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Collective foresight and intelligence for sustainability

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Non-technical summary. Charting robust pathways towards more sustainable futures that 'leave no one behind' requires that diverse communities engage in collective foresight and intelligence exercises to better understand global systemic challenges, anticipate the emerging risks and opportunities that disruptions present, and share perspectives on how to respond and inform decision-making. We report on the recent use of an international rapid foresight survey to assess expected societal trends over the next 3 years following the COVID-19 crisis. The results illustrate the power of collective foresight approaches to provide timely, nuanced insights for decision-making across sectors and scales, particularly in times of uncertainty.

Technical summary. We present the findings of a rapid foresight survey launched in spring 2020 to draw on the collective intelligence of the global community on where the world is headed post-COVID-19. Respondents were asked to (i) assess five key societal trends in the coming 3 years, (ii) provide news headlines they both expect and hope to see, and (iii) assess the role of digital technologies during crises. Analysis of over 2000 responses from more than 90 countries revealed important regional differences in expected societal trends related to sustainability. More respondents in the Global South expected shifts towards less inequality while more respondents in the Global North expected shifts towards a smaller ecological footprint. Qualitative analysis of proposed news headlines revealed four broad themes of focus (environment, equity, health, and economy), and yielded insights into perspectives on critical drivers of change. Finally, the survey report found that the vast majority of respondents were not opposed to digital surveillance in crises. In presenting these results, we explore the value of collective foresight and intelligence exercises in providing pluralistic inputs to decision-making and in complementing more prevalent methods of forecasting.

Social media summary. Collective foresight exercises with diverse communities can help chart robust pathways to more sustainable futures.

1. Introduction

The COVID-19 pandemic has sent an unprecedented shock through global socio-economic systems. This pandemic is not a 'black swan', that is, an event that is wholly unpredictable (*sensu* Taleb 2007), rather it is more of a known unknown (*sensu* Gowing & Langdon 2015). The increasing risk and prevalence of emerging infectious zoonotic diseases, the need for better pandemic preparedness planning, and the potential for far-reaching economic impact have long been forecasted by scientists and intergovernmental organizations (Daszak et al., 2001; Madhav et al., 2017; Peckham, 2013; Taylor et al., 2001; World Health Assembly, 2005). Despite this, the COVID-19 pandemic took the world by surprise – paralysing communities and businesses across the globe almost instantaneously. Many remain ill-equipped to navigate the path ahead, one characterized by volatility, uncertainty, complexity, and ambiguity (VUCA). In a VUCA world, two things are assured. First, human life and prosperity are dependent on, and interconnected with, that of others and nature. Second, there are many more unknowns ahead, which will pose challenges and opportunities for achieving the transformative vision of the United Nations' Agenda 2030 (UN, 2015a) as well as the Paris Agreement on climate change (UN, 2015b). Charting paths towards sustainable futures for all will require that new constellations of diverse communities engage collectively in horizon-scanning exercises to anticipate emerging risks and opportunities and to share perspectives with each other and with decision-makers on how to respond.

For the past 25 years, integrated assessment models (IAMs) have been the dominant mechanism for exploring alternative pathways in the context of climate mitigation planning. The IAM community has developed a range of possible futures in the form of the shared socio-economic pathways (O'Neil et al., 2014), and their use has proven instrumental to the work of the Intergovernmental Panel on Climate Change, by producing quantifiable data,

informing international negotiations, and providing an increasingly consistent framework for strategic foresight exercises (Gambhir et al., 2019; IPCC, 2018). Yet, limitations with IAMs exist. The long interval between reports, focus on decades-long time horizons, and limited diversity of worldviews within IAM expert teams (see, e.g. Ackerman et al., 2009; Biewald et al., 2015) may limit their ability to capture the dynamic challenges and opportunities in a VUCA world. Rapid foresight and collective intelligence approaches can help to provide information in contexts where decisions must be taken quickly and decision-makers require frequent insights into constantly shifting dynamics. They are also better suited to elicit diverse perspectives and explore how worldviews – the set of values, beliefs, and ethics held by different communities – can enhance and deepen reflection on our response to global challenges such as climate change or sustainable development goals (de Vries, 2019).

