

The 10 Must-haves Initiative



**Identifying the 10 Must-have targets and
Must-do actions for a thriving tomorrow**

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How can we transform unsustainable human actions to accelerate the transition toward a global society that coexists harmoniously with the Earth's systems?

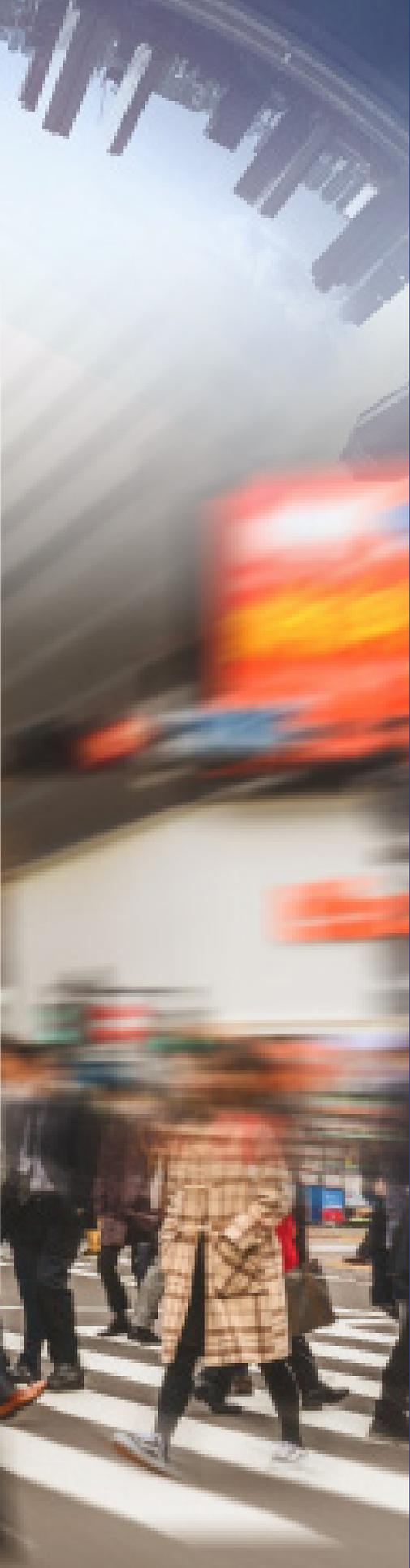
The Julie Ann Wrigley Global Futures Laboratory at Arizona State University and the Earth League invite you to join in the work of the 10 Must-haves Initiative. Through synthesis and critical analysis of some of the best research and thought leaders across sectors around the world, the 10 Must-haves Initiative aims to help actualize a future for current and next generations to thrive on a healthy planet. This initiative proposes a series of broad targets (Must-haves¹) and aligned actions (Must-do's), and endeavors to outline implementation pathways accounting for structural barriers, roles and responsibilities of key players, political will and more.

The 10 Must-haves¹ Initiative has drawn engagement across the globe. The 2023 Global Futures Conference, held during the UN General Assembly and Climate Week in New York City, provided the second annual space for some of the world's top thinkers and do-ers to collaborate on implementation pathways aligned with 10 Must-have targets.

We believe a thriving future for all is within reach.

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10 Must-have targets

A limit of global warming as close to 1.5°C as possible by 2050

An immediate halt and reversal of the loss of nature's functions and diversity

Economies that operate within safe and just planetary boundaries

Equitable access to resources needed for human well-being

Governance transformations to stay within planetary boundaries

Healthy, safe and secure food for the global population

Reconnection of human well-being to planetary health

An ethical digital world providing for human security, equity and education

Stability and security in a global society

A resilient global society ready to respond to planetary crises

Introduction

Compounding crises on local to global scales call for urgent and radical action, a point of virtual consensus among a number of highly credible assessments, analytical frameworks and international agreements. These evaluations simultaneously reflect the awareness of the extraordinary challenges humanity faces, and outline pathways to deepen, accelerate and scale transitions toward a sustainable future across sectors and domains (Loorbach et al., 2020). Transformations across 5-7 socio-economic sectors are frequently identified as necessary and scalable, including human well-being; economic system(s); food, land and health; energy; cities; new commons; and the digital world (Blythe et al., 2018a; Feola, 2015; Gillard et al., 2016). For example, Global Sustainable Development Report 2019: The Future is Now – Science for Achieving Sustainable Development [2019]; Six Transformations to achieve the Sustainable Development Goals [2019]; International Institute for Applied Systems Analysis Transformations within reach series [2021]; Our Common Agenda - Report of the Secretary General [2021]; Center for Global Commons Global Commons Stewardship Framework [2022]; Stimson Center Road to 2023: Our Common Agenda and Pact for the Future [2022]; UNDP Human Development Report 2021-2022: Uncertain Times, Unsettled Lives: Shaping our Future in a Transforming World [2022]. Additional work continues to align evidence-based criteria and metrics with the accelerated transitions needed, including the Science Based Targets initiative (SBTi) [2015], Exponential Roadmap Initiative [2018], the 1.5°C Business Playbook [2020], and the UNFCCC's High-

Level Champions's Race to Resilience and Race to Zero [2020] Campaigns. Extensive collaboration has gone into international agreements and policies to address intersectional transboundary challenges, not least among them the Paris Agreement [2015] and Sustainable Development Goals (SDGs) [2015], as well as their respective precedents, the Kyoto Protocol [1997] and the Millennium Development Goals [2000].

Despite these authoritative and convincing efforts, it is unlikely that many targets society has set for itself, including the Sustainable Development Goals (SDGs), will be met. Despite decades of risk assessments and warnings from the scientific community, nations have failed to reorient their systems away from the risk of irreversible damage to the Earth's environmental and societal systems, resulting in a glaring gap between pledges and action, and ultimately endangering the future of our world (United Nations, 2020a).

Societies and their decision-making bodies have the scientific evidence and scalable solutions in most sectors to substantially accelerate the actions required to reduce the unsustainable pressure on the life-supporting systems of our planet. We must interrogate what keeps us from acting – including, most essentially, the inertia of the status quo across global political and economic systems impeding the building of capacity, will or courage to enact significant change. We must understand what options are left if we fail to meet the targets for moving into a future that allows future generations to thrive on a healthy planet. The science-based calls of urgency are substantiated by rising evidence of extreme

events and irreversible changes that occur faster than previously anticipated (IPCC, 2023). The fact that at least half a century has passed since the clear warnings of future planetary crises (e.g., Club of Rome) without adequate response by global society has left humankind with response times of a few years to a few decades to move off the unsustainable trajectory it is on. We are on track of significantly exceeding the target of keeping global warming below the 1.5°C mark, and we are compromising the resilience of the biosphere. Science and analysts have warned and provided solutions within the realm of mainstream policy and economics for decades, expecting “orderly” scaled action to solve the problems destabilizing the Earth system. We are rapidly approaching a decisive juncture: either we continue on a failing path, or we fundamentally transform how our societal systems function.

In this context the question emerges, what are the global-scale must-have targets required to disrupt the deleterious trajectory we are on and accelerate global-scale transformations across all planetary boundaries and societal systems?

