, Stiglitz et al.'s "personal activities including work" were modified into "**work**" and "**education**" to capture time-use from both work and personal time (Stiglitz, Sen, and Fitoussi 2009). The "**health**" category includes physical health and "**social connections and relationships**" include mental health.

In the third part of the survey, stakeholders: **civil society, local communities, governments, private sector, household and individuals, research communities**

Overview of the Expert Survey and Analysis in this Report

and others are listed for respondents for identification. We asked respondents to select one stakeholder group that would change the most by 2050. The original survey questions are in Appendix III.

2.2 Collection of Survey Data

The survey was designed by IGES and the collection of the survey was implemented as a joint initiative of IGES and UN Environment. We applied an on-line, ad-hoc expert survey of selected future-oriented experts from 25 January to 28 February 2018. The survey aimed to synthesise thinking from the diverse backgrounds of experts, drawing on their collective knowledge to foresee future lifestyle possibilities.

The two groups of respondents are:

(a) Future-oriented experts who research the future in multiple fields such as demography, energy, geopolitics and technology.

(b) Experts whose foci are not necessarily predictive in general but who specialise in fields within which they research the future.

One hundred and thirty seven valid responses were received. More information on the method of survey respondent selection can be found in Appendix II.

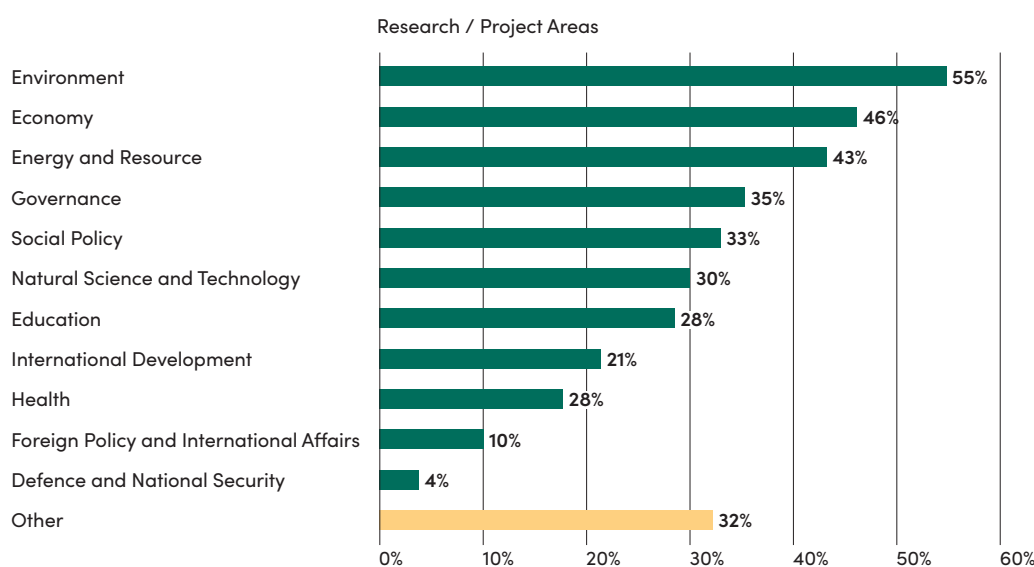
Respondent research areas were environment (55%), economy (46%), and energy and resources (43%). Other addressed subjects were socio-technical areas such as governance (35%), social policy (33%), natural science and technology (30%), and education (28%). Some respondents had more narrowly-defined areas of expertise, such as international development (21%), health (18%), foreign policy (10%), and national security (4%). More details on survey respondents are in Appendix I.

2.3 Scope and Method Report Analysis

This report is a summary of survey findings, and focuses on what future lifestyles might look like and the challenges and opportunities that change could bring. The report is divided into three parts, outlining sustainability implications ranging from wellbeing to environmental footprint perspectives.

The first part is a summary from the survey result of key messages on social changes that could shape our lifestyles in 2050 in the areas of culture and social norms, governance, economy, technology

FIGURE 1 / Subjective Expertise Areas of Respondents



(N=137)

Source: Global Foresight Survey of Potential Changes in Society by 2050 Perspectives of Research Institutes and NGOs
Note: Question "Please select all your relevant research/project areas." Multiple answers allowed.

Overview of the Expert Survey and Analysis in this Report

and innovation, demography, and environment and natural resources.

In the second part, nine key lifestyle domains (food, manufactured goods, mobility, housing, work, education, leisure, health, and social connections and relationships) are moulded into four lifestyle aspects: consumption, infrastructure, time use and meaning of life, and physical and mental health. These, in turn, were analysed to determine changes based on expert responses. For example in the case of food, responses focused on daily changes in diet and food production. As a contribution to future-oriented studies, this demonstrates how change will affect our daily living and lifestyles.

The third part of the study analyses expert responses to better understand the sustainability implications and possible drivers for a transition to more sustainable lifestyles by 2050. Sustainability is analysed using a wellbeing and environmental footprint focus. Wellbeing implications are discussed from four lifestyle aspects: consumption, infrastructure, time use and meaning of life, and mental and physical health. Implications with an environmental footprint focus on three consumption-based lifestyle aspects: consumption, infrastructure and ICT. The figure below visualises the flow of the scope of this report.

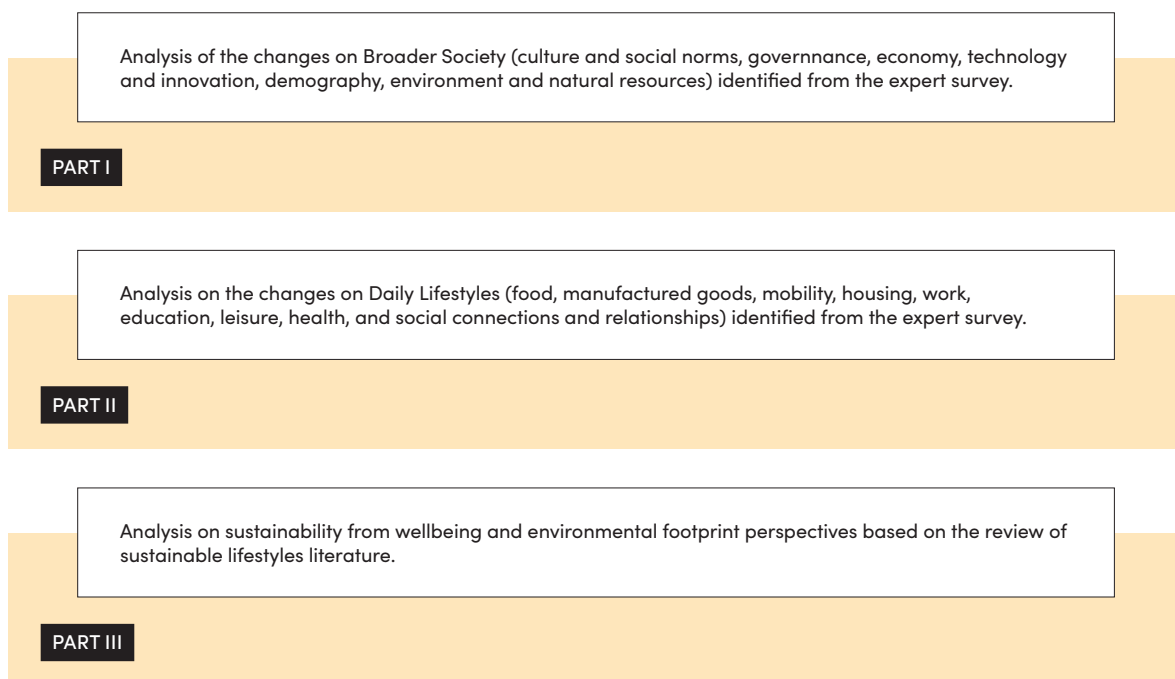
2.3.1 Macro Changes as Context for Lifestyle Domain Change

In chapter 3, foresighted changes in the broader society are summarised in six areas (culture and social norms, governance, economy, technology and innovation, demography and environment and natural resources) based on survey responses. Critical changes in these areas that could significantly shape sustainable lifestyles are also highlighted, based on an analysis of area inter-linkages.

The 395 narrative changes described by respondents were initially manually assigned one or multiple topic labels. The co-occurrence of topics was analysed by the association rule technique, and the inter-linkages amongst the topics were mapped as in Figures 3 to 5. Based on these analyses, the main changes that could significantly influence future lifestyles were divided into the following:

- (a) Culture and social norms, and governance;
- (b) Technology and innovation, and economy; and
- (c) Environment and natural resources, and demography.

FIGURE 2 / Research Flow Chart



Then cross-cutting critical societal issues were identified and discussed based on the identified inter-linkages (Figure 6). These cross-cutting, critical issues emphasise ‘soft’ aspects of anticipated change which have traditionally been under emphasised in conventional studies. The macro context of change are the backdrop to lifestyle domain understanding in chapter 4.

2.3.2 Select Analysed Lifestyle Domains

In Chapter 4, responses from the surveyed experts are structured and presented, highlighting details of the potential changes that may occur by 2050. Having been categorised into the nine lifestyle domain groupings (food, consumption of manufactured goods, mobility, housing, work, education, leisure, health and social connections and relationships), a total of 258 changes came up in survey responses.

As noted, the nine domains are further categorised into four lifestyle aspects:

- (a) Consumption: food and consumption of manufactured goods;
- (b) Infrastructure: mobility and housing;
- (c) Time use and meaning of life: education, work and leisure; and
- (d) Physical and mental health: health and social connections and relationships.

These aspects are drawn from the co-occurring responses selected – the major four clusters of responses. The groupings make sense in lifestyles from the aspects of consumption, infrastructure, time use and meaning of life, and physical and mental wellbeing.

Future lifestyles were analysed to illustrate the full range of potential changes between now and 2050 from different lifestyle domains. Each reported change was assigned from one to multiple labels manually, and the topics and quantities of foreseeable changes in each lifestyle domain were visualised as bubble plots as shown in Figures 7 to 15. In each lifestyle domain, the identified topics were grouped into one to several categories based on the similarity of topics. Then, for each category of changes summarised, the various changes possible in daily living of the population were made clear.

2.3.3 Wellbeing and Environmental Footprint Implications

The foresighted changes in each aspect of lifestyle can have various levels of influence over how sustainable daily living and society will be. Therefore, as there are many uncertainties in the way society and populations adopt new lifestyles, as well as in the numerous interactions between different anticipated changes, the implications of such changes on sustainability require careful examination. This report is intended to be broad in scope, and therefore does not attempt to provide exhaustive in-depth analysis of all areas and domains researched. Hence, in chapter 5, discussion points on what change might look like are presented, and potential wellbeing and environmental footprint impacts provided.

Sustainable lifestyles in this report are analysed with deliberate consideration for whether such lifestyles contribute to improved wellbeing of individuals and society, and also have limited environmental impact.

From the wellbeing perspective (a), the report looks at implications from objective and subjective standpoints. From the objective perspective, the following is considered: whether basic needs are met, whether an increased quality of goods and services is accessible to everyone in society, and whether individuals have healthy lives. Subjective considerations include level of meaningful life satisfaction, satisfying aspirations, a connection with others (community), whether individuals have ‘dignity’ and can operate as free agents to make decisions and living to the extent of their own capabilities.

Environmental footprint (b) refers to the environmental impacts directly and indirectly caused by the production and consumption of goods and services including through trade. Future changes in daily lifestyles, such as consumption patterns and new models of provision, are expected to have environmental footprint impacts through change in the types, amounts, and means of provision of products and services that people consume. In this study, the footprint impacts due to daily living changes reflect carbon, material, water, and land footprint impacts (see an overview of these footprint indicators in Galli et al. 2012; Friends of the Earth Europe, n.d.).

2.3.4 Study Limitations

Response bias, especially in terms of the optimism and pessimism towards the foresighted future is a core limitation. Reported changes reflect a mixture of optimistic and pessimistic views of the future. The lifestyles section was particularly optimistic, possibly because respondents were asked to select two domains about which they were personally more familiar and passionate. In addition, individuals (including experts engaged in future-oriented studies) appeared to be feeling more hopeful and optimistic when thinking about day-to-day living, compared to when thinking about society as a whole.

Selection bias may also have affected survey results, even though a large number of experts were sought covering broad expertise and geographical factors based on a systemic review of the published papers in selected scientific journals. The respondent numbers were not evenly distributed. Respondents may also be biased towards groups more interested in sustainability rather than non-respondents. Considering the aim of this study – to collect “business as usual” viewpoints from survey respondents – responses and selection biases may imply results should be carefully analysed for attribution. Hence counts of

foresighted changes in the analysis were evaluated qualitatively taking these limitations into account.

Furthermore, due to report scope, each area and lifestyle domain was not studied comprehensively. The objective was to provide *an overview* of expected foresighted lifestyle changes across broad areas, but detailed examination of each domain and area topic would result in more understanding. Hence, the report is a starting point for future efforts and debates over the linkages between foresight studies and sustainable lifestyles. There were also contesting or conflictual views amongst respondents on the same topics. Rather than depicting a sure future, the report aims to tease out contested views and gain a broader understanding of the variety of possible futures. Also, depending on the expert, organisation and individual perceptions, the future may look different. In the study, views were collected from diverse backgrounds on a global scale, yet results received were predominately based on the context of urbanised and industrialised country contexts. This leads to one key conclusion – there is a need to develop and apply a more inclusive process when dealing with futures, i.e., one that includes ordinary citizens.

3 • Broader Changes in Society that Shape Lifestyles – Survey Insights



Survey respondents identified a broad range of change possibilities: 395 changes in the six areas which are **culture and social norms, governance, economy, technology and innovation, environment and natural resources, and demography**. In this chapter, reported changes from the survey are summarised and related changes to lifestyles are identified based on an analysis of the inter-linkages amongst topics in three cluster areas: **culture and social norms and governance** (Section 3.1), **technology and innovation and economy** (Section 3.2), and **environment and resources and demography** (Section 3.3). Finally, three observations relevant to lifestyles are offered based on synthesis (Section 3.4).

3.1 Insights on Culture and Social Norms and Governance

The topics related to culture and social norms and governance are summarised in Figure 3. Among the expected changes, five are summarised below which are anticipated to have enormous effects on future lifestyles.

1) More environmental orientation – According to survey respondents, *when the effects of catastrophic environmental change become more visibly apparent in our daily lives, this could provoke collective cultural change and new social norms based around our day-to-day resource use and its environmental implications. Eventually these new norms would lead to cooperative social and technological change and ultimately lead to universal societal transitions. Such trends will reinforce and underscore our environmental orientation, especially among the highly educated. Our relationships with nature would become a crucial part of life.* Some respondents believe this orientation could bring an end to neo-liberalism over the coming decades as we struggle to un-do the current damage and burden on the environment for economic growth and consumerism.