Collective intelligence refers to the shared knowledge that emerges from collaborative exercises among a diversity of individuals, which often include co-developing new ideas or evaluating existing ideas as a group (Leimeister, 2010; Malone et al., 2010). These approaches – which 'elicit, aggregate, modulate and contextualise expectations held by different actors' (Truffer et al., 2008) – are quickly gaining traction as a means to rapidly synthesize information, knowledge, and perspectives from a wide diversity of stakeholders and cross-section of expertise to help inform decision-making. Diversity of information and expertise are critical elements of collective intelligence (Mann & Helbing, 2017; Santos et al., 2012; Zafeiris & Vicsek, 2013), which can help to spark pluralistic dialogues, explore opportunities, and create momentum for societal transformations more effectively than any individual can alone.

In this paper, we argue that rapid foresight and collective intelligence exercises are critical mechanisms for both society and decision-makers to understand and explore solutions to global systemic challenges. With the COVID-19 crisis, society is collectively pushed to ask: What are the biggest risks and opportunities that the COVID-19 crisis presents for transformation to a more resilient, equitable, and sustainable world? How do different stakeholders expect the economy, society, and governance to evolve? How can society most effectively leverage the digital sector to manage this and other global crises, while managing potential threats to privacy, equity, and democratic rule? Below, we explore insights from a recent rapid foresight exercise and argue that such exercises need to be conducted on multiple dimensions of this crisis, with multiple sets of stakeholders and communities. This will be critical in order to facilitate the exchange of information and cross-fertilization of ideas and to provide input to decision-makers to help steer our response to this disruption towards a more sustainable and equitable future.

Before COVID-19, 2020 was to be the pivotal year to kickstart the 'decade of action' towards achieving the Sustainable Development Goals (SDGs), the year the Paris Agreement on climate change was set to come into force, and a time for the world to commit to a post-2020 global framework for biodiversity. The pandemic is threatening the future of these commitments. How governments, economies, and societies of the world choose to respond to this crisis could derail these efforts or propel the world towards such goals more quickly than before.

Nations around the world have already committed trillions of dollars to rebuilding their economies and tackling the ensuing societal crises brought about by the pandemic (IMF, 2020). In March 2020, the US senate agreed to a $2.2 trillion dollar aid package to address the initial impacts of the pandemic, while in July 2020 the European Union agreed to a historic $2.1 trillion dollar recovery plan. To put these amounts into context, estimates suggest that the world needs to invest 1 trillion dollars a year into clean renewable energy to keep global temperature rises below 1.5C (Ceres, 2018), while the financing gap to meet the SDGs is estimated to be around 2 to 3 trillion dollars a year (UNCTAD, 2014). How these new recovery packages are invested will shape society's trajectory for decades to come. Initiatives are now emerging to track recovery packages over the turbulent months and years ahead, such as the Vivid Economics Greenness of Stimulus Index[i] and the Energy Policy Tracker database.[ii] In addition to these types of efforts, frequent collective foresight strategies are needed to better understand challenges and opportunities from multiple perspectives as they unfold, identify options that could drive broad scale changes, and build a collective narrative around the future we choose.