This query serves as the foundation of the 10 Must-haves Initiative, a framework guided by The Earth League, an alliance focused on global dialogue around anthropogenic change, and the 200 attendees of the first Global Futures Conference, convened by the Julie Ann Wrigley Global Futures Laboratory at Arizona State University in September 2022. Our goal is to put forth an accessible, accelerated and implementable roadmap that meshes the best that science and research have to offer with clear policy

pathways, complementing and enhancing existing efforts to stay within the boundaries of our planet. This is the moment when we must identify the most effective changes in actions, policies, regulatory measures, and investments that we need to set in motion at scale, to avoid further crossing critical thresholds. The framework for this task is highly dynamic and adaptive, and involves collaboration across multiple sectors and disciplines. Additionally, the framework includes perspectives from a wide range of stakeholder groups to reduce and address latent risks associated with transformation discourses (Blythe et al., 2018a). It is grounded in the complexity of our interconnected Earth systems and the recognition of the structural lock-ins of existing political economic systems that perpetuate unsustainable activity and injustice, and insufficiently inspire, stymie, or even suppress societal will toward broad-scale and rapid transitions.

What follows is the 10 Must-haves Initiative, including what have been identified as absolute ‘must-have’ targets and the associated “must do” actions to reimagine, restructure and transform trajectories across all of Earth’s systems toward a safe and just future for all (Rockström et al., 2023).

WE MUST HAVE:

A limit of global warming as close to 1.5°C as possible by 2050.

The remaining global carbon budget for a 67% chance of limiting global warming to 1.5°C, counting from the beginning of 2020, is only approximately 400 GtCO₂ (IPCC, 2021). This corresponds to less than seven years of global emissions of CO₂ from fossil-fuel burning and land-use change at current rate of emissions, without consideration of compounding emissions (i.e. wildfires, deforestation, methane release from permafrost thaw, etc.). Keeping global warming to 1.5°C requires that global emissions are cut by half each decade, to reach a net-zero world economy by 2050, i.e. in 27 years. The world has not even started to significantly slow down the rate of global emissions, much less achieve the global annual reduction of >8% that would be required (UNEP, 2022b). It is very likely that we will exceed the 1.5°C warming threshold, just as science shows with increasingly strong evidence that transgressing this line is very dangerous (Armstrong McKay et al., 2022; Bustamante et al., 2023; Steffen et al., 2018).

Knowledge and technologies are available to curb emissions and alter the trajectory of increasing greenhouse gas (GHG) emissions (Bataille et al., 2018; Bogdanov et al., 2021; IPCC, 2022; Otto et al., 2020; Roe et al., 2019). The solutions exist, and there is rising evidence that they deliver better outcomes for all, in terms of health, security, economic development and well-being (IPCC, 2022; Karlsson et al., 2020; Markkanen & Anger-Kraavi, 2019). Renewable energy technologies and carbon capture enterprises have made significant advancements in the past decades (Bui et al., 2018; IEA, 2022; Kavlak et al., 2018; Rohrig et al., 2019). However, there has not been a meaningful down-scaling of the supply and demand for fossil fuels, and we have not reduced global greenhouse gas emissions (IPCC, 2021). To unleash urgent global action in step with science-based requirements, there is a need to consider serious, beyond-the-normal decisions. A global,

just transition to a decarbonized energy system is critical and possible, through a coordinated, cross-sectoral and locally-appropriate series of actions. Wealthier countries must take responsibility and financial leadership for a clean energy transition and a managed, rapid fossil-fuel phase out, based on the pursuit of equity and justice, science-based evidence and best practices of sustainable policy implementation.

Must-do #1: Stop new investments in coal, oil, and fossil gas extraction and use, and establish their end dates

The world cannot afford continued investments in fossil fuels. Governments in all major economies must pass legislation that stipulates following the carbon law – cutting emissions by half each decade, to reach net-zero by 2050 (Rockström et al., 2017). This should be accompanied by compulsory reporting to the UNFCCC by countries across the economic spectrum (including information on greenhouse gas inventories, climate change impacts and vulnerability, and measures to mitigate climate change), to continuously evaluate the effectiveness of these efforts. Stringent emissions budgets should be established, both for countries and major multinational industries, which should be monitored and reassessed at five-year intervals. For fossil fuel emissions out of alignment with carbon law requirements, a system of significant penalties is needed on the international level. Funds accrued under such a program should be used to support an accelerated transition to non-fossil fuel energy options, promising a ‘double dividend’ of these measures (Narassimhan et al., 2018).

Currently, policies like fossil fuel subsidies and tax breaks still support fossil fuel investments and consumption in many countries – which not only

contribute to emission lock-in, but are also bound to become stranded assets in the future (IPCC, 2022, Chapter 15; Jeff Rubin, 2016; Ritchie & Dowlatabadi, 2015). Governments around the world must work toward eliminating such harmful and emission-increasing policies and incentives as soon as possible (Burniaux & Chateau, 2014; Monasterolo & Raberto, 2019; Otto et al., 2020), which can reduce a significant burden from government budgets and steer countries toward cleantech adoption and innovation (Greve & Lay, 2023; Rentschler & Bazilian, 2017). Internationally, efforts must be intensified to move from informal agreements toward binding mechanisms of dismantling fossil fuel subsidies. However, subsidy removal policies should be considered in light of the specific country context, and cautiously address potential negative consequences to avoid facing public opposition (Rentschler & Bazilian, 2017). For example, reforms could include compensatory transfers and information campaigns (Greve & Lay, 2023; Harring et al., 2023). This process will be complicated by the substantial financial influence of multinational corporations and interest groups over both the political sector and public opinion – problems which should be explicitly addressed (Brulle, 2021; Farrell, 2016; Lamb & Minx, 2020).

Must-do #2: Introduce a substantial global price on carbon with built-in adjustments

In recent years, there has been progress on the development and implementation of carbon pricing schemes at the national and international level (Narassimhan et al., 2018), which has contributed to emission reductions (Green, 2021). Now, it is time for an international agreement on a carbon price that is adhered to and monitored on a global scale. Though the price may vary across geographies, markets and sectors (Bauer et al., 2020), it must be initially implemented at a global equivalent of at least \$100 dollars per ton. To reflect the social cost of carbon, the global carbon price will likely need to rise to many times that level in the following decades (IPCC, 2022, Chapter 13). Mechanisms for future adjustments should be built-in to the agreement framework, ensuring that the carbon price aligns with scientific assessments of the social price of carbon, and providing private sector actors with the clear signals

needed for future sustainability financing (Nykqvist & Maltais, 2022; Quatrini, 2021).

To ensure global compliance and a fair accounting of produced emissions, the World Trade Organization should establish tariffs on traded goods that reflect their embodied carbon (Cosbey et al., 2019). The importance of this step is underlined by the fact that, currently, countries' tendency to protect downstream industries has led to a regime of implicit subsidies for carbon-intensive goods (Shapiro, 2021). In designing all of the above measures, care must be taken to protect the welfare of poorer economies (Böhringer et al., 2017; Larch & Wanner, 2017). Through international agreements and national policies, a pathway should be established to redirect carbon penalty funds into green transition stimulus grants, mitigating the burden to lower income economic actors as costs rise (Klenert et al., 2018; Ohlendorf et al., 2021).