2) Towards individual wellbeing – Respondents found that *the next area of change in culture and social norms would be driven by technology. Developments in communication and the automation of labour technology could help integrate and diffuse new ways of thinking. As a result, individuals may place more value on their wellbeing than today. By utilising the Internet and social media, we access information on a global scale which has the power to change local cultures with imported values. Moreover, the creation of abundant free time – brought about by automation – would give people more time to ponder on the meaning of life. In particular, the younger*

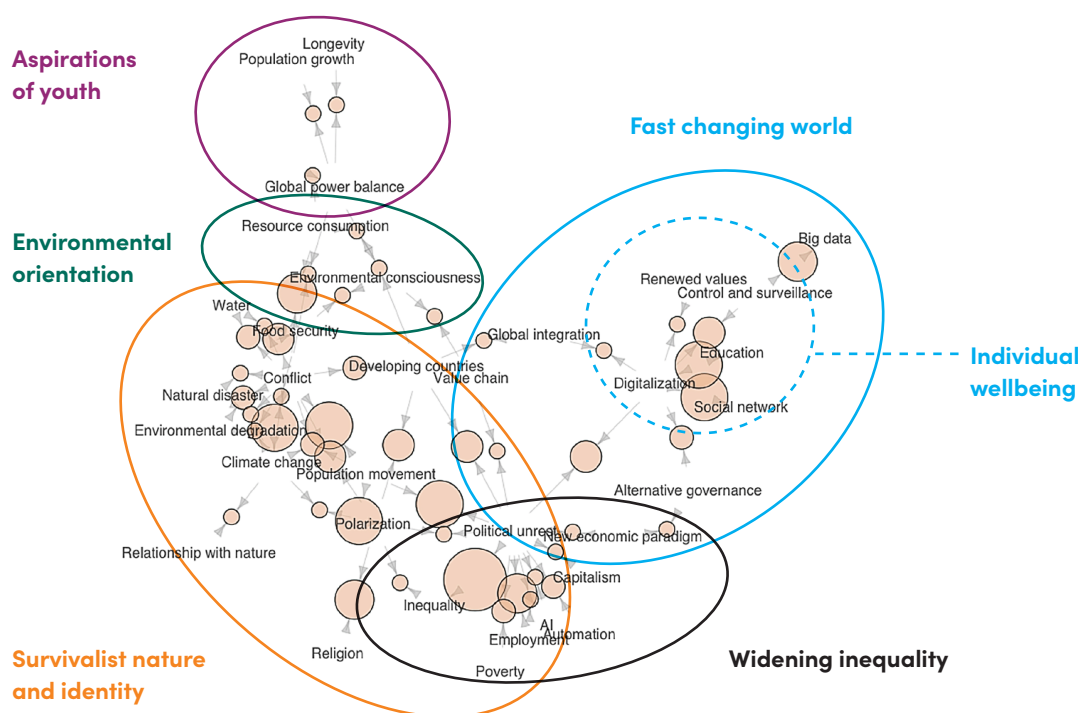
generation would grow up exposed to such thinking, with the wellbeing of the planet and its people as central a potential core theme.

3) Survivalist nature with anxiety and uncertainty – Respondents believe that *the general public may feel they have been cut out of the policy-making process if trends like the withdrawal of social safety nets and uncertainty over employment continue to rise. Some respondents consider that the global atmosphere of anxiety and uncertainty may lead to survivalist attitudes – creating antipathy towards other individuals as well as minorities and nationalities. Rapid urbanization in regions such as Africa could likely drive individualism with a loss of cultural identity. On the other hand, some respondents believe there would be more confrontations, on a systemic level, involving entrenched industries, political interests and societies that are growing more aware, which is where the current trajectory of society is heading.*

4) Widening inequality and youth – Respondents raised the concern that *poverty and inequality are going to widen under the current socioeconomic structure. The changing landscape in employment may further worsen the situation. After economic slowdown, the global situation could become more unstable and more citizens could face economic difficulties on a global scale. With the increased population, climate migration and conflicts may impact health and human conditions which would drive more people into poverty. Factors like automation may lead to employment insecurity and make day-to-day living more precarious. In such contexts, some respondents raised the concern about how the aspirations of youth especially from Africa and Asia can be met in the face of growing populations with economies that cannot absorb them in the employment market. As pointed out by some respondents, these situations in which youth may be pushed in vulnerable socioeconomic situations can exacerbate inequality.*

5) Coping with a fast-changing world – Respondents think that *the ever accelerating rate of innovation could require new forms of governing strategies. Democratic countries might incorporate digital democracy within their processes of governance and political decision-making, at the risk of a rise in the threats from extremist positions, fake news, and data manipulation. Moreover, some respondents think that the Internet of Things could become more pervasive, with conglomerates dominating the collection and control of personal data, which could lead to problems related to manipulation, control and surveillance by such “data monopolies”. The issue of data regulation could become much larger over the next few decades.*

FIGURE 3 / Interlinkages of changes in society by 2050: culture and governance



Source: Global Foresight Survey of Potential Changes in Society by 2050.

Note: Results of association rule analysis of the identified topics related to culture and governance. The texts written in gray represents the topics from responses, and the size of the red circles represents the level of interlinkage between two topics.

3.2 Insights on Economy, Technology and Innovation

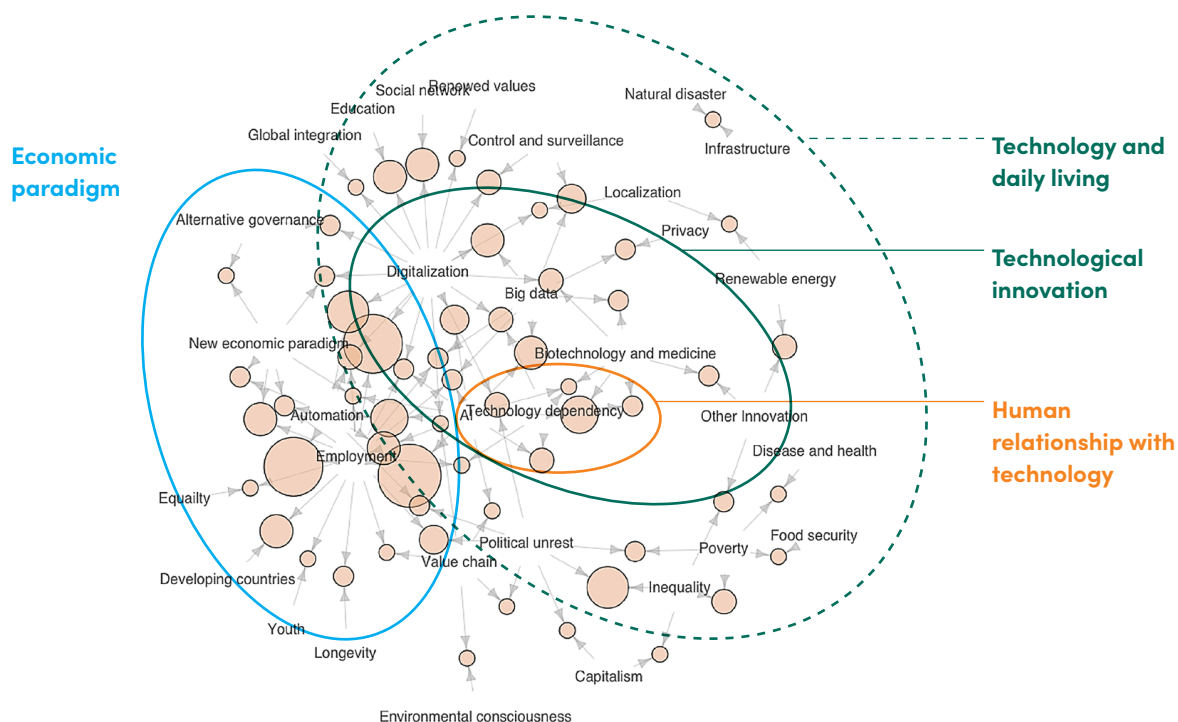
The topics related to economy, technology and innovation are summarised in Figure 3. Among the expected changes, three are expected to have enormous effects on future lifestyles.

6) Technological innovation in economic infrastructure – Respondents think that *technology could significantly change economic infrastructures globally. The growing importance of consumer data and the application of machine learning techniques could lead to further concentration of profits in a few large companies and the decline in competitiveness of smaller enterprises.* There are also views that *the evolution of information and communication technology and things like 3D printing technology could lead to disturbances in production industries, shifting production from emerging economies to more developed ones. These predictions are counterbalanced by views that the application of communication technologies could enable small companies to scale to the global level.*

7) Triggering a new economic paradigm – Respondents consider that *environmental pressures and increased inequality could lead to dramatic changes in our perception towards the relations of economic growth, wellbeing and the environment. Some think that the tipping point to the exploitation of natural resources to stimulate economic growth is nearing. This could drive the economic system with a more circular and sustainable use of resources. Also, through technological advancements, replacement of human labour by robotics could change the employment market significantly, with structural unemployment and a more precarious employment landscape increasing social instability and poverty.* Respondents consider that *drastic societal changes could lead to new economic paradigms such as post-growth systems that focus on improving individual wellbeing and the environment instead of the current priority on economic growth.*

8) Expanded role of technology in daily living – Respondents think that *technology could play a crucial role in changing daily living. While it may improve living environments or provide more environmentally friendly options,*

FIGURE 4 / Interlinkages of changes in society by 2050: economy and technology and innovation



Source: Global Foresight Survey of Potential Changes in Society by 2050.

Note: Results of association rule analysis of the identified topics related economy and technology and innovation. The texts written in gray represents the topics from responses, and the size of the red circles represents the level of interlinkage between two topics.

the benefits may only be available to those who can afford them. Technology could become ubiquitous and transform daily lives. The rise of sustainable technology could become crucial in urban planning, energy, transportation, and buildings in urban infrastructure, although it would take time for all countries to standardize the processes. Virtual and augmented reality could become pervasive in inter-human communication and leisure. In the meantime, the emergence of intelligent non-humans and development of collaborations with AI, robots, and other forms of machine intelligence such as automated cars, could raise the prevalence of metaphysical questions regarding our technological independence could also have negative social and psychological impacts like loneliness and isolation, especially among youth.

3.3 Insights on Environment and Natural Resources and Demography

The topics related to the theme of environment and demography are summarised in Figure 3. Among the

foreseeable changes, two are expected to have enormous effects on future lifestyles.

9) Catastrophic ecological crisis – The majority of the respondents believe that as a result of increased consumption, population growth and urbanization, and the pressure from natural resource use, the consequences of climate change could become catastrophic. They believe that despite promising advances and innovations in sustainable technologies, the ecosystem could eventually be overwhelmed by climate change and lead to environmental conditions beyond saving. With economic growth as one of the only measures of national success, attempts to mitigate environmental degradation and climate change have been insufficient and unlikely to become much more coordinated in the increasingly fragmented and divided world.

10) Mass climate change migration – Respondents pointed out that mass population movement resulting from climate change may be part of our future. Due to accelerated environmental degradation, extreme weather conditions and natural disasters, some regions will become

uninhabitable. There is a growing gap between water supply and demand, which could cause water shortages more severe than today. Moreover, respondents think that the most impoverished regions would be those most likely to be affected by climate change. As a result, mass population movements are expected from countries prone to climate change to other regions. Respondents raised their concerns over the challenges related to accepting migrants in host societies. For the host societies dealing with both domestic and cross-broader inbound migration, enormous political and socioeconomic challenges could arise.

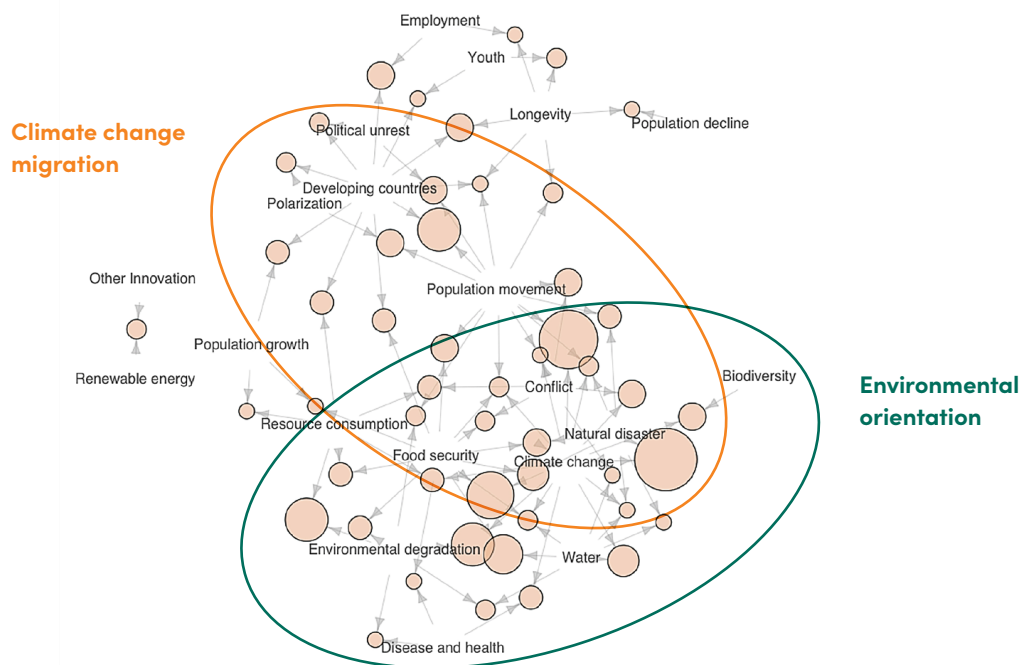
3.4 Overarching Observations on Broader Future Changes

The above changes extracted from survey responses have some overarching issues for future lifestyles in general. In this section, three cross-cutting, critical issues pertaining to 2050 lifestyle changes are identified. As graphically illustrated in Figure 6, there are three critical issues likely to occur: 1) fast changes in both physical infrastructure and people’s

norms due to technological disruption in technology, employment, value orientations and economic paradigms, 2) additional living constraints due to ecological pressure and population increase, and 3) widening gaps between aspirations of individuals and the projected future due to growing inequality, polarisation, and demographic changes. These overarching issues are interlinked and have strong connections with factors such employment, resource consumption, population movement. Therefore, they are significant to understanding what lifestyles will look like in 2050.

1) Fast changes in infrastructure and people’s norms due to technological disruption – Technology could become instrumental in providing advancements in production and day-to-day living and in disseminating new ways of thinking. Such changes could lead societies in different directions. New ideas and thinking may not be limited to national borders, as anyone connected with the Internet can be a creator and spread new ways of thinking. Thus, the speed of change in soft values and norms could also accelerate.

FIGURE 5 / Interlinkages of changes in society by 2050: environment and natural resources and demography



Source: Global Foresight Survey of Potential Changes in Society by 2050.

Note: Results of association rule analysis of the identified topics related environment and natural resources and demography. The texts written in gray represents the topics from responses, and the size of the red circles represents the level of interlinkage between two topics.

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Such changes present opportunities for widespread respect, diversity, and could redirect in positive directions, but could also potentially fragment and polarise societies internationally.

2) More living constraints due to ecological pressure, widened inequality and population increase

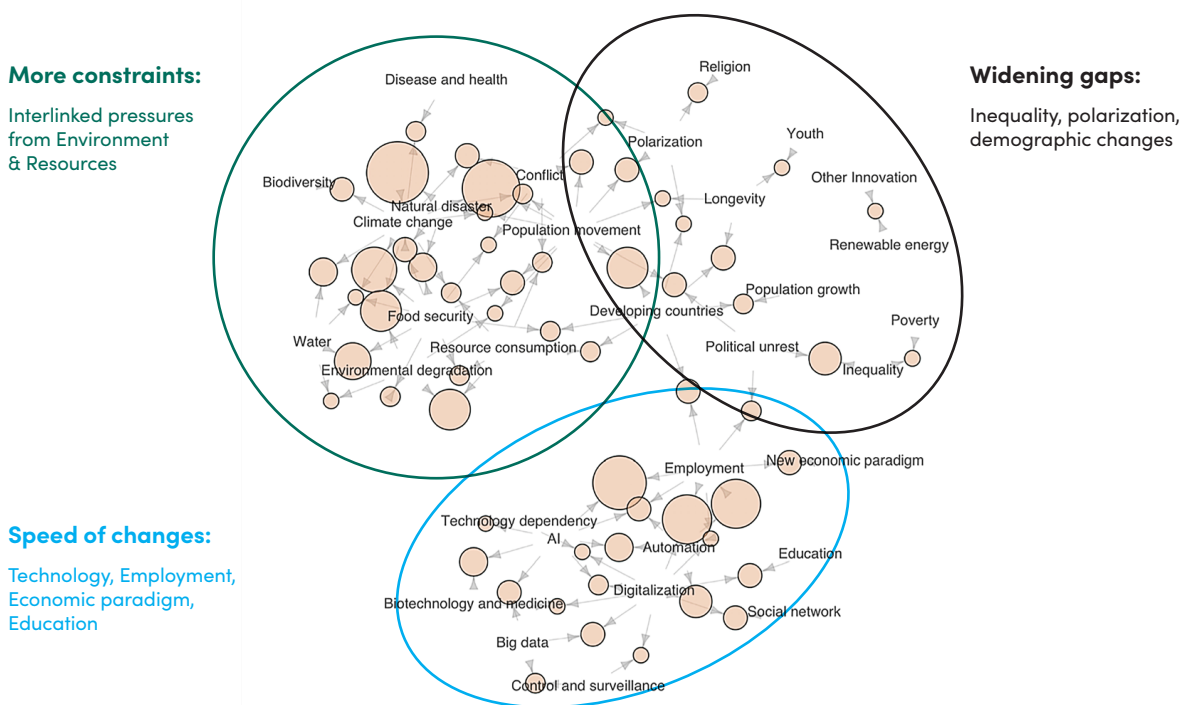
– The third observation is that there may be more constraints as the environment worsens in parallel with inequality and population growth - particularly in Asia and Africa. When faced with the urgency of addressing ecological pressures and simultaneously providing for the basic needs of a growing population that has consumption-driven urban living and lifestyle aspirations in emerging economies could magnify these pressures. Moreover, as inequality widens due to the expected withdrawal of welfare safety nets and structural unemployment, the majority of the population may have limited resources to meet basic needs, let alone pursue additional aspirations. Thus, we will need to think at both societal and individual levels as to how to deal with the constraints in our living, regardless of which country we live in. Nevertheless, the

urgency of these constraints would also act as an impetus to get us thinking about how we can deal with them, which could act as a turning point towards a sustainable transition.