2. Where is the world headed post-COVID-19?

To respond to this unique moment in time, Future Earth, with Imperial College London's Grantham Institute and the Sustainability in the Digital Age initiative, launched a rapid foresight survey as part of a broader collective foresight strategy to inform the path ahead as we navigate through this pandemic. The aim was to tap into a broad range of perspectives on how people expect the world to evolve over the coming 3 years. In April 2020, two parallel surveys were circulated: one to the global environmental sustainability community (hereafter 'Sustainability Community') reaching respondents in 90 countries via a Survey Monkey tool and the other to the General Population in 29 countries via Google Survey tools. The survey to the Sustainability Community targeted people working predominantly in the fields of environment, energy, and education and were distributed via listserv posts and direct emails based on the authorship team's professional networks, as well as institutional social media accounts, as such the sample is not necessarily representative of the full community. The survey to the General Population targeted non-expert citizens delivered by Google Surveys and were targeted towards a representative sample of people by age, gender, and, in some countries, geographic location. For full details on the survey methodology see Future Earth et al. (2020*a*).

The survey asked people to share their perspectives on the evolution of a number of societal trends and potential news headlines over the coming 3 years in response to the COVID-19 pandemic. The first wave of survey results appeared in a July 2020 report titled 'Where is the world headed post-COVID-19? Expected trends in the coming three years'. The report explores global expectations for five key societal trends (level of economic interdependence, centralization of governance, digital surveillance, inequality, and size of ecological footprint), classifies these trends into proposed alternative Sustainability Trajectories, explores prominent drivers of change towards positive visions of the future distilled from news headlines, and assesses perspectives on the role of digital technologies in crises (Future Earth et al., 2020b). Below, we summarize key findings from the report and discuss possible implications of these insights for decision-makers.

[i]See more information, https://www.vivideconomics.com/casestudy/greenness-for-stimulus-index/

[ii]See more information, https://www.energypolicytracker.org/

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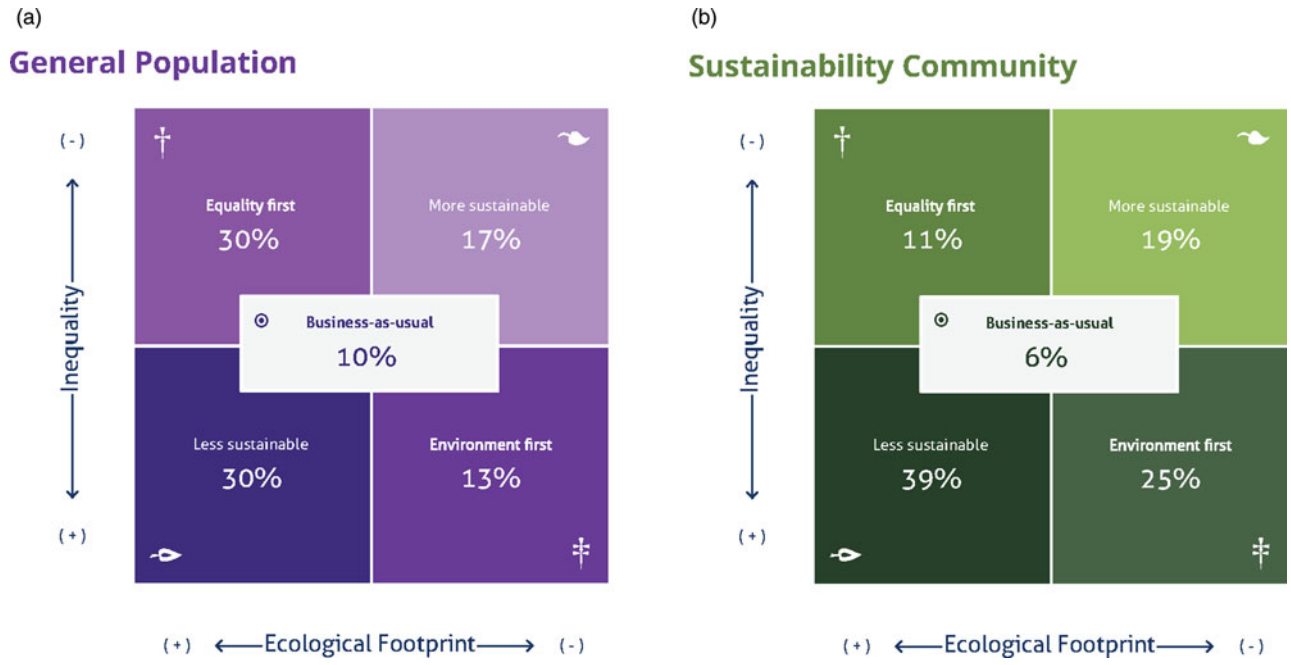