Must-do #3: Incentivize sustainability through financial tools like subsidies and taxes

Carbon pricing alone is not enough (Baranzini et al., 2017): Policy-makers need to use all the financial tools at their disposal to incentivize the use of low-carbon technologies, materials, and practices as well as valuing, protecting and restoring ecosystems and biodiversity (Millward-Hopkins et al., 2018; Rissman et al., 2020; UNEP, 2022b). To accelerate the development, deployment and scaling of the best-available climate innovations, public-private partnership opportunities must be leveraged – including between universities, governments and industry. Learning from past successes (Bai et al., 2019; Stucki et al., 2018), research-and-development subsidies should be used to advance and scale new technologies that have the potential to propel the sustainability transformation forward.

The Paris Agreement calls for “finance flows consistent with a pathway toward low greenhouse gas emissions” (Paris Agreement, 2015, art. 2.1(c)). This underlines the vital role of a transformed global financial system in achieving the climate targets (Naidoo, 2020; Zamarioli et al., 2021). Public investments, private mega-donor investments and the allocation of finance through multilateral

development banks require revision and redirection. Progress in this direction has been significant, yet still highly inadequate (Martin et al., 2022; UNEP, 2022b, Chapter 7). Institutional investors must strive to decarbonize their portfolios, divesting from fossil fuels and other assets that will likely become stranded in the future (Ayling & Gunningham, 2017; Semieniuk et al., 2021). A significant number of pension funds, having long-term investment horizons and often public oversight, have begun this process (Egli et al., 2022; UNEP, 2022b, Chapter 7).

To take these efforts more widely, public action has to be mobilized effectively. Achieving this necessitates the involvement of NGOs, customer advocacy groups and labor unions in the fossil fuel sector. Advancing education and awareness training in National Action Plans can further foster public awareness. Furthermore, international cooperation has to be increased to support oil-dependent countries and economies in developing alternatives to fossil fuel based economy growth. Advancing the harmonization of standards, definitions, nomenclature and related aspects within the green energy transition by standard setting organizations as well as developing a framework for a just transition can serve as foundation for a better international exchange. To achieve an effective implementation, plans and solutions across the entire value chain, including phased out replacements of existing infrastructure and technology have to be developed. Regional consortia should further be mandated to create solutions for a just transition adapted to local circumstances.

Accelerating these activities promises triple rewards: Besides impeding capital generation for new emission-intensive projects, they may reduce the risk of bursting a carbon bubble (Griffin et al., 2015; Rubin, 2016), and potentially even trigger self-reinforcing feedbacks and tipping points toward a low-carbon financial system (Eker & Wilson, 2022; Otto et al., 2020).

Must-do #4: Manage land use for food production to reduce emissions

Although the Earth has the capacity to produce enough food for the human population, today's global food system is not sustainable (Steffen et al., 2015). Emissions from food production, transport, and consumption, as well as deforestation and other environmental degradation represent a third of global anthropogenic greenhouse gasses (Crippa et al., 2021), and must be minimized globally (Laurance et al., 2014; Poore & Nemecek, 2018; Springmann et al., 2018). However, climate change is not the only concern: many different social and environmental challenges intersect in the agricultural sector. An important example is the potential conflict between biofuel cropping versus land requirements for food production and biodiversity conservation. Thorough sustainability assessments and a range of policy and regulation measures are needed to navigate these challenges (Humpenöder et al., 2018), for example by requiring the use of secondary biofuels.

Holistic approaches such as regenerative agriculture (Lal, 2020) promise to address many of the challenges facing the food system, and should be enabled and encouraged through national policies. Not only can sustainable biofuel production benefit from such practices (Martin et al., 2022; Schulte et al., 2022), they can also strengthen the carbon capture capacity and water retention of soil, boosting climate resilience (Amelung et al., 2020; Lal et al., 2018), as well as increasing farmer income and resilience (LaCanne & Lundgren, 2018; Schulte et al., 2022) (refer to Must-have "Healthy, Safe and Secure Food for the Global Population"). Regenerative agriculture is an example of the broader paradigms that are needed when interacting with the biosphere: a systemic shift maintaining productivity and predicated upon the simultaneous conservation, restoration and enhancement of ecosystems, and their climate mitigation and adaptation potential (Rockström, Beringer, et al., 2021).

WE MUST HAVE:

An immediate halt and reversal of the loss of nature's functions and diversity

Humankind has caused the loss of so many species and ecological functions that scientists have credited people as the leading cause of the sixth mass extinction of species on Earth for more than 30 years (Cowie et al., 2022; N. Myers, 1990). The elimination of nature and its functions threatens human health, through reduced food, clean air and water, buffer zones to prevent zoonotic diseases – put simply, planetary health. The loss of nature further hinders the planet's capacity to sequester carbon, cope with shocks and provide stabilizing functions (like moisture and heat exchange between land, ice, ocean and atmosphere). There is strong scientific support that (1) loss of species and natural ecosystems in the ocean and on land must be halted now, and (2) that we have lost many of nature's services to people (including natural and cultural heritage). This means that halting the loss is not enough, and that more investments are required to restore and regenerate natural functions in terrestrial and aquatic ecosystems.

Food systems transformations, for example, can contribute to overall resiliency and promote the conservation and restoration of ecosystems and nature's functions (refer to Must-have "Healthy, Safe, and Secure Food for the Global Population"). This calls for transforming agricultural production and food systems to prioritize biodiversity dividends by reforming incentive structures; facilitating access to green borrowing and green bonds; promoting regenerative agriculture and circularity across agricultural supply chains. Stopping biodiversity loss will require urgent, interlinked action across all of the targets set by the Kunming-Montreal protocol (Leadley et al., 2022).

Equity and justice are deeply intertwined with action on biodiversity decline. Up to 80% of the planet's remaining intact biodiversity is reportedly located in the territories of Indigenous peoples and local

communities (Obura, 2023), while the main drivers of decline are associated with economic growth and consumption (Obura et al., 2023). Indigenous cultures have demonstrated effective ways to steward Earth's systems through traditional ecological practices, presenting an opportunity for knowledge-sharing led by such communities.

Initiatives such as 30X30 and Nature Positive are designed to halt and reverse the trend of losing nature. However, sufficient financing and robust mechanisms for monitoring and accountability are required for these to be successful (Leadley et al., 2022; Mace et al., 2018).

Must-do #1: Codify into national laws the equity-based Nature Positive agenda with science-based targets.

To halt and reverse nature loss so that nature measurably recovers by 2030, transformative change is urgently needed (Leadley et al., 2022). Science based targets for nature have to be established for governments and the private sector and implemented through national laws. Mitigating the drivers of biodiversity loss as well as the protection, conservation and restoration of biodiversity requires strong international collaborations that focus on an equitable and adequate share of efforts (Leadley et al., 2022). Nature positive values have to be embedded in all sectors including less obvious domains such as education, legal, and engineering systems and practices (IPBES, 2022). This will require reaching a broader set of stakeholders and identifying locally relevant power brokers and leverage points among Indigenous and local communities, youth, educators and private sector actors. The current capacity to monitor biodiversity changes is unequally distributed across regions.