3) Widening gaps between aspirations of individuals (what people want) and the reality of the expected future (what there would be) in an unequal world –

Individuals may need to consider the environment in their pursuit of individual wellbeing and living their aspirations. In the meantime, the struggle to meet aspirations in the context of widening socioeconomic inequality and uncertainty could direct people towards survivalist and exclusionary mindsets. This phenomenon could become particularly significant among youth in countries with growing populations. This is due to an aspirational dilemma stemming from exposure, through social media, to more affluent lifestyles on the one hand and the lack of coping mechanisms to deal with the reality of their reduced economic abilities to realise such lifestyles, in part also due to reduced employment possibilities due to increased automation.

FIGURE 6 / Changes in Broader Society Foresighted in the Survey



Source: Global Foresight Survey of Potential Changes in Society by 2050.

Note: Results of association rule analysis of the identified topics in changes of society. The texts written in gray represents the topics from responses, and the size of the red circles represents the level of interlinkage between two topics.

4 • Insights on Day-to-Day Living in 2050



Respondents reported 285 changes in the daily lifestyles of people in nine domains (food, consumption of manufactured goods, mobility, housing, work, education, leisure, health and social connections and relationships). In this chapter, we summarise the different perspectives. The changes are also visualised in Figures 7 to 15.

The chapter is divided into four aspects of lifestyles - consumption, infrastructure, time use and meaning of life, and physical and mental health. In consumption the focus is on food and manufactured goods (Section 4.1). In infrastructure, mobility and housing, the focus is on technology-oriented advancements (Section 4.2). In time use and the meaning of life, the change in purposes of work, education and time use are explored (Section 4.3). The last section focuses on physical and mental health (Section 4.4).

4.1 Consumption: Food and Manufactured Goods

In consumption, food and manufactured goods and changes in overall consumption and production patterns are the key factors.

4.1.1 Lifestyle Domain: Food

From the survey, the respondents discussed three changes in food consumption: food security, dietary habits and localised production. Approximately one-eighth of the changes in daily living (32 out of 258 changes) selected by the experts were related to food. Those changes are categorised into three groups (see Figure 7). One of the major groups of changes was population dietary habits, including trends like vegetarianism, organic food, insect-based food, artificial meat, and convenient food, partly due to health and environmental concerns and food scarcity. In addition, a substantial number of respondents report changes related to food security and productivity improvement, including pressures from climate change, utilisation of ICT, and food waste reduction. Other experts consider shifts in food production location. The changes are summarised below.

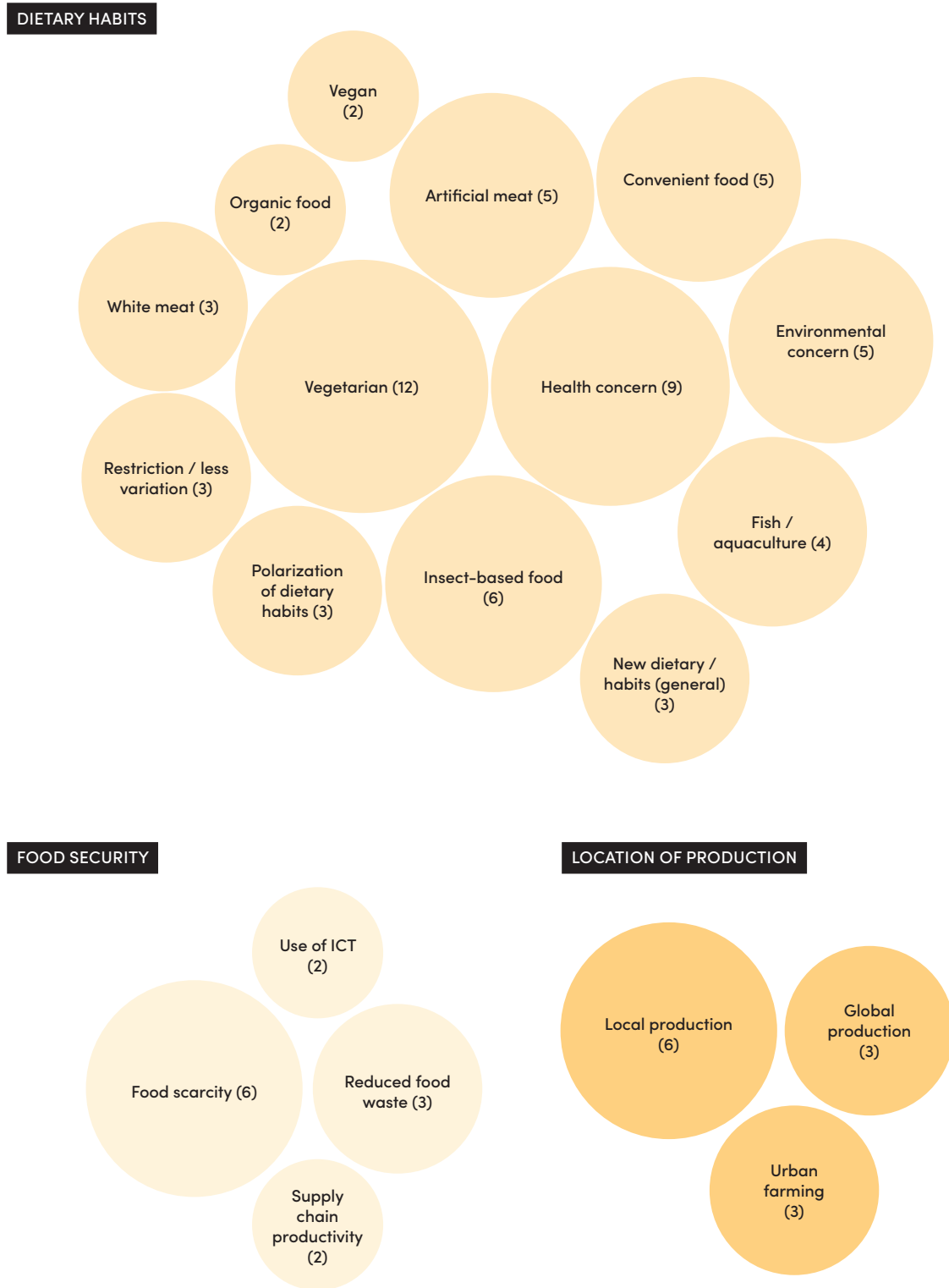
1) Dietary Habits – Respondents report on *future dietary habits as well as the drivers of these changes. Dietary habits include insects, convenient food, food with less variants, artificial meat, white meat, and vegetarian and vegan diets.* They listed three significant drivers for such changes: *pressure due to food scarcity and the necessity to reduce the environmental impact of food consumption, voluntary choice due to health and environmental concerns,*

and the preference of convenience. Respondents believe *various foods (even developed markets) could disappear due to the lack of space and land to grow them. Increased concern over climate change and sustainability could also reduce the appeal and acceptability of high carbon and resource-intensive diets such as red meat. There could be a rise in vegetarianism, driven by concern over animal welfare, health and environmental impact. Consumers may demand more naturally produced food and avoid plastic packaging to reduce environmental costs, and may become more concerned over the impact of food on their health and demand more information about the food they consume, such as nutrition facts, origin of production, sustainability of ingredient sources and ethical production processes.* Meanwhile, some respondents pointed out *the desire of some consumers for more time-saving convenient food through advancements in technology such as virtual shopping, home delivery, and home insect farms. Although the majority respondents argued meat consumption is already reduced, this may be the case mostly in Western countries according to some, while in countries with growing middle class this could increase.*

2) Food Security – Respondents believe *several elements could affect food security: productivity increase, climate change and population growth. In terms of productivity, new technologies such as mechanization and aquaculture and the expansion of agricultural land could lead to greater yields. Moreover, greater connectivity across the food chain enabled by ICT technologies may play a vital role in food waste reduction. However, even if all these factors were combined, respondents believe that the net gain from such progress would likely be outstripped by the effects of climate change and population growth, leaving food shortages a likely consequence. Food shortages may increase in regions already sensitive to climate change, such as sub-Saharan Africa. Compounding this issue, respondents noted that climate change can create multiple pressures on food systems.*

3) Location of Production – In the production scale, one key insight is that *localised food production and distribution may become better rooted, especially among high and middle income groups. In urban areas, people could become more self-sufficient in producing through roof gardens, greenhouses, algae production, underground mushroom farming and vitro/cultured meat. Locally produced food may be used for local consumption and for income generation. There are also views that imports and exports of food could still account for a large portion of economic growth as technology is still incapable of controlling the weather. Nevertheless, respondents believe that the amount of food mass produced globally may be limited to a few food commodities to sustain global programs for poorer populations.*

FIGURE 7 / Foresighted changes in food domain



Source: Authors, based on the Global Foresight Survey of Potential Changes in Society by 2050. Counts in parentheses represent the number of responses identifying the relevant item. N = 258.

4.1.2 Lifestyle Domain: Consumption of Manufactured Goods

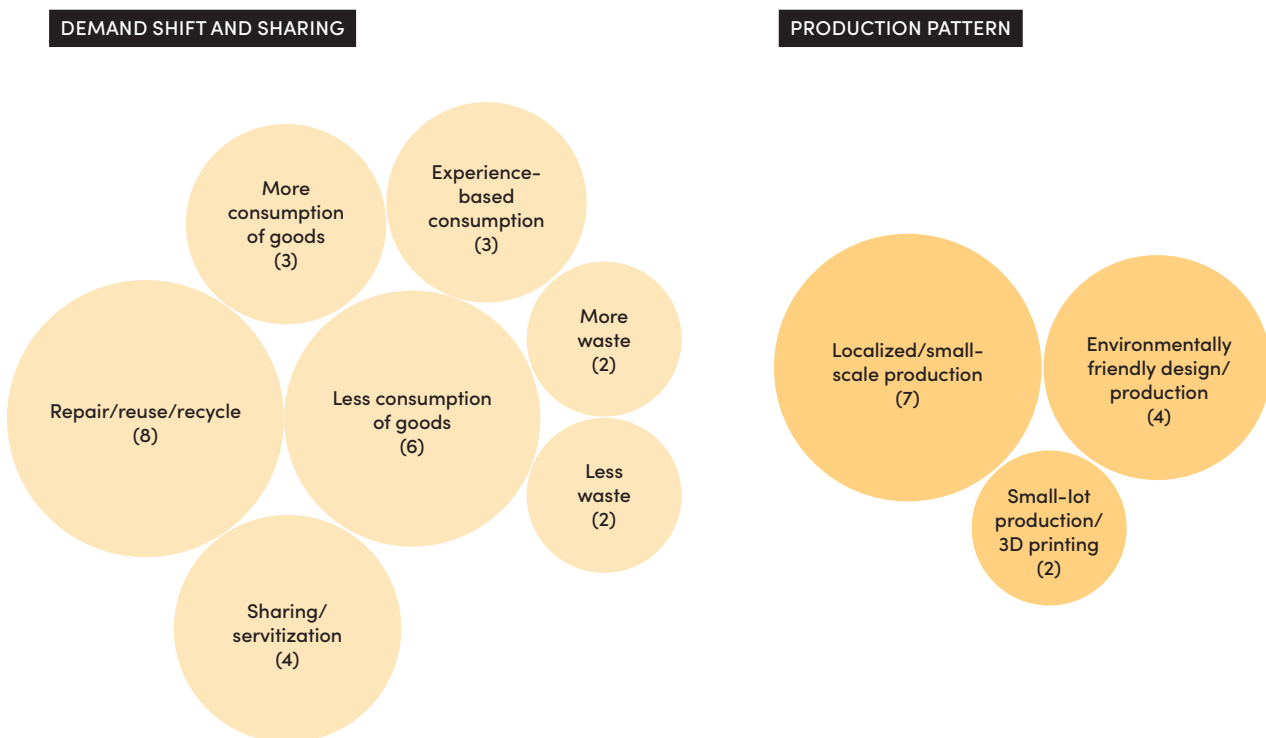
Respondents forecasted two types of changes: demand shifts and sharing and production patterns. In survey, about one-twelfth of the expected changes in daily living (21 out of 258) were related to consumption of manufactured goods. The reported changes are categorised into three groups (see Figure 8). Respondents highlight that a reduced demand is likely due to reduction trends like 3Rs (repair, reuse, and recycle), sharing and servitisation, and experience-based consumption. Another group of manufactured goods changes is related to shifts in production patterns, such as localised, small-scale production, environmentally friendly design and production, small-lot production and, the low cost, low labour production process of 3D printing. The changes are summarised below.

1) Demand shift and sharing – Respondents point out that demand may shift because of *the increased adoption of 3R activities, driven by environmental concern. Responses were split that there would be a rise in consumption*

in emerging economies due to an increasing middle class and a lowered rate of consumption in high income countries, who would chose to move away from mass-consumption models. People in general however, may be less interested in consuming manufactured goods and more interested in how they spend/consume their time.

2) Production Patterns – Respondents note that *production may become more localised and smaller scale, and more environmentally conscious in product design and material use. Some examples include dramatic transformations in manufacturing and material processing due to non-use of fossil fuels, algae-based fuels replacing crude oil, biodegradable bioplastics replacing oil-derived plastics, and “green” chemistry replacing synthetic chemistry. Some think that manufacturing could become more decentralised and distributed locally, which would make economies more locally oriented. Mass-produced goods from factories may become less necessary for households and community based economies. There could be a shift away from corporate employment towards family businesses, from multi-national brands towards local producers, and from large manufacturers towards local 3D printing, if the technology becomes widely available.*

FIGURE 8 / Foresighted changes in manufactured goods domain



Source: Authors based on the Global Foresight Survey of Potential Changes in Society by 2050. Counts in parentheses represent number of responses identifying the relevant item. N = 258.

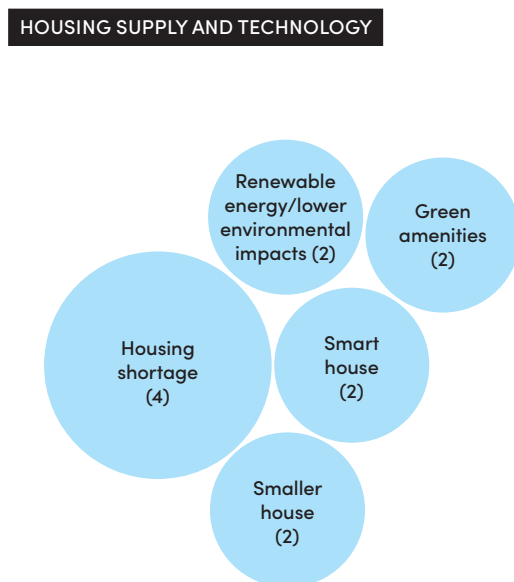
4.2 Infrastructure: Mobility and Housing

In infrastructure, mobility and housing, technology is the key factor that may bring about changes. Respondents focused on the advancements that can be realised through technology and access to such technology.