Figure 1. Sustainability Trajectories. Five alternative Sustainability Trajectories for the world identified based on expected trends in the level of inequality and size of society's ecological footprint over the coming 3 years and the distribution of respondents from the (A) General Population and (B) Sustainability Community.

2.1. Sustainability Trajectories

In the report, survey responses on expected trends in the level of inequality and the size of society's ecological footprint over the coming 3 years were used to define five Sustainability Trajectories. These were identified by creating a 2×2 matrix, allowing us to quickly organize and interpret the large amount of acquired data (Figure 1).

The report found that 30% and 39% of the people polled in the General Population and Sustainability Community respectively expect society to be on a trajectory towards a *Less Sustainable* world characterized by growing inequality and a larger ecological footprint (Figure 1). Respondents with this outlook also expect a trend of increasing centralization of power over the coming 3 years. This is particularly true within the Sustainability Community.

A nearly equal proportion (17–19%) of both polled communities expect society to shift towards a *More Sustainable* world with decreasing levels of inequality and reduced pressure on the environment (Figure 1). Of these respondents, a large proportion also expects a shift towards less economic interdependence among countries. Shifting towards greater self-reliance is a common response to economic crises, for example in the case of the 2007–2008 financial crisis (Postelnicu et al., 2015). However, that this group of respondents also expects a decrease in inequality and ecological footprint suggests that they may perceive the move away from globalized economies towards stronger local and national economies to be more sustainable.

The remainder of respondents expressed mixed or neutral expectations of these societal trends, however there were important differences both between the two communities and between regions. Overall, the General Population has a stronger expectation for an *Equality First* trajectory (30%), where inequality decreases but ecological footprint increases (Figure 1); this is true across all surveyed regions (Figure 2). In contrast, a greater proportion of the Sustainability Community expect an *Environment First* trajectory (25%, Figure 1), where the ecological footprint decreases but inequality rises. However, the breakdown by region suggests that this is primarily true in the Global North (23–27%, Figure 2) – which includes a large proportion of all Sustainability Community respondents – and in Latin America (37%, see Future Earth, 2020a for more details on distribution of respondents).

This suggests that there are important differences in perspectives between regions and communities on how society is expected to evolve post-COVID-19. For example, in the Global North, people may expect the COVID-19 crisis to strongly impact regional economies and individual behaviours, lowering their relatively large local ecological footprint. Meanwhile, in the Global South, many may still see an overarching need to continue to improve standards of living and address deep inequalities through use of their natural resources despite COVID-19. Understanding these differences is invaluable to support planning and decision-making, as they provide insight on the types of policies that may be more or less acceptable to different communities. They can also act as a mechanism to complement or provide input to other sustainability transition pathways tools, providing richer insight into the combination of diverse perspectives on alternative futures that traditional tools may miss.

2.2. Key drivers to move us towards a more positive future

In the survey of the Sustainability Community, respondents were asked to provide two news headlines of 'how the future may unfold from the current crisis' (i.e. COVID-19) – one they hope to see in 3 years' time and one they expect – with a short description. This type of question is designed to push respondents to envision and create a narrative of the future and allows for the analysis of the latent meaning behind statements. This can

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Figure 2. Regional distribution of Sustainability Trajectories. Distribution of survey responses into each Sustainability Trajectory by world region are shown for the General Population (purple pie charts) and Sustainability Community (green pie charts). The number of respondents from each community in each world region is indicated below and to the right of the pie charts.

facilitate the identification of drivers of change that often go beyond the purely objective and have the potential to speak to the values and worldviews that underlie perspectives (Futures CoLab, 2018). Although such qualitative analysis can be more difficult to interpret, this process is crucial in order to understand different points of view and motivations, to put these into context for decision-making, and to spark more pluralistic policy debates.