The capacity to track biodiversity changes has to

increase, especially in regions that are deficient, and the aggregated data has to be made openly accessible to bridge knowledge gaps (Leadley et al., 2022). Enhancing this capacity could be enabled by redirecting problematic subsidies toward supporting nature-based solutions that prioritize justice-minded resource conservation and restoration efforts. Accounting for equity related to conservation and land use in international governance should involve addressing and recompensing legacies that are the root of vast rifts in wealth and development. At the heart of such a pursuit is the recognition that current wealth was – and is – being generated through the destruction of nature. That destruction, of ecosystems and the consequent ability to develop economically, is often elsewhere, far from the source of the activity or benefit of profits (D. O. Obura et al., 2023).

Must-do #2: Create global markets for nature-based solutions

Nature-based solutions are key to protect, restore and regenerate nature (IPBES, 2019). According to UNEP, in 2020, the global investment in nature-based solutions amounted to 133 billion USD; public funds, both in the form of domestic government expenditure and international public finance, accounted for nearly 90% of this investment. In order to meet climate change, biodiversity and land degradation targets, these investments have to triple until 2030 and increase by four fold until 2050, for a cumulative investment of 8.1 trillion USD. Achieving this requires a significant increase in private investments in

nature-based solutions. This, in turn, requires raising awareness on the benefits of investing in nature-based solutions and bolstering economic and regulatory incentives to encourage greater investments in this area (UNEP, 2021). But central to the success of creating a global market for nature-based solutions is not only an increase of coordinated public and private funding, but also the development of key prerequisites (Toxopeus & Polzin, 2021).

The emphasis on short-term and individual gains has led to an excessive focus on economically valuing nature and its degradation. To promote sustainability-aligned values, it is essential to consider the value that nature holds beyond economic terms and immediate financial gains (IPBES, 2022). The involvement of indigenous and local communities is often key to implement nature-based solutions. Policy measures have to ensure that the implementation of nature-based solutions respects the cultural and ecological rights of indigenous and local communities and is executed with their full engagement and consent (Campos-Silva et al., 2021; Seddon et al., 2021).

Nature-based solutions lack worldwide accepted and standardized indicators that measure their effectiveness regarding climate change adaptation and mitigation as well as other co-benefits (Kabisch et al., 2016; Kumar et al., 2021). Developing targeted indicators to be used for measuring, analyzing and monitoring effectiveness and characteristics is key to track and communicate the benefits of nature-based solutions (Kabisch et al., 2016).



WE MUST HAVE:

Economies that operate within safe and just planetary boundaries

Over the course of the past decades, there has been a significant increase in global average life expectancy and a reduction in poverty rates. However, recent studies show that important increases in welfare indicators have been closely linked to a significant increase in resource usage, which has outpaced improvements in welfare within the global economy (Kalimeris et al., 2020). Additionally, accelerated resource usage and extraction over the last 20 years is responsible for approximately 90% of biodiversity loss and water stress, and contributes to around 50% of GHG emissions (International Resource Panel, 2019).

In terms of inequality, between 1990 and 2015, the top one percent increased its income, while the bottom 40% earned less than a quarter of income (UN DESA, 2020). This disparity between economic growth and rising inequality has spurred action on advancing the “inclusive growth” agenda, referring to “economic growth that is distributed fairly across society and creates opportunities for all” (OECD, 2018b).

A stable and resilient Earth system requires economies that operate from an equity-centered paradigm (UNRISD, 2022) that recognizes the intrinsic value of natural capital and its vital role in sustaining life on Earth (Dasgupta, 2021). As the primary indicator for development, Gross Domestic Product (GDP) centers profit and short-term gains and fails to account for environmental damages, inequality and the informal economy. For instance, even with a significant economic recovery in 2021 on a global scale, two-thirds of countries witnessed a decrease in life expectancy at birth. These shortcomings substantiate the calls for moving away from GDP, and reconceptualizing the measurement of progress and development toward comprehensive frameworks that integrate societal well-being and planetary health (Arrow et al., 2012; Bizikova et al.,

2021; Costanza et al., 2009; Stiglitz et al., 2018; van den Bergh, 2022). In this vein, the UN Secretary General has issued a policy brief calling on member States in the context of the Summit of the Future to measure progress beyond GDP (United Nations, 2023b).

Across the Global North and Global South, various examples of alternative proposals of economic models, such as doughnut economics, degrowth, well-being economy have gained popularity, especially within the context of circular economy related discourses (Calisto Friant et al., 2020). Inclusive labor markets and innovation policies, fairer tax systems and investment in marginalized populations and geographies are necessary for inclusive growth (OECD, 2018b). Under these paradigms, growth is not an end in itself, but rather a means to achieve development and well-being. However, achieving a widespread paradigm shift away from environmental degradation and the risks of planetary disruption requires overcoming profound structural and systemic challenges embedded within global capitalism.

Achieving just economies that operate within planetary boundaries will require inclusive, authentic, and representative stakeholder involvement and consent in decision-making processes (Bowen et al., 2017; Glass & Newig, 2019; Newig et al., 2018) (refer to Must-have “A Resilient Global Society To Respond To Planetary Crises”). Additionally, this requires inter-ministerial and inter-agency collaboration in the development of fiscal and monetary policies to address potential trade-offs, ensure non-discrimination, foster social progress and prioritize well-being (OECD, 2018b). At the global level, establishing systems of restitution for losses and damages across the global commons, is needed to accelerate inclusive growth and sustainable development across regions (United Nations Inter-Agency Task Force on Financing for Development,

2023). In terms of responsibility, a common but differentiated governance approach (Meuleman & Niestroy, 2015) can help ensure that those least responsible for the consequences bear the least costs and that loss and prevention are adequately addressed. While COP27 made significant progress by agreeing to establish a new loss & damage fund, questions regarding its structure, management, sources of funding, allocation criteria and timelines persist.

Must-do #1: Accelerate the transition to a just, circular, and regenerative economy.

The circular economy, which aims to eliminate waste and pollution, keep products and materials in use, and regenerate natural systems, holds significant potential for transforming economies (Ellen MacArthur Foundation, 2021). Despite the growing recognition across policy and business domains for the need for a transition to a circular economy, global circularity has actually decreased to 7.2% in 2023 from 9.1% in 2018. This is driven by increasing material extraction and use, and the prevailing cost-driven approach in decisions to recover waste to use as secondary resources (Circle Economy, 2023).

Policy measures, at national and international levels, must be adopted and implemented to accelerate the transition to a global circular economy (Milios, 2018). These include measures that extend producer responsibility frameworks (Murthy & Ramakrishna, 2022), enhance green public procurement schemes (Wijayasundara et al., 2022) and introduce natural raw material taxes (Milios, 2021) as well as regulations to combat planned obsolescence (Maitre-Ekern & Dalhammar, 2016). It is important to view these measures as part of a comprehensive policy mix, rather than standalone to ensure harmonization and effectiveness across different levels and scales (Milios, 2018).

Accelerating the transition to a circular economy requires engaging and centering non-traditional actors such as micro, small and medium enterprises (MSMEs), trade and labor unions and the informal sector. Notably, SMEs constitute approximately 99% of all global firms (OECD, 2023a), making them potential key drivers of the circular economy.