4.2.1 Lifestyle Domain: Housing

Survey respondents noted that housing changes would come from changing housing supply and technology. Few responses centered on housing (8 out of 258). The changes noted are categorised in two groups – housing supply and technology – but due to the limited number of responses these are combined in Figure 9. About half of the respondents selecting this domain consider a possible shortage of housing supply. Some experts refer to the incorporation of renewable energy, lower environmental impacts, and adaptability to climate change in housing. Also, smart homes, i.e., automatic, connected homes, were identified as an emerging trend in the housing domain. The changes are summarised below:

FIGURE 9 / Foresighted changes in housing domain



Source: Authors based on the Global Foresight Survey of Potential Changes in Society by 2050. Counts in parentheses represent number of responses identifying the relevant item. N = 258.

1) Housing supply – One comment is that there may be a *housing shortage due to climate change and rapid urbanisation. Housing is expected to change significantly due to the increased need to adapt to extreme weather conditions.* Respondents also think that *due to rapid urbanisation, the family and social units in cities could be transformed into smaller units that require smaller living spaces. Competitive economies may increasingly focus on the quality of citizen housing to incorporate local food production, (tree) shade, ecological connectivity and outdoor social amenities to reduce car dependence.*

2) Technology – Some respondents consider that *by utilising the latest technologies, housing can integrate renewable energy grids, water recycling and storage, solar design and recyclable materials. Sensor type housing devices and gadgets can allow people to manage and integrate functions with cars through smartphones.* Nevertheless, respondents think that *technological advancements would only be available to those who could afford them.*

4.2.2 Lifestyle Domain: Mobility

Respondents looked at this issue from three lens: mobility technology, access and demand and transportation mode. Mobility was one of the major areas for lifestyles change with almost one-seventh of the answers (36 out of 258 changes). Reported changes are categorised into three groups (see Figure 10). One major changes noted was the advancement of mobility technology, such as automated vehicles, electric and hybrid vehicles, and high-speed transport systems. Apart from this, many experts forecasted shift in access and demand, such as a drop in mobility demand related to digital communication, unequal or rise in access to mobility, and continuation of the rising trend in mobility demand. Furthermore, some experts referred to changes in transportation mode towards mobility as a service, sharing, and public transport. The categories are summarised below.

1) Mobility technology – The majority of the respondents consider *advancements in mobility technology. The likely dominant technology shift involves autonomous vehicles.* Some respondents think that *due to the rise of environmental concerns, more people could shift from fossil fuel-dominated mobility to electric vehicles. With increasingly favourable regulations, electric vehicles are considered to become a significant mode of transportation. Other technologies such as high-speed transportation may become more prevalent as well.*

2) Access and demand – One noted change respondents mention is that *due to the digital transformation, mobility itself may become less necessary. IT could replace*

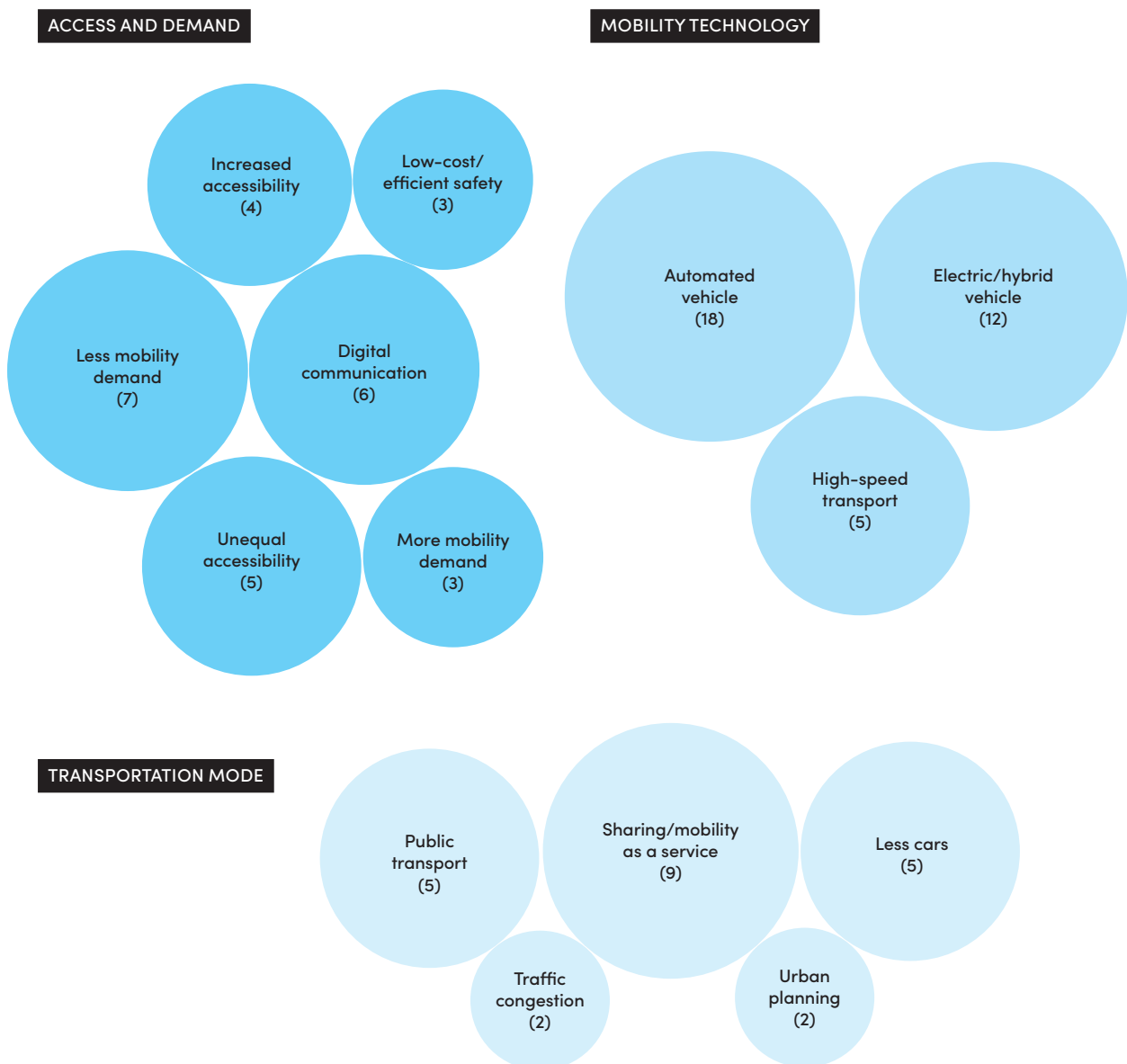
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professional travelling with video conferencing, teleworking and labour platforms. In contrast, there are views that the demand for mobility may increase due to the wide range of opportunities globalisation offers, conflict, and climate change. Some respondents point out that technological developments may lower the cost of mobility and make it more efficient and safer. But it would not be accessible to all. There are views that if energy becomes scarcer, the ability to travel could be limited to

those who could afford it and mobility itself may become more politicised when the impact of excessive travel on the global and local environment becomes unacceptable.

3) Transportation mode – Respondents also think that modes of transportation may change as mobility-as-a-service and sharing platforms are beginning to replace private ownership.

FIGURE 10 / Foresighted changes in mobility domain



Source: Authors based on the Global Foresight Survey of Potential Changes in Society by 2050. Counts in parentheses represent number of responses identifying the relevant item. N = 258.

4.3 Time Use and the Meaning of Life: Education, Work and Leisure

While these domains are less related to direct consumption, they remain significant in terms of setting peoples aspirations, time use and the meaning of life.

4.3.1 Lifestyle Domain: Work

Respondents argue that work may change in four ways: labour market, work format, meaning of work, and linkages with other lifestyle domains. In the survey, work was the most frequent lifestyle domain chosen by respondents with almost one-fifth answers (47 out of 258 changes). The noted changes are categorised into three groups (see Figure 11). One of the most frequently cited potential changes is the labour market itself, including the replacement of human labour by automation, unemployment, liquidity in the labour market, and more emphasis on highly skilled and human-centered jobs. Changes in the format of work, such as teleworking, freelancing, and work-sharing formed the second largest group of answers. The third group of changes related to the meaning of work, resulting from changes in remuneration systems, income and social security, and the work-life balance. The changes are summarised below.

1) Labour market – Respondents note that *rapid developments in AI and robotics could cause significant unemployment. Robots could replace numerous specialists, ranging from drivers to junior lawyers and medical doctors, resulting in fewer new professions requiring higher qualifications and multi-sectoral knowledge. Respondents site that changes could force the global employment market to be more flexible in working structure and relationships. Permanent contracts may disappear, employment may become more tenuous and people may be forced to specialise in areas the service sector chooses to empathise. Some respondents also state that the world of work might become more stratified, with increased numbers of specialised experts commanding their own work and lifestyle choices with global mobility. A large workforce of production labour would remain, but such work would be mostly transient and transferable between nations and regions. There were also views that there could be more employment in industries related to the sharing economy, and green jobs in renewable energy and recycling.*

2) Work format – *The next perspective concerned changes in the formats of day-to-day work. New communication technologies may offer more people opportunities to work through telecommuting. Moreover, respondents consider that job-sharing or limited working hours could become more flexible and that most people may work as a precari-*

at with increased flexibility/work-life balance. There were also views that climate change would affect our ability to travel to work in central hubs, and that environmental conditions may make outdoor work impossible.

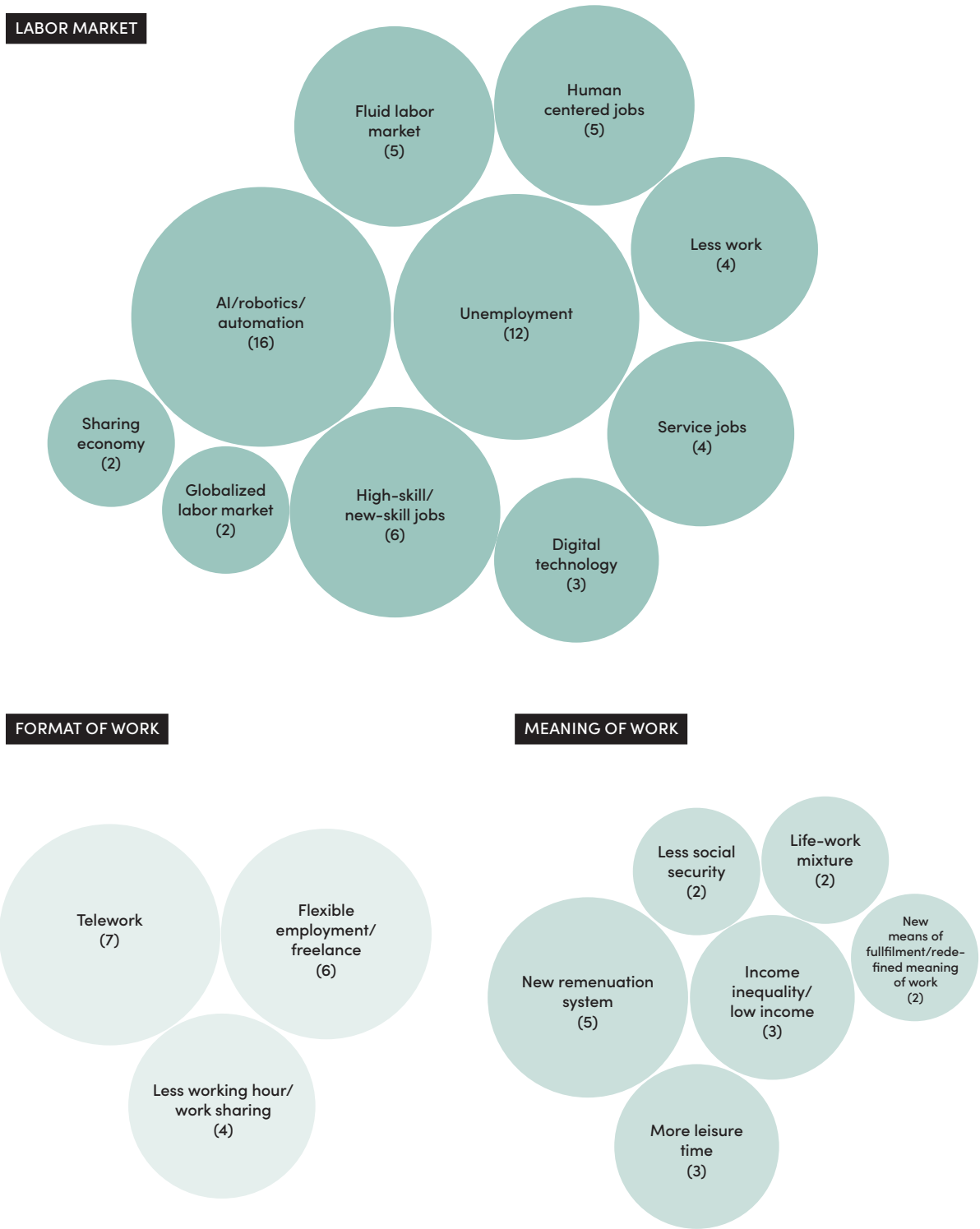
3) Meaning of work – Respondents provide insights into *how the changes in the labour market relate to the meaning of work. The income inequality between those still employable and those becoming jobless could enlarge. Pessimism over the ability for most people to be able to earn their living was also expressed, with capital owners grabbing ever higher shares. Optimistic views are also expressed, arguing that methods like universal basic income, asset ownership schemes, robot sharing on a common basis could enable work to become a choice to enrich life rather than to ensure economic necessity. As a result, being employed would no longer be the source of one’s access to goods and services. The perception and application of the term “work” may encompass many more human activities and current unpaid forms of work.*

4.3.2 Lifestyle Domain: Education

Respondents note that the future of education may change in two ways: access/format of education and purpose. In the survey, about one-ninth of the respondents selected education (30 out of 258 changes). The reported changes in this domain are categorised into three groups (see Figure 12). Education’s purpose includes increased importance of ongoing education, vocational training, new and soft skill development and repurposed education. Access to and the format of education would include technology-assisted education and out-of-school learning. The changes are summarised below.

1) Purpose of education – One key feature projected by respondents is that *education may not be limited to formal schooling but could become a lifelong pursuit. Due to the faster pace of societal changes ranging from technological disruption and continuous upgrading of knowledge education may not be limited to specific life periods but may be available throughout life offering new opportunities to participate and promote new skills and attitudes. Increased emphasis would therefore be on reaching (new) students to develop the needed soft skills to work flexibly across a wide range of areas. There may be more study programmes dedicated for part time jobs as a result of new employment structures. This may increase curriculum changes that further enable students to develop ethical and practical skills in addition to vocational, professional and academic understanding. Moreover, some respondents note the purposes of education could completely change. With the rise of machine-learning to replace human labour, life-long learning may become required to*

FIGURE 11 / Forecasted changes in work domain



Source: Authors based on the Global Foresight Survey of Potential Changes in Society by 2050. Counts in parentheses represent number of responses identifying the relevant item. N = 258.