The report focused on news headlines describing *positive* futures, which included all hopeful headlines and expected headlines that described increased human and planetary well-being. Using qualitative data analysis of over 800 positive headlines and descriptions, the four most frequently mentioned classes of drivers leading to positive futures were identified: shifts in policies, norms, power dynamics, and mindsets. These align strongly with the work of systems scientist Donella Meadows, who proposed that the most impactful leverage points for driving systems change are 'the rules of the system, the power structures and dynamics that uphold existing rules, and the mindsets that define them' (Luers et al., 2020, p. 19; adapted from Meadows, 1999).

We further identified specific mechanisms of change within each of these classes of drivers. Examples include: emissions cap-and-trade or universal health care policies (Policy), changes in travel patterns (Norms), empowerment of local actors (Power dynamics), and the re-centring of values around compassion and kindness (Mindsets) (see Table 1 of the report, Future Earth et al., 2020b). Although not exhaustive, this list of mechanisms suggests that there are many existing tools that can be used to begin shifting society towards a more sustainable, equitable, and resilient world.

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2.3. What changes are expected across the positive futures?

Going beyond the analysis presented in the report 'Where is the world headed post-COVID-19? Expected trends in the coming three years' (Future Earth et al., 2020b), here we also reflect on common recurring themes across headlines that have been classified. Although the subject matter was wide-ranging, the most prominent themes related to: the environment, equity, health, and the economy. What's more, these themes were frequently mentioned together, suggesting that the issues raised within each theme are intrinsically interlinked.

2.3.1. Environment

Positive news headlines frequently addressed issues related to the environment, especially climate change, biodiversity loss, and nature protection. This is not surprising given that respondents were from the global Sustainability Community. It may, however, reflect the perceived opportunity presented by the COVID-19 crisis to address pressing environmental challenges through society's response to the health crisis (Everard et al., 2020; Harris, 2020). Many headlines within this theme alluded to the establishment of Green New Deals, rapid shifts to renewable technologies, and more permanent changes to people's lifestyles as mechanisms that could put society on pathways to more positive futures.

2.3.2. Equity

Of the top four themes, equity was the most cross-cutting and most often mentioned in conjunction with the other themes. Positive headlines discussing equity often alluded to declining disparities in wealth, income, and/or access to food, services, or technology, at both domestic and international scales. Positive changes in these headlines were often the outcome of new or improved social welfare programmes (e.g. universal basic income and healthcare), tax reforms, shifts to new economic models (e.g. circular economies, principles of degrowth), as well as greater participation of citizens in decision-making processes.

2.3.3. Health

A large emphasis in many positive news headlines was on improving the quality of, and access to, affordable health care. Many respondents also linked human health with planetary health and the environment. Among the mechanisms mentioned for driving shifts to more positive futures were the adoption of universal health care, greater investment in health and international cooperation in the drive to develop vaccines, and the development of national and international institutions to anticipate and avoid future pandemics.

2.3.4. Economy

A large range of topics were included in positive headlines related to the economy. For many, a return to business-as-usual and the recovery of the economic system were mentioned as hopeful headlines. A number of other respondents described reimagined financial systems and investments that support environmental and social outcomes, or changes to the way businesses operate (e.g. working remotely, shorter work weeks, and job sharing), as desirable outcomes of the COVID-19 crisis. Another group of respondents described shifts towards new economic models (e.g. circular economy, degrowth, or the rise of social enterprises) as important factors in transitions to more sustainable futures.