However, existing literature on the circular economy in the context of MSMEs identifies significant barriers to achieving circularity, including limited access to resources and technology, insufficient support from business networks, and a lack of policy incentives to facilitate the shift toward circular practices (Mishra et al., 2022; Rizos et al., 2016). Additionally, the informal sector should be integrated as a relevant stakeholder in the transition to circularity given its active contribution to recycling, repair, refurbishment efforts and beyond (Zisopoulos et al., 2023). Including the informal sector in the circular economy can contribute to the advancement of gender equality, occupational health and poverty reduction (Rutkowski, 2020; Sharma et al., 2021; Valencia, 2019), while its exclusion can jeopardize livelihoods and generate unintended consequences as well as increase inequality among urban stakeholders (Barrie et al., 2022; Schroeder, 2020). Involving social partners representing the interests of workers and employers, such as trade and labor unions, is key to ensuring a just transition to the circular economy as they can act as a bridge among different stakeholders, provide training and re-skilling opportunities for works and act as guarantors for social protection in the transitions to circularity (Circle Economy, n.d.)

The circular economy can act as a pathway for lower-income countries to “leapfrog” toward sustainable development, avoiding lock-in to linear and resource intensive practices (Schroeder et al., 2018). Harnessing international trade toward the advancement of circular economy calls for a collaborative and coherent global effort involving action on various fronts, including establishing shared and harmonized language and definitions for circular goods, removing barriers to trade in secondary materials, and integrating circularity and inclusivity principles in international trade agreements (Barrie et al., 2022). Active participation of developing countries and small and medium-sized enterprises in global circular value chains requires increased international cooperation especially for capacity-building, knowledge transfers and technological development (Mulder et al., 2021). Increased investment is also needed from development banks, public funds, impact investors, and philanthropy (Schroeder, 2020) to overcome financial and technological barriers and to de-risk investments in circular economy projects,

research, and innovation (Dewick et al., 2020; Hofstetter et al., 2021). Fostering collaboration and exchange between circular economy scholars and the financial industry is needed to ensure investments are effective and science-based (Dewick et al., 2020).

Must-do #2: Develop true cost accounting frameworks that equip and exhort investors to direct capital within safe and just planetary boundaries

The future of investments within planetary boundaries is to be shaped by several trends, including public discourse and skepticism about Environmental, Social and corporate Governance (ESG) frameworks, growth of socially responsible (i.e., ethical, sustainable) investment products and increasing demand for transparency (Sciarelli et al., 2021). Developing true cost accounting frameworks for investments and development proposals is necessary to guide and transform the private sector’s acceptable practice. Increasing targeted education opportunities for investors is key to promote the integration of sustainability principles in both large and small scale investments. Spotlighting existing initiatives such as the Principles for Responsible Investment can promote the uptake of ESG in corporate investments.

To ensure accountability, robust systems of information transparency, reinforced by third-party certifications, are needed to lend credibility and support sustainable investment. Addressing limitations within existing initiatives,

such as the Science-Based Targets Initiative, by strengthening reporting requirements to improve the transparency, comparability and validity of corporate action is a step in the right direction (Gieseckam et al., 2021). Corporate greenwashing is often incentivized by limited and imperfect information about ESG performance, complex reporting frameworks and an overall lack of sanctioning or preventive policies (Alrazi et al., 2015). Industry 4.0 technologies, such as blockchain, big data and artificial intelligence can contribute to capturing, processing, analyzing and transmitting information and data from diverse sources, enabling more accurate true cost accounting calculations and providing managers and decision-makers with quality information (Gusc et al., 2022).

Clear and standardized communication of the environmental and social impact of investment, along with improved mechanisms to measure this impact, are necessary to further stimulate investor action within safe and just planetary boundaries (Sciarelli et al., 2021). In this context, insurance and reinsurance companies can play a role in enforcing true cost accounting. Additionally, a code of ethics and regulations, that incorporates sanctions, integrates a multistakeholder oversight system, promotes consumer education and rights, as well as mandates higher transparency in relation to corporate ESG claims, should be implemented to protect individuals from false advertising (Sun & Zhang, 2019).



WE MUST HAVE:

Equitable access to resources needed for human well-being

The global disparity between the wealthy and poor, exacerbated by the COVID-19 pandemic, is emblematic of deep and fundamental inequities. Contributions to human-caused GHG emissions differ widely: 10% of households with the highest per capita emissions contribute 34–45% of global consumption-based household GHG emissions, while the middle 40% contribute 40–53%, and the bottom 50% contribute 13–15% (IPCC, 2023). Yet, locations with higher poverty rates and limited access to basic services exhibit higher levels of vulnerability in the face of climate risk (IPCC, 2023). In other words, those who are least responsible are paying the highest price.

Recent data suggests 1.75 Earths would be needed to sustain all of humanity's demands on the earth's ecosystem; however, zooming in on individual countries' consumption levels paints a different picture. We would need 5.1 Earths, for example, if everyone lived like an average US resident (Footprint Data Foundation et al., n.d.). Overconsumption of elements of our life-supporting systems is emblematic of the systemic challenges negatively impacting communities that are the least responsible, yet bear the biggest burden. Examples include clean air and water; excessive waste (especially food); deleterious material cycles with extraction, production, and overuse of problematic materials (e.g., plastics); and, planned obsolescence and insufficient recycling.

Achieving integrated systems of responsible consumption is a prerequisite to ensure equitable access to resources needed for human well-being for current and future generations. This will require a transformation, underpinned by global-to-local coordination and an active commitment from the private sector, regulators and institutional structures (Alfredsson et al., 2018).

Must-do #1: Implement and uphold regulations that mainstream principles of equity across consumption systems

By 2030, it is projected that the per capita consumption emissions of the world's wealthiest 1% will be 30 times higher than the levels compatible with the 1.5°C goal of the Paris Agreement, while emissions from the poorest half of the world's population (in terms of income) are expected to remain significantly below that threshold (Gore, 2021). Destructive patterns largely driven by the affluent lifestyles of the world's wealthy hinder equitable access to natural capital and resources (Wiedmann et al., 2020). Development pathways underpinned by unconstrained growth and increased resource-intensive consumption and production translate into increased risks of water scarcity, land degradation and food insecurity (IPCC, 2023).

The public sector must implement and uphold regulations that, following a gradation of responsibility, mainstream principles of equity across consumption systems that address overconsumption and affluence to stop the exploitation of the global commons and advance a just transition. Demand-side measures, such as taxes, subsidies, consumption-based approaches along with innovative ways of end-use service provision can reduce global GHG emissions in end-use sectors between 40 to 70 percent by 2050 (IPCC, 2023). Situating the global population within the thresholds of consumption corridors would translate into considerable progress in well-being and equitable access to resources (Fuchs et al., 2021). Recent scientists' warnings and studies emphasize the affluent's responsibility for the environmental crisis (Wiedmann et al., 2020). Public policy must recognize the imperative to reduce consumption to ensure equitable access to resources (Creutzig et al., 2018; Hickel & Kallis, 2020; Parrique et al., 2019).

Must-do #2: Advance the social and solidarity economy through public policies and legal frameworks.