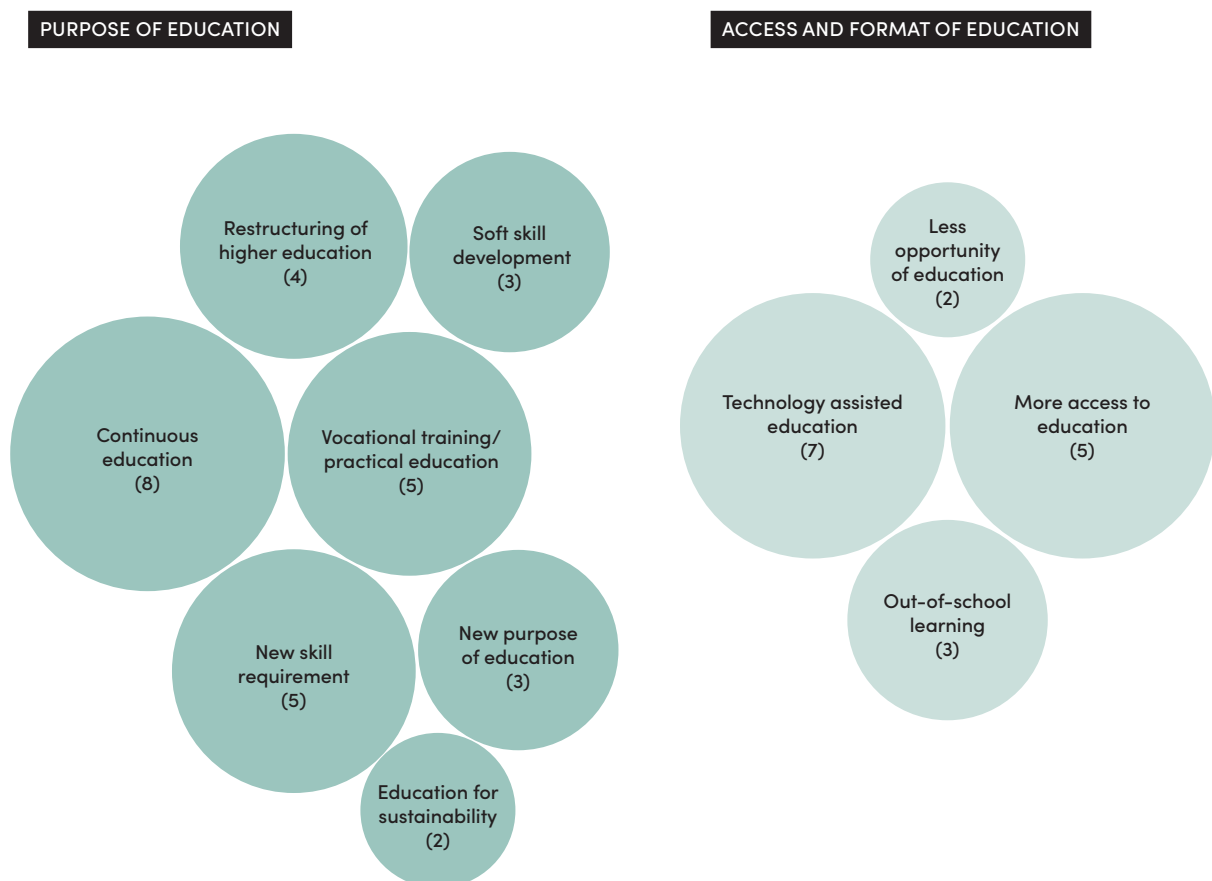
Insights on Day-to-Day Living in 2050

prevent mental degradation, boredom, and the feeling of irrelevance. Education could therefore likely be re-purposed, with an extension of specialities, potentially including self-awareness/spiritual dimensions.

2) Access and format of education – Respondents note that technology could play an essential role in defining access to education and our ability to change its format. The digital transformation may increase information’s availability online. Virtual classes formed by students globally utilising conferencing technology could become the norm. New technologies such as simulation

games and dynamic graphic presentations would improve interaction between students and teachers via computers. Computer science and technology interaction would be taught much earlier in life, and students would be given skills that cannot be replaced by artificial intelligence. Traditional education could be replaced significantly by alternative education such as home-schooling, self-education or online education. Alternative views suggest that opportunities for education may become limited to specific groups and that the motivation for undertaking formal education may drop.

FIGURE 12 / Foresighted changes in education domain



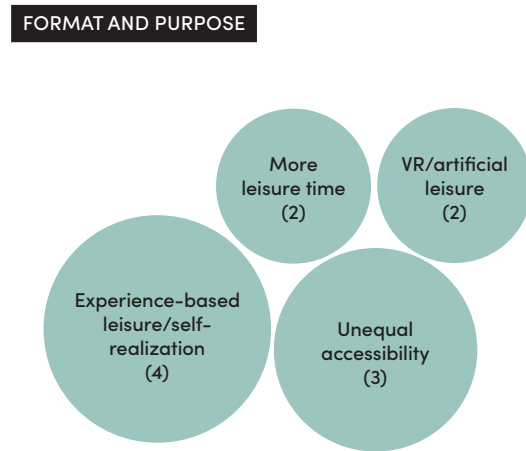
Source: Authors based on the Global Foresight Survey of Potential Changes in Society by 2050. Counts in parentheses represent number of responses identifying the relevant item. N = 258.

4.3.3 Lifestyle Domain: Leisure

Respondents consider leisure changes by analysing its format and purpose. Leisure was one of the least frequently mentioned domains (8 out of 258 changes) but is still an important aspect of lifestyles, in particular in relation to wellbeing. Changes in this domain are categorised into one group (see Figure 13). According to responses, some experts noted changes in the format and purpose of leisure, such as experience-based leisure, artificial leisure, and individualised leisure. Other respondents noted increases in leisure time could parallel with growth in unequal access to leisure services. The changes are summarised below.

1) Format and purpose of leisure – Respondents suggest *people may move towards experienced-based leisure embracing inter-cultural understanding, holidays, or ‘green’ tourism. Moreover, developments in technology, such as virtual reality, may contribute to more individualised and home-based experience-based leisure. Moreover, with assumptions about AI and robotics replacing a significant number of jobs and provision of a universal income, some respondents mentioned that there may be more free time, which might be used for purposes such as self-realisation.*

FIGURE 13 / Foresighted changes in leisure domain



Source: Authors based on the Global Foresight Survey of Potential Changes in Society by 2050. Counts in parentheses represent number of responses identifying the relevant item. N = 258.

4.4 Physical and Mental health: Health, Social Connections and Relationships

The last aspect focuses on the discussion of physical and mental health. Two important changes were cited regarding increased life expectancy/aspirations – advances in healthcare and the impacts of social media on human relationships.

4.4.1 Lifestyle Domain: Health

Respondents addressed changes from four perspectives: access to healthcare, innovation in healthcare, longevity, and new challenges. Health was the second major domain and comprised approximately one-seventh of answers (38 out of 258 changes). The changes are categorised in four groups (see Figure 14). One major change is related to innovations in healthcare, such as new technologies, automation, self-monitoring, precision and preventive healthcare. Another major area is new healthcare challenges, including risks of epidemics, antibiotics resistance, environmental degradation, non-communicative diseases, and mental health problems. Also, some experts expect changes related to longevity, including life-prolonging medicine, the health condition of the elderly population, and end-of-life decisions. Apart from these, some respondents report changes related to access to healthcare services. The changes are summarised below.

1) Healthcare innovation – Respondents note that *technological advancements could greatly contribute to healthcare. Robots in the operating theatre could perform surgery and surgeons would be able to remotely operate machinery. There may also be innovations in the treatment of wide-spread diseases such as cancer, Alzheimer's and Parkinson's. Some experts suggest that new human organs would be made with 3D printers and grown artificially, and doctors would be able to correct any DNA abnormalities in embryos before birth. Vital improvements in health outcomes and even advanced humans would become possible. However, because of high costs, it is likely that these improvements will disproportionately benefit those who can afford them, entrenching social divisions. According to respondents, the next area of healthcare advancement would be in the use of massive data sets. In-*

dividualised medicine could come about via automated diagnosis made possible through ownership of massive patient data. Instead of a one-size-fits-all model of clinical decisions for each patient, diagnostic testing would be used to select appropriate and optimal therapies based on the context of a patient's genetic content or other molecular or cellular analysis. Personalised medicine would also see the selection of drugs or treatment protocols that minimise side effects and, more importantly, will indicate an individual's susceptibility to certain diseases before they manifest. This would facilitate a focus on preventative medicine. For homes and individuals, this would mean health monitoring and intervention is more easily accessible for some.

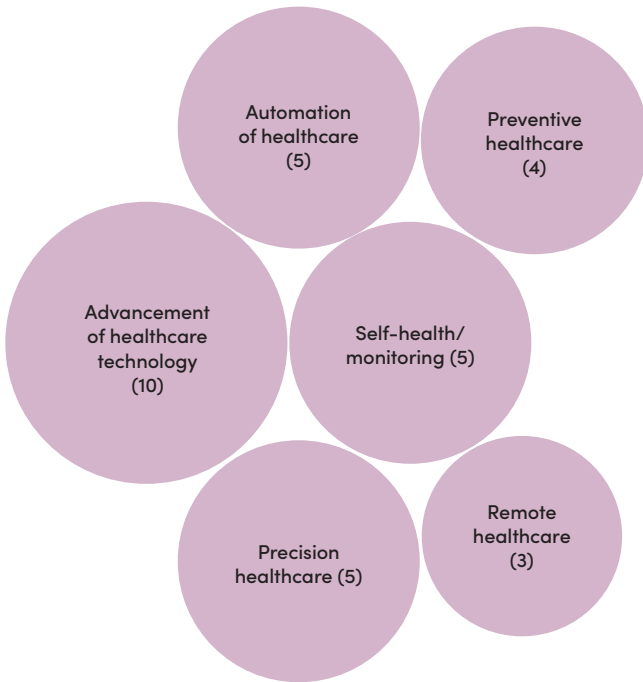
2) New challenges – Respondents highlight *new future challenges such as increased antibiotics resistance and cumulative long-term effects of sedentary lifestyles, high-processed food diets and environmental degradation, which could undo or offset advances made in other areas of human health. As a result, there could be an increased prevalence of cancers, diabetes, dementia, memory related issues and mental health issues. Extreme weather like natural disasters and pollution peaks would also contribute to higher death rates. Moreover, increased pressures from stress, inequity and migration may come about, which could cause significant physical as well as mental health challenges.*

3) Longevity – Respondents consider that *advancements in healthcare technology would enable increased longevity, potentially causing periods of morbidity during sickness. In responding to an ageing society, new approaches centered on illness prevention may become necessary. Countries would be forced to confront end-of-life decisions like assisted-suicide services. There were also views that health would be more prioritised in lifestyles, which could lead to more active old age.*

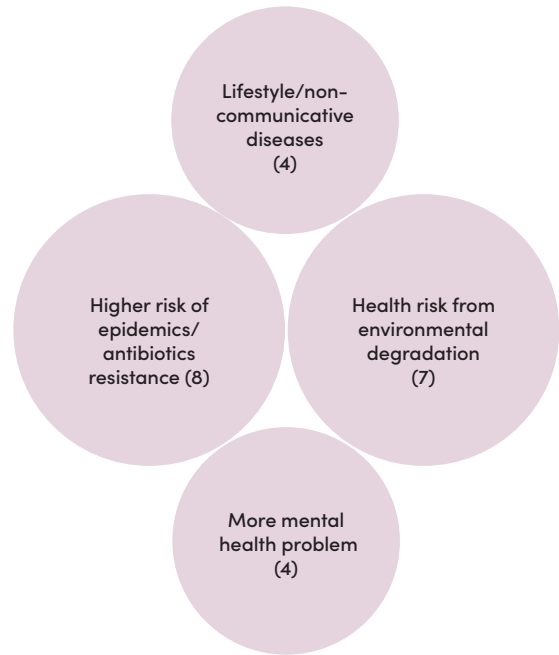
4) Access to healthcare – Respondents highlight that *access to healthcare would remain unequal and that advancements in healthcare such as personalised healthcare would only be available to those who can afford it, exacerbating health-care inequalities. Nevertheless, some respondents think that private entities would emerge to help provide innovative ways to make healthcare more accessible. Respondents also think that private entities would drive innovation and cost reductions in healthcare through sustainable and culturally relevant health treatments.*

FIGURE 14 / Foresighted changes in health domain

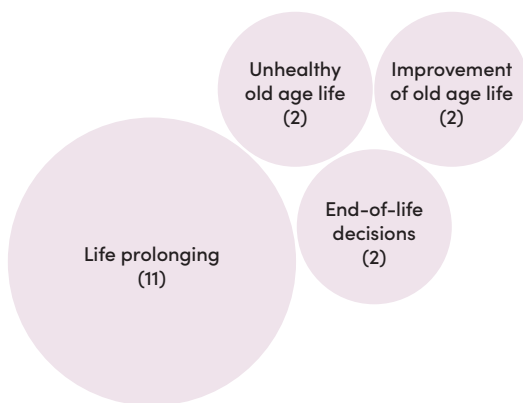
INNOVATION IN HEALTHCARE



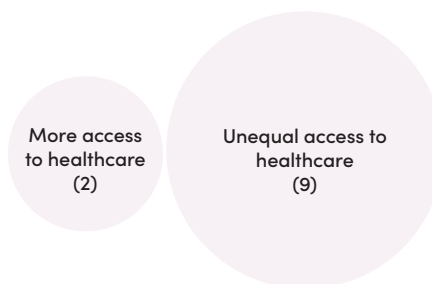
NEW CHALLENGES



LONGEVITY



ACCESS TO HEALTHCARE



Source: Authors, based on the Global Foresight Survey of Potential Changes in Society by 2050. Counts in parentheses represent the number of responses identifying the relevant item. N = 258.

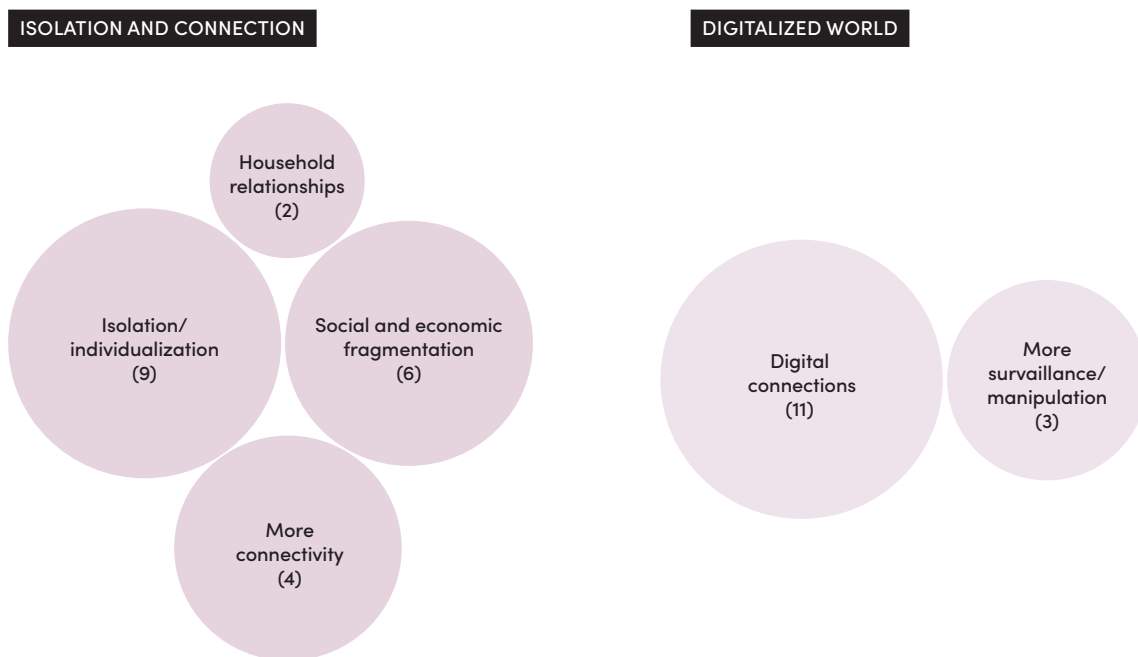
4.4.2 Lifestyle Domain: Social Connection and Relationships

Respondents approached this from two vantage points: isolation and fragmentation, and connecting in a digitalised world. Social connection and relationships were selected by almost one-tenth of respondents (25 out of 258 changes). The changes are categorised into two groups (see Figure 15). Of these, some experts consider both isolation and connection, including individualisation, social and economic fragmentation, more connectivity, and changes in household relationships. Also, some respondents emphasise changes in social connections due to the digitalised world, including digital connections and surveillance. The changes are summarised below.