Together, these four themes suggest that many people within the Sustainability Community see the crisis as an opportunity to rethink how societies are structured, the value systems that underpin them, and the types of actions that could put us on a course to a more resilient, equitable, and sustainable future. Many hopeful headlines expressed ideas that prior to the crisis had little political traction but that are now being considered by many as politically salient or necessary (e.g. universal basic income and Green New Deal). The challenge now is to ensure that these and other bold ideas enter policy dialogues and foster debate on these topics among a broad cross section of society (Ivanova & Luers, 2020).

2.4. The role of digital technologies in a post-COVID-19 world

The post-COVID-19 world – the so-called 'new normal' – will be considerably different than the one left behind. As societies look towards new technologies and applications to contain the pandemic and keep citizens safe (e.g. contact tracing apps or immunity passports), a new range of issues arise related to the use of digital surveillance in society. For example, these technologies raise questions around privacy, ownership of collected data, and the ethical implications of the ends to which these data are used. How these questions are answered, and by whom, has the potential to transform how society functions.

Survey respondents in both the Sustainability Community and the General Population overwhelmingly expect that the extent of digital surveillance will increase substantially in the near future. Nonetheless, many respondents in both communities are not opposed to the use of surveillance in times of emergency if it could save lives. Indeed, 53% of the General Population and 57% of the Sustainability Community 'support' or 'strongly support' the use of digital surveillance under these circumstances, with a further 29% and 18% of those polled respectively expressing a neutral opinion on the topic. When asked whether they also support the use of digital surveillance to help tackle the climate crisis, a smaller, but still substantial, proportion responded as being in favour (46% of the General Population and 41% of the Sustainability Community) with 32% and 17% expressing a neutral opinion, respectively. Taken together, these results suggest important levels of support for the expanded use of digital surveillance in society to tackle the COVID-19 pandemic and other more slow-burning crises occurring at a global scale.

There were, however, important caveats expressed among respondents regarding the expanded use of digital surveillance. Even among those in favour of surveillance, many respondents expressed concerns regarding how and for how long these data would be collected, the ownership and use of collected data, and the regulation of their collection and use. Although over half of survey respondents were supportive of monitoring individuals in the case of the health crisis, many fewer supported individual-level monitoring to help mitigate climate change. Those opposed to the use of digital surveillance in sudden emergencies or to tackle the climate crisis often argued that such tools were not appropriate solutions (e.g. that masks are more effective at reducing the spread of the virus, or addressing the underlying economic system should be the priority to address climate change). Others expressed deep distrust that there would be effective and ethical oversight of the collection and use of these data.

Together, these results suggest that most people expect digital surveillance to become an integrated part of the post-COVID-19 world. However, ensuring public support for its use requires a clear rationale and justification, ethical and transparent protocols on the collection, ownership, and use of personal data, and an

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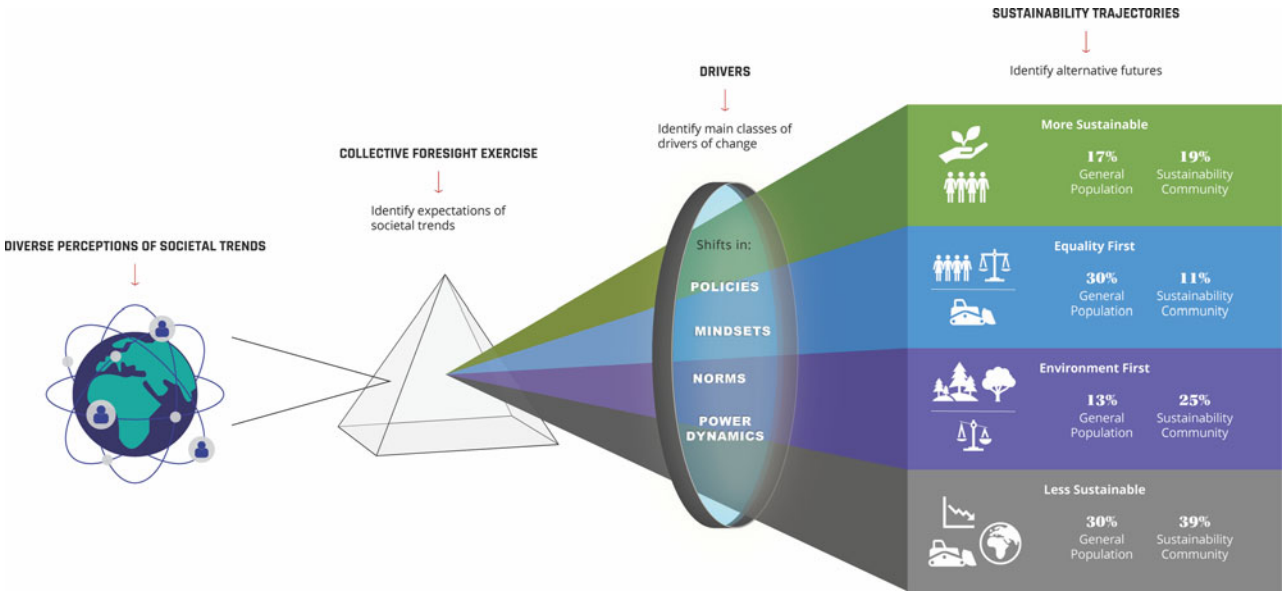