Innovative business approaches focused on cooperation, community and localization can be pivotal for transforming current models of exchange (Wiedmann et al., 2020). The SSE presents a distinct economic approach that prioritizes people and planet over profit while advancing sustainability and inclusivity (UNRISD, 2022). As defined by the International Labor Organization, the social and solidarity economy (SSE) “encompasses enterprises, organizations and other entities that are engaged in economic, social, and environmental activities to serve the collective and/or general interest, which are based on the principles of voluntary cooperation and mutual aid, democratic and/or participatory governance, autonomy and independence, and the primacy of people and social purpose over capital in the distribution and use of surpluses and/or profits as well as assets” (ILO, 2022).

In Europe alone, the SSE employs over 13.6 million people, accounting for approximately 6.3% of the EU-28 working population (CIRIEC, 2017). Organizations within the SSE space enable social transformations by facilitating equitable access to resources and strengthening productive capacities of vulnerable and marginalized collectives (UNTFSSSE, 2022). The SSE has the potential to address social and ecological goals and contribute to the achievement of the SDGs (Esteves et al., 2021; UNTFSSSE, 2022).

National governments have a crucial role in acknowledging and harnessing the potential of the SSE by creating enabling environments through robust policy and legal frameworks, including the following concrete actions (OECD, 2023b). First, governments need to establish legal frameworks that can operationalize innovative business models and facilitate access to finance and markets for SSE initiatives. Second, SSE principles should be integrated into existing frameworks, ensuring their adoption throughout relevant sectors and policies. Lastly, governments should raise visibility on the SSE by providing conceptual clarity and boundaries, allowing for its recognition within the broader economic system (OECD, 2023b). The Resolution concerning decent work and the SSE, adopted at the 110th International Labour Conference, and the Recommendation on the Social and Solidarity Economy and Social Innovation, adopted by the OECD Council in June 2022, represent significant advancements in spotlighting the potential of the SSE toward sustainable and just transitions. The April 2023 UN General Assembly resolution applied the ILO definition of SSE and mandated (a) governments to develop an enabling environment; (b) the UN to include SSE in its program; (c) the financial sector and development banks to finance them; and, (d) the UN Inter-Agency Task Force on SSE to support the UN Secretary General in preparing a progress report in 2024. The SSE is also one of the building blocks for New Economics for Sustainable Development of the UN Economists Network (Yi et al., 2023).



WE MUST HAVE:

Governance transformations to stay within planetary boundaries

The complex and cross-cutting nature of global issues such as climate change, compounded by the fragmentation and lack of coordination between state actors and the increasing influence of non-state actors (civil society, companies, cities, among others), represents an important challenge to the current governance architecture and reform prospects (Stranadko, 2022). Additional forces include declining trust in science and institutions and the rapid spread of misinformation (Kennedy et al., 2022; Philipp-Muller et al., 2022; West & Bergstrom, 2021). Existing governance systems have proven inadequate to regulate the processes that result in the degradation of life-supporting systems on Earth, undermining the wellbeing and inter-generational stewardship of all people. Despite important action occurring at local levels, for example in terms of climate adaptation, insufficient support limits its impact and scale (Glennie & Huq, 2023). Additionally, few binding legal frameworks exist that span local to global scales to control critical activities such as greenhouse gas (GHG) emissions, pollution (including transboundary pollutants), geoengineering, and resource extraction and use.

In a time marked by high geopolitical tension and limited aspiration for strengthened integrations between local and global governance, we must strengthen and establish frameworks that promote collective governance and management of the entire Earth system. This calls for a socially just and equitable transformation of the governance system to achieve the SDGs and stay within planetary boundaries. Leveling the playing field is an important function of governance institutions for just, sustainable futures, including effectuating ambitious multilateral agreements toward global standards, accompanied by capacity-building such as through technology transfers and knowledge-sharing, across issues ranging from GHG emissions leakages to occupational health and safety. While governance is

a means of achieving a sustaining change (Beunen et al., 2022), calls for governance transformations raise important questions of “who decides what should be transformed, by whom and how” (McDermott et al., 2022). Ideally, multilateralism, guided by the principles of inclusion, co-responsibility and social ownership, should be the avenue for governing global public goods (Espinosa, 2023).

Must-do #1: Establish an international “Emergency Platform” to enhance preparedness for effective response to complex challenges.

The failure to provide a rapid coordinated response to the COVID-19 pandemic as well as the climate crisis emphasizes the need to invest in anticipation, preparation, mitigation, and response of emergencies. Echoing the UN Secretary-General, Antonio Guterres, an international Emergency Platform must be established to enhance disaster preparedness for effective response and to activate countries to unite strategically for complex transboundary crises (The Stimson Center, 2022; United Nations, 2021). This platform would “leverage existing sectoral emergency response mechanisms to deliver collective outcomes” with the aim to “identify and bring together actors expeditiously at the appropriate level to respond to complex global shocks that require multisectoral, multi-stakeholder action [...]” (United Nations, 2023a). Operationalizing an international Emergency Platform calls for developing contingency plans and increased investment in and access to including early warning systems with actionable data (refer to Must-have “An ethical digital world providing for human security, equity and education”). Additional investments are needed to strengthen existing relevant UN entities, specialized agencies and multilateral actors to better anticipate and prepare for future global shocks and large-scale crises, while also augmenting capacities for peacebuilding, peacekeeping, and humanitarian

purposes.

Must-do #2: Revise the UN Charter to explicitly protect future generations, safeguard critical Earth system regulatory functions, and advance peaceful conflict resolution

To achieve governance transformations that respect planetary boundaries, the UN Charter should be revised triggering Article 109 to extend protection to the Earth system as a whole, including future generations, children, nature and climate. The revised Charter needs to give the UN the capacity to pass binding legislation to protect our planetary environmental system and the common goods it provides, with the necessary enforcement and dispute settlement mechanisms, as is already being done with the 27 members of the European Union. In time for the Summit of the Future, the UN should do away with obsolete language in the Charter, such as removing references to “enemy states” and it should update language referring to gender as exclusively male to be more inclusive or neutral (Global Governance Forum, 2023). The UN Secretary General has called for a global level “new deal” to improve the protection of global commons and the provision of global public goods, necessitating strengthened multilateral governance and strategies (United Nations, 2021).

While the UN General Assembly (UNGA) has been instrumental in raising awareness of environmental issues, there remains much work to be done to transform global systems for sustainability ambitions (Matz-Lück & Christiansen, 2020). Environmental legislation is needed to thwart human activities from breaching planetary boundaries (Chapron et al., 2017). Yet, adaptation governance under the UNFCCC, for example, is characterized by low legalization and while wealthier countries have offered adaptation financing, binding obligations on adaptation are necessary for international cooperation and national substantive commitments (Hall & Persson, 2018). A possible initial step toward this could involve granting the United Nations Environment Assembly legislative powers to protect planetary boundaries (Global Governance Forum, 2023).

The reluctance of many states to adopt comprehensive and binding environmental conventions (Juste Ruiz, 2020) exemplifies the need for a global road map for the effective implementation of international law (United Nations, 2021). Nonetheless, non-binding agreements and other soft law instruments can complement hard law standards by offering greater flexibility and inclusiveness, such as through the involvement of non-state actors (Guruparan & Zerk, 2021).