1) Isolation and Fragmentation – One crucial feature pointed out is that *people are going to be more isolated and individualised, due to multiple factors. The spread of Western lifestyles could lead to more focus on self-improvement rather than to connecting and developing social bonds. Individualism and narcissism could likely to grow.*

Increasing rates of isolation could rise due to lower rates of marriage, divorce, smaller families, more individualised global leisure activities and digitalisation of communication. In addition, people may travel more often; relationships may become more fragmented with less intimate relationships (reinforced through social media) rather than those with physical presence. Growing inequality could also contribute to widening class gaps. Contrasting views suggest we may become more connected, due to shifts in ageing demographics, and a return to the extended family to ease domestic chores. The changing employment landscape could also provide new modes of time use, in which social networking may become the central way to connect. Globalisation may bring people closer in terms of communication. For example, at the community level people could address common causes like environmental and socio-economic concerns. Such developments could lead to higher tolerance and equality in society. Women’s empowerment could influence ideas of gender and gender relations. Views on gender would also likely be more fluid, with sexuality, as a dynamic concept, shifting away from binary forms of identification. There would also be refinements of marriage and relationship structures.

FIGURE 15 / Foresighted changes in social connection and relationships domain



Source: Authors based on the Global Foresight Survey of Potential Changes in Society by 2050. Counts in parentheses represent number of responses identifying the relevant item. N = 258.

2) Connecting in a digitalised world – Respondents mention that *digital interconnections both with people and objects, could drastically change communication. Social relationships may keep shifting away from face-to-face interactions and towards online communities. Interactions within family and friends would mean simultaneously interacting with different online apps, leading to more fluid connections between people but lower attention spans and intimacy. For instance, rating based apps and commenting on social media may influence individual identity and how people build connections and make friends.* Nevertheless, there are alternative views that *artificial social connections might collapse, with people returning to physical interactions because online communication already raises social concerns about loneliness and polarisation. Also, the immersion of online systems might place societies under increasing surveillance, raising the potential for manipulation and control by powerful institutions armed with big data on people's behaviour.*

4.5 Overarching Observations from Lifestyles Aspects

This chapter listed a variety of possibilities under nine lifestyle domains. Food, consumption of manufactured goods, housing, mobility, work, education, leisure, health, and social connections and relationships were further categorised into four lifestyles aspects (consumption, infrastructure, time use and the meaning of life, and physical and mental health) for the analysis. Because the purpose was to list possibilities rather than perform a synthesis, there are contesting views within each domain description or in the same topics across the domain. These contrasts reflect the different future possibilities. A more in-depth analysis from wellbeing, environmental footprint, and a sustainability perspective, is presented in chapter 5. Overarching observations appear below.

Some respondents noted that consumption and production patterns could move towards sustainability. Resource constraints and environmental pressures may affect consumers' orientation and lead a shift in more sustainable production and consumption patterns. Nevertheless, this may be most relevant for those who could afford the changes. For all domains, respondents point out how technological advancements would result in lifestyle changes and that advancements may not benefit everyone. Technology introduces more solutions and disruptive changes into daily living but whether they would enrich life is not certain. More analysis on this is considered in the next chapter.

Among non-consumption domains of work, education, social connections and relationships and

leisure, the suggested changes are similar, primarily due to the assumption that AI and robotics would replace human labour in multiple fields. Experts note that some soft interpersonal skills that robots cannot handle, such as caring, communication, and empathy, would be emphasised in human education to nurture related talents and skills. Moreover, there could be a need to upgrade skills through lifelong learning. The use of machines and artificial intelligence would co-exist alongside a human workforce. Respondents note changes in social structures. To address this some experts supported counter efforts like a universal basic income and time for leisure. Respondents also suggest that individuals could need to contribute in new ways through non-paid work, raising children, caring for elders, or other civic engagement such as community volunteering. Hence it appears that the changes of lifestyles domains are interlinked – when one domain changes, it affects others. This implies that a lifestyle cannot be broken down into independent domains completely and underscores the need for systemic thinking when transitioning towards more sustainable living. The next chapter offers more analysis on the wellbeing and environmental footprint perspectives.

5 • Implications on Wellbeing and Environmental Footprints



Due to differing and contesting expert views on future lifestyles, this chapter provides the key determining factors of wellbeing and environmental footprints - the basic elements of sustainable lifestyles - and outlines discussion points to be considered.

To analyse wellbeing, objective and subjective aspects are reviewed. Objective refers to basic needs, accessibility of an improved quality of goods and services, and individual physical health. Subjective refers to life satisfaction, mental health, dignity, and the ability of individuals to improve their lives. From the environmental sustainability perspective, potential impacts of future lifestyle changes on the environmental footprints in the first four consumption domains (i.e., food, manufactured goods, housing, and mobility) are considered as these domains account for more than four-fifths of carbon, land, water, and material footprints (NTNU 2018). After that, the potential impacts of other domains (e.g., work, education, leisure) mainly from the perspective of time-use and ICT are considered. The chapter aims to provide insight into how current wellbeing levels can be provided and sustained in the future.

5.1 Wellbeing Perspective

1) Consumption and wellbeing (food and manufactured goods consumption)

From the survey, two potential drivers to shift towards lower and more sustainable consumption production were suggested: 1) constraints caused by resource

scarcity and 2) increasing concerns over the environmental impacts of food. Two types of consumers may form, one that chooses to voluntarily consume less because of environmental or other health concerns, and another that is forced to consume less. For the latter group, the possibility of food scarcity has significant implications, for both objective and subjective wellbeing. From the objective wellbeing perspective, people already at the brink to meet basic needs could be driven below it. Even today, 795 million people, or 1 in 9 of the global population, goes to bed hungry every night, and 1 in 3 suffers from malnutrition (World Food Programme, n.d.). By 2050, food production would have to increase by 70% (compared to today) to feed the global population (FAO 2009). For those forced to consume less due to the lack of access to sufficient food and goods, they will be affected both objectively in not being able to meet their basic needs for a decent living, and subjectively in not being able to meet their desired level of consumption.

For those who meet their basic needs or even over-consume and opt to consume less voluntarily because of environmental concerns, the subjective impacts of lowered consumption requires further exploration. The rationale cited for choosing to consume less is often noted as wellbeing. Some experts consider that current patterns of over-consumption are a threat to the quality of life. They note that in reality, they fail to satisfy their needs through materialistic consumption (Jackson, 2005). Other than material wealth, aspects such as knowledge, beliefs and values influence wellbeing (Carlisle & Hanlon, 2018). For those who choose to consume less meat and/or products, or consciously consume for lower environmental impacts, their subjective wellbeing may even increase.

Thus, paying attention to the reasoning behind those who choose to consume less could enrich the debate on subjective wellbeing.

2) Accessibility, wellbeing and advanced technology in infrastructure (housing and mobility)

In housing and mobility domains, respondents note that technological advancements will raise convenience levels and services for individuals, providing better access to and higher quality mobility, which will in turn improve living. Such improvements will contribute to raising objective wellbeing and enhance access to basic needs and better infrastructure and living conditions. At the same time, respondents raised concerns over the outcomes of advancements being unequally shared. The inequality in access to technology could even increase (Warschauer & Matuchniak, 2010).

Amid rapid urbanisation, populations living in urban slums will keep rising, especially in developing regions, accounting for about 30%, or 880 million residents (PSUP, 2016). Towards 2050, though technology improvements could improve infrastructure and housing conditions, the disadvantaged and marginalised groups will likely be excluded. From the objective wellbeing point of view, unequal access to mobility services and a housing shortage would likely greatly impact the poor, reducing their ability to meet basic needs.

From a subjective wellbeing perspective, the exacerbated inequality in future societies pointed out by respondents, would increase gaps in innovative services between those who can afford and those who cannot. If societal inequality rises, people are more likely to report themselves as unhappy (Alesina, Di, & Macculloch, 2009). Despite research that counters this perspective (Rozer & Kraaykamp, 2013), in terms of subjective wellbeing, the gap between expectations and reality due to social inequality would become the key factor for those who cannot afford access to technological advancements.

3) Time use, wellbeing, and the meaning of life (work, education and leisure)

In the domains of work, education and leisure, changes due to large-scale replacement of human labour by robotics and AI, may significantly impact on objective and subjective wellbeing, depending on the support systems that may exist in a specific context, such as a basic income provision by the government. From an objective wellbeing perspective, the disappearance of employment may have both positive and negative implications. If support systems like universal basic income or similar measures are implemented to address

the loss of work, the change could result in more flexible time use and/or more time to spend on leisure and hobbies. However, if such measures are not in place and the profits generated by robotics are not distributed, in the absence of social security safety net, a majority of people could lose income sources and access to meet basic needs.

Furthermore, even when measures such as universal basic income and social safety nets are provided, objective wellbeing could vary depending on people's current standard of living. There are views that an adequate universal basic income providing for all needs is unaffordable, with a more comprehensive social security system suggested instead (Coote, 2018). For those who currently have a very high quality of living, their objective wellbeing may decrease if universal measures aimed at more equal distribution provide only a minimum level of basic needs. For those who only have basic needs being satisfied, their objective wellbeing will remain the same. Finally, for those who do not meet their basic needs today, their objective wellbeing could increase if their basic needs were satisfied.

For subjective wellbeing, the implications are more complex. Wellbeing could drop without social security measures due to rising stress levels over economic and aspirational uncertainties, and could rise due to reduced work-related stress and increased control over personal time use, because work stress is considered a common occurrence today (European Agency for Safety and Health at Work, 2012). Moreover, time affluence, i.e., the sense of having sufficient time for personal use, could enhance people's wellbeing (Kasser & Sheldon, 2009). Creating the conditions for more individual control and autonomy over personal time which could add meaning to time spent at work and in other activities (Dumitru & Mira, 2017). When people have the luxury not to work or to work part-time, they have more freedom/control over time use to allocate time for interests and hobbies along with work. Respondents point out that people could have other activities such as voluntary services to society that contribute to fulfilling aspirations. Yet, too much time could lead to a drop in subjective wellbeing if there is an absence of clear goals or purpose. These changes may offer room to search for one's identity.

Moreover, people could have to seek alternative identities than those related to work, so education could be expanded beyond current foci. Today education and work are tied to economic productivity, to acquire the skills for jobs and to contribute to individual income generation. There are other critical, non-economic meanings related to work in terms of fulfilment, which also contribute to wellbeing. Opti-

mal wellbeing can be achieved when individuals have identities with a combination of control, achievement and inclusion in broader society (Nguyen & Cairney, 2013). Hence, education and employment are crucial tools to enabling this. Employment is not only about generating income. It is also essential to wellbeing, providing an opportunity of control, usage of skills, and interpersonal contacts and goal achievement (Warr, 1987). The key challenge lies in enabling the non-economic work benefits so that they are accessible, given structural unemployment, through non-traditional means, such as through voluntary activities and civic engagement.

4) Mental and physical health, and wellbeing (health and social connections and relationships)

Respondents point out that increased longevity due to advancements in healthcare technology is one key feature. The level of subjective wellbeing would depend on whether a longer life is healthy or ends up meaning more time in ill-health at the end of life. For subjective wellbeing, having an active and fulfilling older life is key to wellbeing, especially after retirement. About 10–13% of the elderly are estimated to be affected by acute loneliness (Local Government Association, 2016), and higher levels of isolation lead to lower wellbeing (Shankar, Rafnsson, & Steptoe, 2015). At an almost universal scale, aging is perceived as a social stigma and being elderly has been equated with ugliness, incompetence and uselessness, and a lack of agency when individuals are obligated to retire at a certain age (Nussbaum & Luvmore, 2017). For subjective wellbeing, whether the elderly are connected and active in society and community would be an important factor to consider for higher subjective wellbeing in contexts of longevity.

In the future, social connections and relationships will continue to be important factors contributing to both objective and subjective wellbeing. For objective wellbeing, connections provide help and assistance in both professional and personal settings. The contribution to subjective wellbeing is equally important. Having better connections like a sense of peer association and social cohesion contributes to higher self-esteem and lower levels of depression (Mao & Zhao, 2012). Connections with others, via friendship and neighbours, colleagues and families are strongly linked to individual wellbeing (Helliwell & Putnam, 2004). In the future social connections, influential social network services (SNS) are highlighted by respondents that could be positive or negative for wellbeing. The cybersocialist/pessimist debate has revealed evidence that SNS helps already happy people feel even happier (Munzel, Galan, & Mey-

er-Waarden, 2018). SNS is also considered to help build social capital to maintain a relationship for jobs and employment opportunities (Ellison, Steinfield, & Lampe, 2007). However, the majority of respondents were pessimistic over where SNS will lead people in terms of inter-personal connections. Though they may become broader, they will also be shallower. SNS such as Facebook do not fulfil key emotional needs of youth like stress relief. (Kalpidou, 2015). In this age of digital connectivity, the effects of SNS on subjective wellbeing require more consideration of factors such as whether emotional needs for deeper connections can ever be fulfilled.

5.2 Environmental Footprint Perspective

1) Materialistic consumption and environmental footprint

Some of the anticipated changes in consumption patterns in food and manufacturing goods are likely to have significant impacts on reducing daily environmental footprints. According to existing studies, changes in dietary habits from omnivorous to plant-rich foods and reductions in food waste can significantly reduce carbon, water, and ecological footprints (Rosi et al. 2017; Heller and Keoleian 2015; Jalava et al. 2016). As an alternative to meat consumption, a study from the UK suggests that cultured meat (meat produced in vitro) has less than one-fourth the greenhouse gas emissions and water and land use of regular meat production (Tuomisto & Teixeira De Mattos, 2011). Furthermore, as consumption of manufactured goods accounts for a significant share of the environmental footprint, reducing the level of consumption itself is expected to have positive impacts on reducing ecological pressures. The circular production and use of goods can generally reduce environmental impacts. For example, literature suggests that recycling and re-manufacturing contributes to reduced resource inputs and greenhouse gas emissions (Sundin and Lee 2012; Grimes, Donaldson, and Gomez 2008). Although some responding experts in the survey suggest changes that contribute to more sustainable approaches, such as reduced material consumption and vegetarianism, other respondents suggest that changes are likely to have adverse impacts on footprints, such as increases in meat consumption, manufactured goods, and waste generation. There appears to be no agreement among experts on the direction of changes because of the disparity in consumer groups and contexts around the world, implying consumption trends could polarise.

Environmental footprint impacts from some reported changes in food and manufactured goods are contested. With regard to food, existing studies suggest that the contribution to a net reduction in greenhouse gases by urban and local farming is positive but marginal and depend on crop choice (Goldstein et al. 2017; Kulak, Graves, and Chatterton 2013). Building vertical farming can reduce arable land and water inputs but requires more energy use than conventional farming, and will reduce the environmental impacts of transportation only marginally (Molin & Martin, 2018). Furthermore, although sharing can reduce consumption of new products, a recent study concluded there is no empirical evidence to date testing to its efficacy, apart from in car sharing (Frenken & Schor, 2017). Savings in expenditure realised through sharing may actually be used to purchase other products and services, causing a net increase in environmental impacts, the so-called “rebound effect”; incomes of populations also may shift due to sharing practices, which would in turn shift environmental impacts from such expenditures (Frenken & Schor, 2017). Similarly, experience-based consumption caused by a shift from consumption of goods to sharing services may not necessarily reduce environmental footprints as the provision of services themselves may require materials and energy, and access to services may increase transportation demands. For example, the carbon footprint may intensify per unit of monetary expenditure of services is not necessarily lower than that of manufactured goods (Institute for Global Environmental Strategies, Aalto University, and D-mat ltd. 2019). Such mixed findings on the impacts of these new provision models of products imply that we need to create ways of introducing sharing models with fewer rebound effects, experience-based consumption with a lower footprint, and types of crops suitable for urban and vertical farming.