Figure 3. Overview of the collective foresight process and selected results. Such results can be used to integrate diverse perspectives into the exploration of alternative policy pathways.

open and publicly accountable system of oversight. Understanding and learning from culturally and historically diverse experiences around the world on value-laden issues such as digital surveillance will be vital input to emerging systems designed to regulate and oversee their use.

3. Discussion and conclusions

The collective foresight and intelligence exercise described here illustrates the power of these approaches to distil and provide timely, nuanced insights for decision-making across multiple sectors and scales. In today's VUCA world, global sustainability challenges cannot be tackled in isolation and sustainability action planning must be iterative, responsive, and inclusive. The COVID-19 crisis has put a spotlight on the need for rapid collective foresight in the midst of disruption. To steer the response to this global systemic crisis, and future ones, we need more agile collective foresight that can rapidly tap into the expertise and imagination of a broad diversity of people, knowledge systems, and worldviews from around the world to help society anticipate risks and opportunities.

For example, this collective foresight survey revealed a general acceptance by the majority of respondents for the use of digital surveillance to address crises. It also highlighted the nuances of this acceptance, of which decision-makers and regulators need to be cognizant. Our survey revealed important differences across regions and communities regarding how societal trends may evolve in the coming 3 years, which could serve as input to inform alternative policy pathways analyses (see Figure 3). Outputs from such exercises have the potential to provide inputs for more complex and computationally-intensive models (e.g. IAMs) that explore pathways to sustainability, thereby making models more robust by integrating a broader diversity of perspectives into their underlying assumptions. Initiatives such as the World Value Survey, which has been providing rigorous data on changing values since 1981, can provide complementary insights to foresight and IAM exercises by furnishing a framework to interpret different groups' responses to challenges and opportunities. Further research and innovation will be necessary to understand how to better harmonize different types of futures analyses and horizon-scanning exercises in an iterative and complementary manner.

Although this paper focuses on results from the first phase of the survey, additional follow-up surveys will serve to track how perspectives are shifting as our global society navigates this tumultuous time and explore some of these issues in more depth. While analysing responses to the survey provides a snapshot of people's perspectives at a particular moment in time, sparking broader and more inclusive dialogues, accessible to large numbers of people, will be important to encourage public deliberation. An important next step will be to deepen the engagement of respondents through virtual dialogues and to explore a broader diversity of topics and perspectives related to the COVID-19-sparked global crisis. This can in turn enable much deeper learning about different value systems and worldviews (e.g. following the worldviews framework in de Vries, 2019), cross-fertilization of ideas leading to innovative thinking, and the opening up of opportunities for deliberative policy learning (Kowarsch et al., 2016).

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