Within the sphere of international law, there is a need to promote a permanent rules-based international order, based on fair and transparent rules and obligations, including stronger measures for the peaceful resolution of conflicts. The United Nations General Assembly is a vital mediator in this regard, and must be given the necessary authority and resources to facilitate peaceful resolutions (Espinosa, 2023). Transparency and accountability improvements across UN organs, including the Security Council and the Economic and Social Council, will also enhance their effectiveness in setting norms and policies, and as a source of international law. Enhancing representation in the Security Council, expanding its membership and curbing misuse of the veto, are essential recommendations for conflict prevention and management and collective security. These are particularly critical issues given that the dysfunctionality of the Security Council, due to the power of the veto, has greatly hampered the ability of the UN to become a problem-solving organization (Global Governance Forum, 2023). In parallel, the reach of the International Court of Justice and the International Criminal Court should be strengthened, which requires increasing their enforcement powers, preserving their independence, and enhancing their resilience (The Stimson Center, 2022).

Must-do #3: Reform the international governance system to address climate change and biodiversity loss in an integrated manner

The interconnected nature of climate change and biodiversity loss calls for a drastically reformed international governance system that addresses these issues in an integrated manner (Du Toit & Kotzé, 2022). The recent Kunming-Montreal Global

Framework, which sets quantitative targets for the protection of nature, is a step in the right direction. The Biodiversity Beyond National Jurisdiction (BBNJ) Agreement provides a legally binding instrument that could transform how the international community collectively safeguards marine biodiversity and can promote international cooperation toward global conservation efforts, supported by a more cohesive and integrated management (Santos et al., 2022). Additionally, the BBNJ treaty could protect the rights of all nations to be involved in decision making and establish a universal standard for meaningful and widespread involvement in international environmental law (Santos et al., 2022). Similarly, the resolution adopted by the UN Environmental Assembly in 2022, titled 'End Plastic Pollution: Towards an International Legally Binding Instrument,' emphasizes the need to combat plastic pollution, with an emphasis in marine environments. These ongoing negotiations, slated to conclude in 2024, mark a historic milestone as the first legally binding agreement with such a specific focus.

Building upon existing efforts, siloed governance systems must be reformed and integrated in order to address issues associated with – as an example, and not limited to – the interconnected elements of biodiversity and climate change, and to ultimately achieve “planetary nexus governance” (Kotzé & Kim, 2022). This reform should be carried out through the establishment of an integrated, accountable, and authoritative structure, treating biodiversity and climate change as interconnected elements of the global commons contributing to intergenerational resilience and justice. Questions regarding the authoritative structure’s placement and the sources from which it derives its powers, such as treaties, agreements, or Security Council resolutions, arise and should be considered.

Must-do #4: Advance intra- and inter-regional cooperation to accelerate the uptake of local innovations and promote integration among levels of governance

Responding to the challenges of the Anthropocene requires more inclusive forms of governance, in which diverse stakeholders, across various scales, levels and geographies, can actively and meaningfully

participate in crafting governance systems that respond to complex challenges (Di Gregorio et al., 2019; Florini et al., 2022). In this context, adopting a multi-level governance approach, facilitated by a shift toward polycentricity and more adaptive governance structures, has the potential to promote cross-level interactions (Di Gregorio et al., 2019) to improve the distribution of power and create shared responsibility toward planetary health.

At present, powerful states and corporate actors dominate and concentrate power through top-down hierarchies in the configuration of the global governance structure (McDermott et al., 2022). To this end, institutions like the UN could adopt innovative operating models based on horizontal structures (Dupont & Skjold, 2022). Additionally, increased inter- and intra-regional cooperation can serve as a mechanism for low and middle income countries, in specific, to strengthen their international participation, negotiating capacity and respond to crises such as climate change, pandemics and growing inequality.

Among the key trends in the way engagement is conducted, the latest Global Parliamentary Report finds a growing public demand to influence decision-making (IPU, 2022). Mainstreaming consultation processes and enabling spaces that allow for an active participation of civil society, including youth, women’s organizations, and Indigenous peoples, is a key action for reshaping multilateralism, promoting international cooperation, accelerating the uptake of local innovations at larger scales and creating congruous legal changes that operate according to human rights laws. The value of having a diverse set of actors working together to overcome complex challenges and toward shared global goals lies in the potential of building resilience against shocks, increasing coordination to respond to disasters and reconnecting decisions for implementable and transformative action on the ground.

WE MUST HAVE:

Healthy, safe and secure food for the global population

We live in a world with a global food system that delivers neither nutritional requirements for all people, nor sustainability for the planet. There is insufficient progress to deliver on UN Sustainable Development Goal 2 (to end hunger, achieve food security and improved nutrition and promote sustainable agriculture by 2030), with 2.3 billion people in the world being moderately or severely food insecure, 828 million people affected by hunger, and a rising number of people on the verge of starvation (currently more than 200 million), as well as 10-11 million people annually dying prematurely due to unhealthy food (Willett et al., 2019). Despite this underperformance of the global food system, it is one of the primary drivers for transgressing the safe planetary boundary on loss of biosphere integrity (Dudley & Alexander, 2017), climate change (Tubiello et al., 2022), land use change, nutrient overloading (nitrogen and phosphorus) (Quinton et al., 2010), freshwater overuse (Rost et al., 2008), and a major contributor to chemical pollution (for example, pesticides) while also consuming high amounts of resources such as energy (Paris et al., 2022) and fertilizers (Ludemann et al., 2022). Transforming the food system is necessary for a trajectory toward human security in a safe and just world. Perturbations of the food system, driven by environmental degradation, disasters and sociopolitical disruptions and conflict, demonstrate the vulnerabilities of the world food system.

There is an urgent need for a systemic shift toward the global adoption of a flexible Planetary Health Diet, so-named for its promotion of healthy people living on a healthy planet, while recognizing and evolving with local and seasonal dietary cultures and diversity (FABLE, 2020). This will require a concerted effort including local stakeholder dialogues and empowerment, global campaigning and adoption of regulatory frameworks (e.g., standards and safe levels for different health-threatening food

substances). It is possible. Movements toward plant-based diets and plant-based proteins are on the rise. Pushes for locally-grown foods are apparent, even in international retail chains. We have the tools to scale up efforts that enable equitable access to healthy and sustainable food, in turn enhancing social and environmental resilience.

Transforming the global food system requires the integration of measures improving human diets, livelihoods, biosphere integrity and agricultural management (Bodirsky et al., 2023). A healthy, safe and secure diet for all can be achieved through a shift to a planetary health diet (including equitable access to culturally relevant infrastructure to support this), sustainable development in the agri-food sector including a shift to agroecological and socially responsible practices and increased resilience toward food system shocks.

Must-do #1: Enable the Planetary Health Diet for all

To enable the transition toward a healthy, just and sustainable food system, consumer behavior has to be shifted toward a planetary healthy diet (Willett et al., 2019). The planetary health diet, put forward by the EAT-Lancet Commission, encourages a primarily plant-based food diet with little to none animal sourced protein with the aim to promote both human and planetary health. Achieving this transition requires a higher awareness of and knowledge about healthy diets as well as a better accessibility to healthy and sustainable alimentation. Guidelines for healthy and sustainable diets have to be developed and launched at national and subnational level, accompanied with education campaigns that challenge entrenched narratives around nutrition habits (Behrens et al., 2017). A higher awareness for healthy and sustainable diets can, for instance, be reached by enabling better and systematic nutritional training for general practitioners (Rust

et al., 2020). Increasing the accessibility of healthy and sustainable diets requires the removal and replacement of harmful subsidies and as well as measures that create positive incentives for healthy and sustainable alimentation (Friel et al., 2020).