2) Infrastructure and environmental footprint

The changes related to infrastructure use are expected to have significant impacts on reducing environmental footprints. As a means of mobility, automobiles and aeroplanes tend to be the most significant contributors to carbon footprints, whereas the share of different transportation modes and mobility distance varies across countries (Institute for Global Environmental Strategies, Aalto University, and D-mat ltd. 2019). The shift from private vehicles to public transport can contribute to reducing greenhouse gas emissions (Hodges, 2010), as would the shift from combustion engines to electric and hybrid vehicles, yet the level of low-carbon impact of electric vehicles varies depending on the power source (Wilson, 2013). In the

housing domain, the operational phase of buildings accounts for more than 80% of total building energy consumption (Ramesh, Prakash, & Shukla, 2010). Space heating (air conditioning) and water heating are responsible for more than three-fourths of energy use, in comparison to the relatively minor impacts of using other home appliances (UNEP, 2007). The shift of renewable energy in housing is a key to reducing carbon and material footprints (Institute for Global Environmental Strategies, Aalto University, and D-mat ltd. 2019). Similarly, smart building management such as building automation for efficient ventilation, lighting, and air temperature can reduce energy consumption of buildings by at least 10% (Hawken, 2017). Again, how much these pro-environmental options will penetrate through communities and countries in the future cannot be judged via the survey.

As suggested in the survey, new mobility provision models are expected to emerge, but their environmental impacts have not been thoroughly examined. As automobile use has one of the largest environmental impacts in mobility, reduction in car use will reduce carbon overall, but whether the reduction is related to ownership or use has different implications. To illustrate this, car sharing can reduce footprints at the manufacturing phase, but its overall impacts depend on the frequency and distance of shared car use. Similarly, while ridesharing can decrease per-passenger greenhouse gas emissions from car usage, people may choose to ride cars more frequently because it costs less or is more convenient than using public or body powered mobility for example. An existing study predicts that car sharing targeted at urban residents with good access to public transport may reduce mobility-related energy by approximately 5%, but only by 3% if the rebound effect, i.e., where expenditure saving from car sharing is used to purchase other products and services, is considered (Chen & Kockelman, 2016). Another study predicts that the maximum CO₂ reduction impacts of ridesharing are no less than 33%, which would be reduced to a half or a third due to the rebound effect we see in switching from public transport to cars and longer travel distances (Yin, Liu, Coulombel, & Viguié, 2018). A similar discussion can be applied to automated vehicles; e.g., the estimated impacts of energy use by autonomous vehicle ranges from an almost 90% saving to above 250% increase in energy use (Brown, Repac, & Gonder, 2013). Because mobility is one of the domains highly relevant to environmental footprints and intertwined with other issues such as access to services, means of commuting, and availability of spare time, it is essential to reflect further and identify the sustainable ways of introducing new mobility models.

3) ICT and environmental footprint

For other domains, such as work, education, and leisure, noted changes in the use of ICT, work style, and time-use are highly relevant to the global environmental footprint. Teleworking and teleconferencing could become more popular and people may adopt more flexible ways of working, such as freelancing. The expected reduction in overall mobility demand, on one hand, contributes to a reduction of environmental impacts, but an increase in the consumption of other high-footprint products and services in the time saved may cause rebound effects. An existing study estimates the rebound effect of telecommuting is at least 27%, which cancels out over one-fourth of the reduced transport energy consumption (Reitan, 2014). Another teleworking study concluded that the home-related environmental impacts due to additional time spent at home may offset the reduction from less commuting (Kitou & Horvath, 2003). A study in Sweden estimated that a decrease in work hours is associated with less energy demand and greenhouse gas emissions, and can contribute to reaching climate targets (Nässén & Larsson, 2015).

On another front, a more extensive use of ICT is likely to reduce environmental impacts, but the overall results are not yet fully evaluated. Smart solutions such as automation and AI can significantly reduce environmental impacts of daily living. A study in the US concluded that citizens spending more time at home via the use of ICT, such as computers and working at home, contributed to decreased energy demands (Sekar, Williams, & Chen, 2018). However, the environmental footprint of ICT infrastructures such as the Internet and its backbone computing power and data storage is not negligible. A study estimated that the footprint of the ICT industry as a whole is as much as 2% of global emissions, while the contribution of ICT in areas such as smart buildings, smart logistics, smart grids, and smart motor systems, on footprint saving, could reduce projected total emissions by 15% by 2020. This is five times the footprint of the ICT industry itself (Global eSustainability Initiative, 2008). Further understanding of overall impacts of new trends in lifestyles including time-use, working styles, and the use of ICT is required to identify more sustainable ways of living.

6 • Conclusions and Way Forward



6.1 Foresighted Changes in Society

This report aimed to combine the strengths of studies and emerging research on sustainable lifestyles to serve as a basis for future discussions in more participatory foresight processes by different stakeholders and citizens. It surveyed 137 futures-oriented experts from diverse fields on a global scale, and analysed their collective insights on potential future disruptions in society. Such knowledge assists in the transition to sustainability through providing a better understanding of how society and lifestyles could evolve over the next few decades towards 2050, and how more adaptive strategies could be developed to ensure a more constructive and inclusive transition.

The survey for this report asked for expert views on potential changes in culture and social norms, governance, economy, technology and innovation, environment and natural resources, and demography. From the responses, potential future changes affecting broader society were analysed in three themes – **culture, social norms and governance; economy, technology and innovation; and environment, natural resources and demography**. Further, we identified that key changes towards 2050 could have a strong effect on day-to-day living.

(i) Culture and Social Norms and Governance.

According to futures experts:

– As the effects of catastrophic climate change become more apparent in daily life, society would orient itself towards **better incorporation of environmental actions**.

– We could see a move towards **a focus on individual wellbeing**. The spread of communication technology and replacement of human labour by automation would allow people more free time for leisure and other more creative engagements that could support personal wellbeing.

– Nevertheless, withdrawal of social safety nets and uncertainty over employment due to automation could lead to increasing instability in society and cause development of a **survivalist atmosphere due to anxiety and uncertainty**.

– Under the current socioeconomic structure, and the changing landscape in employment partly due to automation, there could be **widening poverty and inequality**. This could have especially critical implications for the **youth population**, which would become even more vulnerable.

– Governments and other organisations would have to **cope with a fast changing world** both in structure and decision-making processes due to the ever accelerating rate of technological development and innovation.

(ii) Economy and Technology and Innovation.

According to futures experts:

– Changes in the economy and technology could contribute to **consolidating profits into the hands of a small number of conglomerates**.

– Developments in information and communication technology and 3D printing could lead to more distributed production, which could also provide opportunities for **smaller companies to scale up by connecting producers and consumers**.

– In the meantime, environmental pressures and widening inequality would likely lead to changes in how we perceive the relationship between economic growth and the environment, which could trigger a new economic paradigm and **a shift towards a post-growth system**.

– The **role of technology in our daily living would expand**, with increased options in sustainable technology in urban infrastructure and increased presence of non-human entities in our lives.

(iii) Environment and Natural Resources and Demography.

According to futures experts:

– There is broad consensus that society could face a **catastrophic ecological crisis** due to urbanisation, overconsumption and population growth.

– Although there are promising advances in sustainable technologies, without some radical intervention **the ecosystem could eventually collapse**.

– As a result of environmental degradation, extreme weather conditions and natural disasters, some regions could become unsuitable for living and there may be **mass climate change migration** within countries and across borders, which would present enormous political and socioeconomic challenges to governments and institutions.

Conclusions and Way Forward

Based on the above changes, three overarching observations can be made about the changes in the society. The first is that the rate **of change in both physical infrastructure and people's norms could accelerate due to technological disruption**. New ways of thinking and ideas could lead to the growth of a more tolerant society, but could also cause further fragmentation and polarisation. The second broad observation is that future society would face **more constraints compared to today due to ecological pressures, widened inequality and population increase**. This would affect everything from individual access to basic needs, up to macro institutions and governance. Third, expert insights show **widening gaps between aspirations of individuals (what people want) and the reality in foresighted future (what people will have)**. While individuals increasingly internalise environmental concerns and focus on wellbeing, the context of widening socioeconomic inequality and uncertainty in a rapidly changing world will likely direct people to develop survivalist mindsets at the expense of others.

6.2 Implications to Daily Living and Sustainability

None of the above is sure to occur because these are not predictions, they are interpretations of possibilities. In that regard, the report examined lifestyle perspectives in more detail to promote more sustainable living and lifestyles – achieving wellbeing with low environmental footprint. Researchers on sustainable consumption and lifestyles typically approach consumption by analysing the key domains such as food, consumption of manufactured goods, mobility, housing, education, work, leisure, health and social connections and relationships. As entry points to bending the future towards sustainable lifestyles, we categorised these domains into four groups:

(i) Consumption (food and consumption of manufactured goods): **Constraints arising due to the scarcity of resources and increasing concerns over the environmental and health impacts of food could lead to shifts in diets and habits**. For some this would be voluntary; for others it would be less about choice. While supporting pro-environmental and health choices, it is important to ensure that basic needs are guaranteed for all, including those people adversely affected by the changes described by the futures experts.

(ii) Infrastructure (mobility and housing): The technological improvements in mobility and housing would improve objective wellbeing with more options to improve living conditions. Yet, **due to cost of access,**

making technologies accessible only to those who can afford them, living conditions could be worse than today for the poor. Therefore, democratisation of sustainable technologies is important.

(iii) Time use and the meaning of life (education, work and leisure): Foresighted changes due to the large-scale replacement of human labour by automation is the critical factor. For objective wellbeing, less work could lead to increased leisure time and flexibility over time use. **This would only yield positive outcomes if benefits from automation are fairly distributed to all people in society**. One example is to explore using it to allocate basic income for everyone in society. On subjective wellbeing, lack of social security measures could increase stress levels due to instability and uncertainty. Analysis shows the need for people to have an **alternative identity beyond work**, and for the purpose of education to be based on more than contribution to the economy – new non-economic means of meaningful engagement in society and education would be crucial for wellbeing.

(iv) Physical and mental wellbeing (health and social connections and relationships): One key factor is **longevity, as people are anticipated to live longer**. Its implications for subjective wellbeing would depend on whether we could still enjoy a healthy and active life when old, instead of spending old age in extended sickness and loneliness. Connecting to others provides more opportunities for professional and personal encounters; better connections provide happier living. Social connections and relationships are important, and as such so are social network services.

Based on the discussions on the implications of the survey results from a sustainability perspective, we concluded the following messages in the context of the discussion on future lifestyles:

(i) **Lifestyles go beyond material consumption domains** such as food, mobility housing and manufactured goods typically addressed in quantitative analysis. In this study, we address non-consumption domains such as work, education, health, social connections and social relationships in order to bring out intangible elements that are strongly linked to fulfilment and have meaningful purpose in life. Further to this, while lifestyle domains may constitute units of scientific analysis, in practice they are inseparable. Therefore, analyses designed for strategies affecting everyday living would **need systemic thinking when approaching the transition towards sustainable lifestyles**.

Conclusions and Way Forward

(ii) Part of the challenge of achieving sustainable lifestyles is to reconcile the seemingly opposing approaches of reducing overconsumption while also increasing consumption for those who do not meet basic needs. The recommended approach is to **focus on wellbeing**. In this regard, both underconsumption and overconsumption are detrimental to wellbeing. Underconsumption typically occurs where people have limited agency, and as such there is need for action to redress the situation at a broader contextual level – such as better provision systems. In the case of overconsumption, individual actions can contribute to reducing environmental pressures while increasing well-being. In this case, **people’s values and norms are critical to the acceptance of ‘less’ consumption**.

(iii) Emerging business models and provision systems, such as mobility as a service, automated vehicles, and the use of ICT were foresighted to be prominent in the future. **Although new provision models can potentially enable sustainable ways of living, existing research has provided mixed findings on their environmental impacts, including due to rebound effects**. It is crucial to evaluate these new models in terms of sustainability and to strategically promote them to enable dematerialised and decarbonised lifestyles.

(iv) Among people, there would be more diversified values and ways of living due to the widening inequality and diversified social norms and cultures; even within the same physical borders there would be divergence between and within consumer groups and ways of living. Furthermore, there is a disparity in the foresighted changes relating to consumption **between experts who consider the dominance of lifestyle trends that could reduce environmental footprints and those who foresee trends which could increase footprints**. For example, even among experts, there is no agreement on whether vegetarianism (with low environmental impact) would become the main dietary approach or meat consumption would continue to dominate. Without clear interventions, the two may coexist.

(v) **The speed of changes in society could be more rapid than ever**, not only in physical infrastructure but also in social norms that **need to be addressed by policies through adaptive policy planning to capture the opportunities of innovations** such as new provision models, sharing and servitisation, or a shift towards new paradigms directing society. This calls for enormous efforts in **capacity building, and new institutional arrangements** well before 2050 that are different from those of entrenched unsustainable lifestyles as currently being practiced.

Although what future societies would be like cannot be foreseen with any certainty, the future can be co-created by bringing together those engaged in preparing for it and opportunities, both anticipated and unanticipated, that arise. This requires deliberate efforts to understand potential changes that lie ahead, and also empowering societies to map out scenarios of possible sustainable futures. To this end, futures studies can help us better understand how – as households and households, organisations and businesses, communities and nations, and governments at different scales – we can all contribute to jointly envision and then shape the future we want. Such an approach could provide different stakeholder groups with the necessary buy-in to shape a sustainable tomorrow, and with it a readiness for change, including searching and preparing for possible interventions to inject when positive disruptions inevitably occur. Naturally this requires more than just awareness. It also requires concrete investments in infrastructure, organisational practices, and new institutions that can shepherd society into a future that is inherently different from that which current infrastructure and institutions are built for.

Futures studies also have a responsibility to go beyond focusing on economic predictions and technological advancements in this process. To continue the discussion on future lifestyles, futures researchers could enhance efforts to understand the future through the lenses of hard technology and the economy and look at the soft aspects of cultural and social norms. This will lead to a richer and more dynamic understanding of future society. In addition, futures studies could enrich understanding through a sharper focus on daily living and provide a more “people-centred” picture of possibilities of how ordinary individuals could live – in order both for everyone to have a better feel of how changes in the future could affect their daily living and to invite others, especially the general public, into exploring the future.

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Annexes

Annex I. Overview of respondents

In total, 202 responses were collected by the cutoff date (28 February 2018). Of these, 137 provided at least one freely written answer. Since the focus of this survey is on eliciting such answers, the other 65 responses were treated as invalid and excluded from this analysis as they only answered Part I of the survey.

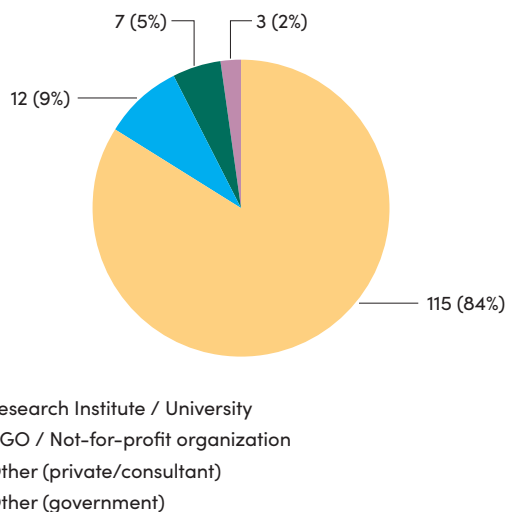
1) Organisation Type

The majority of the respondents belong to a research institute or university (84%). Other respondents include 9% from NGO/not-for-profit organisations, 5% from the private sector/consultants, and 2% from the government sector.

2) Geographical Coverage of Research Focuses

For geographical coverage of areas that respondents are knowledgeable about, a good balance was obtained in order to capture distributed regional representatives, although Europe (55%) and North America (26%) are among the most well represented. A substantial number of the respondents are knowledgeable about the remaining regions, including Asia-Pacific (31%), Africa and Middle East (20%), and Latin America and Caribbean (17%). A large proportion of the respondents did not focus on specific regions or focused on the global level (40%).

Type of Organization

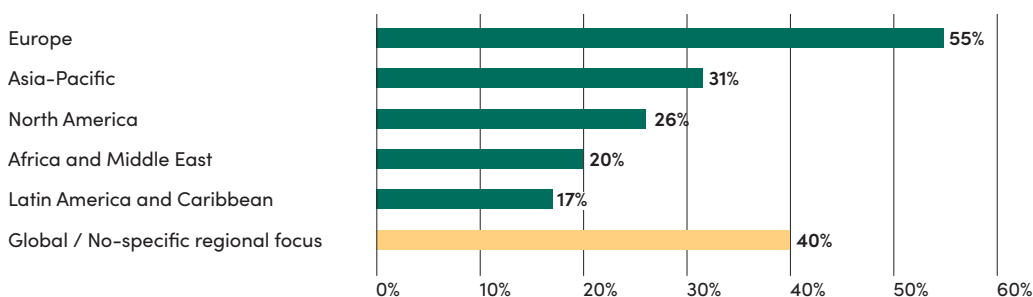


(N=137)

Source: Global Foresight Survey of Potential Changes in Society by 2050 Perspectives of Research Institutes and NGOs

Note: Based on the specific organisational information provided by respondents, “others” category was separated into government and private/consultant. “others” category were also recorded to “research institute/university” for retired professor and independent researcher or “NGO/Not-for-profit organisation” based on specific information.

Geographical Areas



(N=137)

Source: Global Foresight Survey of Potential Changes in Society by 2050 Perspectives of Research Institutes and NGOs

Note: Question “Please indicate the geographical area(s) you are knowledgeable about.” Multiple answers allowed.

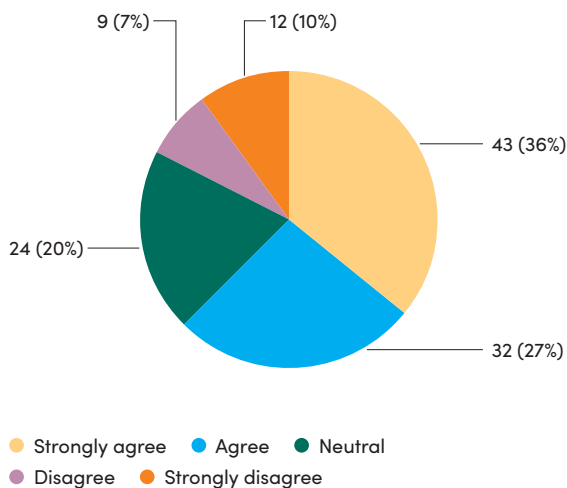
3) Research and Project Areas

As the research and project focus of respondents, environment (55%), economy (46%), and energy and resources (43%) are the most prominent subject areas. Other socio-technical areas such as governance (35%), social policy (33%), natural science and technology (30%), and education (28%) are also frequently addressed areas. International development (21%), health (18%), foreign policy (10%), and national security (4%) have less focus among respondents compared to other areas.

4) Environmental and Sustainability Focus

To evaluate how many of the respondents are biased due to their professional focus on environment or sustainability, a five-step Likert-scale question was investigated. Among those responding to this question, slightly less than two thirds of the respondents are working on professional activities focused on environmental issues and sustainability (strongly agree and agree: 63%). Slightly more than one third of the respondents have no particular focus on environment and sustainability (neutral, disagree, and strongly disagree: 37%). This implies that slightly less than two thirds of the respondents are looking at this survey through a ‘sustainability lens’ including both environmental and other sustainability aspects, whereas this is not the case for the remaining respondents.

Environmental Issues and Sustainability as Major Focus

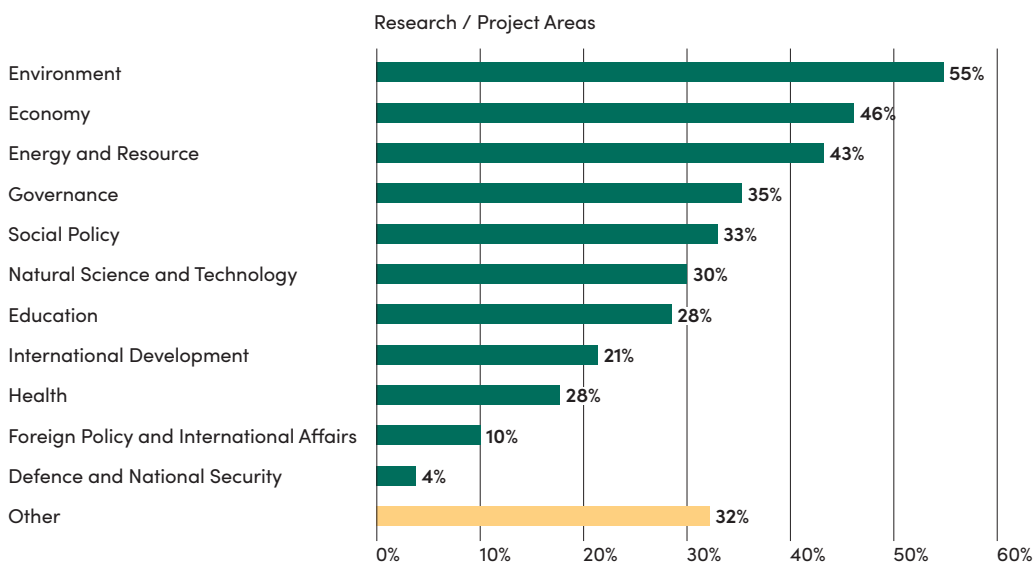


(N=120)

Source: Global Foresight Survey of Potential Changes in Society by 2050 Perspectives of Research Institutes and NGOs

Note: Question “To what degree do you agree with the following statement? Environmental issues and sustainability are the major focus of my professional activities – Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree.”

Research and Project Areas



(N=137)

Source: Global Foresight Survey of Potential Changes in Society by 2050 Perspectives of Research Institutes and NGOs

Note: Question “Please select all your relevant research/project areas.” Multiple answers allowed.

Annex II. Survey Methodology

1) Selection of Respondents

The expert sample of the survey was selected from authors of the relevant articles in the following foresight journals and keyword search on online journal research platforms. The research team reviewed the title and abstract of the articles, and excluded articles which focused too narrowly on technical aspects of particular areas. From the selected journals, 1,200 experts were identified.

- Journal of Futures Studies (300 experts)
- Technological Forecasting and Social Change (300 experts)
- Futures (300 experts)
- World Futures: The Journal of New Paradigm Research (100 experts)
- International Journal of Foresight and Innovation Policy (100 experts)
- International Journal of Forecasting (50 experts)
- Risk Analysis (50 experts)

Through keyword research on online platforms of Science Direct and Jstor, we searched for the following words to identify publications that are related to foresight topics: “Foresight Study,” “Foresight 2050,” “Future Foresight,” “Future Scenarios,” and “Future Study.” From the research topics identified, there were more articles on topics related to technology and economy. Therefore, in the keyword searches, we also targeted journals in the humanities and social sciences to balance the representative of research fields. A region-targeted keywords search was also conducted to find studies of less-published regions, in particular Latin America and Africa. For this reason, we added keywords “Africa” and “Latin America” combined with the above mentioned five keywords to identify more experts (e.g., “Future Foresight of Africa”, “Future Scenarios of Latin America”). From those keyword searches, 300 experts were identified.

2) Questionnaire Design and Analysis

The expert survey was implemented as a joint initiative of the Institute for Global Environmental Strategies (IGES) and the United Nations Environment Programme (UN Environment) from 25 January to 28 February 2018. We sent the survey questionnaire to approximately 1,500 foresight experts and received 137 valid responses. The target of the survey was researchers who have published articles on topics related to foresight studies in academic journals such as the Journal of Futures Studies, Technological Forecasting and Social Change, and Futures and those

identified through a keyword search on a journal database (to see more details of the sample selection, please refer to Annex II).

The survey is designed in a way that encourages respondents to freely express their thinking regarding changes in society up to 2050. The survey consists of five parts: i) Background Information, ii) Changes in Society towards 2050, iii) Challenges in Daily Living by 2050, iv) Changes in Stakeholders towards 2050, and v) Acknowledgement and Receiving the Results. Part I is for the purpose of collecting respondents’ profiles regarding their research expertise on topics and geographical coverage. Part V aims to verify whether their research focus is in sustainability areas and their preference on whether to be acknowledged in this study. The main parts of the questionnaire survey are summarised as follows. The questionnaire survey is attached in Annex III.

The results of the expert survey were analysed by the Institute for Global Environmental Strategies using a combination of qualitative and quantitative approaches. The analytical methodology mainly consists of quantitative analysis of coded answers, qualitative analysis of major groups of foresighted changes, and interpretation of the foresighted changes from a sustainable lifestyle perspective. The steps of analysis are as follows.

- 1) Freely written responses were manually coded with labels. Multiple labels per answer were allowed since each freely written response consists of more than one event or change item. Two researchers have mutually confirmed the labels to ensure the consistency of labeling criteria.
- 2) The labels were manually classified into a smaller number of groups based on the expert judgement of the changes in society and lifestyles. These groups were used for qualitative analysis and for the headlines of the report.
- 3) Based on the results of coding and grouping of labels, the major changes and their frequency for each group were summarised as graphs. Also, the interlinkages between labels of changes in the society were visualised by association rule analysis.
- 4) Each group of labels was qualitatively analysed by referring to the original answers. The major foresighted changes were narratively described in the report.
- 5) The major foresighted changes in daily living identified in the previous steps were interpreted from the sustainability perspective based on the literature review.

Annex III. Global Experts Survey

Global Foresight Survey of Potential Changes in Society by 2050
Perspectives of Research Institutes and NGOs

Introduction

Thank you very much for taking part in the Global Foresight Survey of Potential Changes in Society by 2050 - Perspectives of Research Institutes and NGOs.

This survey is conducted by the Institute for Global Environmental Strategies (IGES) and United Nations Environment Programme (UN Environment) as a part of a study under the initiative of the 10-Year Framework of Programmes on Sustainable Consumption and Production (10 YFP), adopted at the United Nations Conference on Sustainable Development (Rio+ 20) in 2012. There are currently 129 national government focal points and more than 650 actors participating in the multi-stakeholder programmes.

The aim of this survey is to collect the opinions of researchers and practitioners to understand current thinking on how changes in society from now to 2050 could shape people's daily living across the globe.

We would like to gather *personal, not institutional opinions* through this survey. The survey consists of five parts and should take about 30 minutes to complete. All answers to the survey will remain anonymous and will only be used for this project.

With your permission, we would like to acknowledge participating individuals and organisations in the final report. Please let us know in the last part of this survey if you would prefer to remain anonymous. In addition, we will provide you with the results of the survey before the publication of the final report. We will also invite you to review and comment on the analysis made in the study and keep you informed about the launch of the report in 2018.

Thank you very much again for your participation!

Global Foresight Survey of Potential Changes in Society by 2050
Perspectives of Research Institutes and NGOs

Part I Background Information

* 1. Type of Organisation. Please select one.

- Research Institute / University
- NGO / Not-for-profit organisation
- Other: (please specify)

* 2. Please select all your relevant research/project areas. (Please select all that apply).

- | | |
|---|---|
| <input type="checkbox"/> Defense and National Security | <input type="checkbox"/> Health |
| <input type="checkbox"/> Economy | <input type="checkbox"/> International Development |
| <input type="checkbox"/> Education | <input type="checkbox"/> Natural Science and Technology |
| <input type="checkbox"/> Energy and Resource | <input type="checkbox"/> Social Policy |
| <input type="checkbox"/> Environment | <input type="checkbox"/> Governance |
| <input type="checkbox"/> Foreign Policy and International Affairs | |
| <input type="checkbox"/> Other: (please specify) | |

* 3. Please indicate the geographical area(s) you are knowledgeable about. (Please select all that apply).

- | | |
|---|--|
| <input type="checkbox"/> Africa and Middle East | <input type="checkbox"/> Latin America and Caribbean |
| <input type="checkbox"/> Asia-Pacific | <input type="checkbox"/> North America |
| <input type="checkbox"/> Europe | <input type="checkbox"/> Global / No-specific regional focus |

Global Foresight Survey of Potential Changes in Society by 2050
Perspectives of Research Institutes and NGOs

Part II Changes of Society towards 2050

From now until 2050, what are possible significant changes in society in areas such as Culture and Social Norms, Demography, Economy, Environment and Natural Resources, Governance Structure, Technology and Innovation, and other areas? *Please list and describe three changes below.*

4. Change one: Please describe in about 100 words.

5. Change two: Please describe in about 100 words.

6. Change three: Please describe in about 100 words.

Global Foresight Survey of Potential Changes in Society by 2050
Perspectives of Research Institutes and NGOs

Part III Changes in Daily Living by 2050

In this part, we would like to know about possible changes in daily living for individuals and households in 2050. Please select two domains from below that could likely change the most compared with today.

7. Please select the first domain.

- | | |
|---|--|
| <input type="radio"/> Food | <input type="radio"/> Education |
| <input type="radio"/> Mobility | <input type="radio"/> Work |
| <input type="radio"/> Housing | <input type="radio"/> Leisure |
| <input type="radio"/> Consumption of manufactured goods | <input type="radio"/> Social connections and relationships |
| <input type="radio"/> Health | |
| <input type="radio"/> Other: (please specify) | |

8. How would the first selected domain above change? Please describe in about 100 words.

9. Please select the second domain.

- | | |
|---|--|
| <input type="radio"/> Food | <input type="radio"/> Education |
| <input type="radio"/> Mobility | <input type="radio"/> Work |
| <input type="radio"/> Housing | <input type="radio"/> Leisure |
| <input type="radio"/> Consumption of manufactured goods | <input type="radio"/> Social connections and relationships |
| <input type="radio"/> Health | |
| <input type="radio"/> Other: (please specify) | |

10. How would the second selected domain above change? Please describe in about 100 words.

Global Foresight Survey of Potential Changes in Society by 2050
Perspectives of Research Institutes and NGOs

Part IV Changes of Stakeholders towards 2050

11. In your opinion, which of the following stakeholders could have the most significant changes to their role in society as compared with today? Please select one.

- | | |
|--|--|
| <input type="radio"/> Civil Society | <input type="radio"/> Local Communities |
| <input type="radio"/> Governments | <input type="radio"/> Private Sector |
| <input type="radio"/> Households and Individuals | <input type="radio"/> Research Communities |
| <input type="radio"/> Other (please specify) | |

12. What could be the likely changes to their role in society? Please describe in about 100 words.

Global Foresight Survey of Potential Changes in Society by 2050
Perspectives of Research Institutes and NGOs

Part V Acknowledgement and Receiving the Results

13. To what degree do you agree with the following statement?

Environmental issues and sustainability are the major focus of my professional activities.

Strongly disagree

Disagree

Neutral

Agree

Strongly Agree



14. Please check following statements if you agree:

- I would like to receive the survey result before the publication of the report.
- I would like **my name only** to be acknowledged in the report of this survey.
- I would like **my organization's name only** to be acknowledged in the report of this survey.
- I would like **both my name and my organization's name** to be acknowledged in the report of this survey.
- I would like to participate in the reviewing and commenting process of the report for this survey.

15. Please provide your contact information below if you agreed with any of the statements above in Q14.

Name

Company

Address

Country

Email Address

Phone Number

Global Foresight Survey of Potential Changes in Society by 2050
Perspectives of Research Institutes and NGOs

Thank you!

Thank you very much for your kind cooperation!

We would like this survey to be taken by more researchers/practitioners who are working on foresight studies.

Could you recommend ***someone you know who also has the relevant background*** to respond to this survey?

16. If **Yes**, please provide the contact information of the recommended person for us to send the survey invitation.

Name

Organization

Country

Email Address

For any questions, please contact ***10yfp.sle@iges.or.jp***

**Society and Lifestyles in 2050:
Insights from a Global Survey of Experts**

by the **Institute for Global Environmental Strategies**
supported by the **United Nations Environment Programme**

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