Other measures for policymakers to increase the accessibility of healthy and sustainable diets include incentivizing the availability of plant-based food in public cafeterias, e.g., in hospitals and schools (Garnett et al., 2019), imposing restrictions on unhealthy product advertisement (Thomas et al., 2022) and partnering with the food industry to offer more plant-based and sustainable options (Rust et al., 2020). In order to avoid political feasibility and public acceptance problems, policy packaging - bundling of different policy measures- helps to mitigate trade-offs between policy effectiveness and political feasibility (Fesenfeld et al., 2020). Regarding the private sector's significance, researchers and policymakers need to further explore mechanisms to transition corporations away from short-term profit-driven structures and identify innovative strategies to influence corporate behavior.

Must-do #2: Increase sustainable development in the agriculture and food sector

The agri-food sector has an increasingly important impact on the global environment. It is a major contributor to greenhouse gas emissions (Tubiello et al., 2022), has severe impacts on the biogeochemical cycles (Quinton et al., 2010), is a major driver of land use change, consumes high amounts of resources such as energy (Paris et al., 2022), fertilizers (Ludemann et al., 2022) and water (FAO, 2020; Rost et al., 2008) and contributes to biodiversity loss and ecosystem degradation (Dudley & Alexander, 2017). In addition, 25-30% of food is lost or wasted along the food value chain (Cattaneo et al., 2021)

Increasing sustainable development in the agri-food sector will require research and deployment of efficient fertilizer applications that minimizes the loss of nutrients from agricultural fields and farms (Chien et al., 2009). Furthermore, nitrogen and phosphorus fertilizer application have to be rebalanced between over and under-applied regions (Mueller et al., 2012; Willett et al., 2019). It will require changes in irrigation,

cropping and fertilization that reduce methane and nitrous oxides emissions as well as the development of new varieties of rice and other crops with lower greenhouse gas and nitrous oxide emissions (Su et al., 2015). First generation biofuels have to be phased out (Beach et al., 2015).

Methods for radical efficiency in water supply and energy planning for current and future crop demand have to be researched and deployed. This includes an increase in basin efficiency, storage capacity and a better utilization of rainwater (Willett et al., 2019). Biodiversity loss and soil degradation have to be reduced. This can be achieved by diversifying sustainable agriculture practices and adopting agro-ecological or regenerative farming practices. Land-based carbon dioxide removal such as carbon storage in topsoils helps to offset GHG emissions and by shifting incentives for food producers to encourage smaller sustainable farming businesses (Horton, 2017) (refer to Must-have "A limit of global warming as close to 1.5°C as possible by 2050"). Industry-wide practices to reduce food loss and waste have to be improved resulting in a halving of food loss and waste (Shafiee-Jood & Cai, 2016; Willett et al., 2019).

In terms of policy instruments, public food procurement (PFP) can play a key role in promoting sustainable food systems by influencing consumption and production patterns (FAO, 2021; Swensson et al., 2021; Swensson & Tartanac, 2020). More specifically, PFP, primarily aimed at supplying food to large institutions like schools, hospitals and prisons, holds significant potential to drive sustainability by shaping the type of food purchased, the food suppliers and the methods of food production. To fully realize the potential of PFP as an instrument for sustainability, it is essential to establish an enabling regulatory framework and implement appropriate incentives (FAO, 2021) coordinated to support agro-ecological, regenerative and circular models for nutritious food production.

Addressing food system challenges necessitates a comprehensive, multi-tiered, and inclusive approach encompassing stakeholders who are often excluded or not considered conventional allies, such as small island communities, technology industries, women,

engineers, smallholder farmers, next-generation farmers, human rights activists, institutional buyers with volume leverage, influencers, culinary education institutions, restaurant and producer associations. Carbon markets and credits should be tailored to recognize and compensate smallholder farmers, raising the questions of how to establish incentives for carbon markets to operate at scale and in an equitable manner, and which technologies can be used at the farm level to make this affordable and measurable.

Must-do #3: Secure and strengthen the resilience of agricultural supply chains

The cultivation of crops is increasingly challenged by changing weather regimes and extreme climate events (Willett et al., 2019). However, to achieve food security for a growing global population, the yield gap – observed yields expressed as percentage of those potentially attainable in a given region – has to reach 90%. Research into impacts of growing population and increased frequency and severity of climate impacts on food supply and demand has to be bolstered and synthesized. Data quality for projection mapping in forecasting population growth and its impacts on food waste, production and consumption has to be enhanced and the data has to be made publicly available through institutions such as the Food and Agriculture Organization of the United Nations (FAO), whose mandate includes the collection, validation and dissemination of data and information related to food and agriculture.

Research investment on identifying heirloom varieties and creating new breeds that would be better suited to projected climate change has to increase (Horton et al., 2017), though climate resilient crop varieties are well-enough studied for application (Dhankher & Foyer, 2018). Crops, cultivars, species and breeds that are less susceptible to stresses such as drought, pests and salinity, and also offer other benefits for livelihoods or nutrition, have to be implemented and scaled (Davis et al., 2017; Lin, 2011; Melino & Tester, 2023). Programs aimed at promoting climate resilient crops must be subsidized (Davis et al., 2019), and their results must be made available more rapidly in the Global South (Global Commission on Adaptation, 2019).

Innovative technologies such as precision agriculture, microbial protein or agri-photovoltaic systems have the potential to increase resilience and resource efficiency (Herrero et al., 2021). The public and private sectors must collaborate to scale up innovative technologies, create an enabling environment and build trust and inclusive governance structures to safeguard against unintended consequences. In addition, regulatory measures to strategically reduce threats and increase the resilience of the food system have to be introduced (Pörtner et al., 2022). Diversification of crop production and of the entire value chain can significantly improve the resilience of the food system and should be promoted (Hertel et al., 2023).

Must-do #4: Ensure socially responsible practices across land and sea agriculture

For a fair and safe food system, socially responsible agricultural practices on land and water must be ensured. To address widespread human rights abuses and inhumane working conditions throughout the global supply chain, legislation must be formulated and enacted to ensure human rights, including fair wages, fair trade practices, and health and safety protections that apply to all workers (ILO, 2023; Samaan et al., 2023).

For equitable and sustainable distribution of agricultural land, the legitimate holders of land use rights and their rights to natural resources and land use protection must be recognised, respected and protected, both in law and in practice. Where rights are violated or distorted, the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security (VGGT), which provide options for action by states, civil society, businesses and development agencies, should be applied (WHO, 2018).

There are important links between gender equality, women's empowerment and food security and nutrition (Njuki et al., 2023). Equal access to education, technology, land, finance and markets strengthens women's decision-making power, increases agricultural productivity and has a direct impact on household income and food security. Achieving this requires gender transformative

approaches as well as ensuring that women's perspectives are included at all levels of decision-making (FAO, 2011, 2019, 2023).

As an alternative to industrial food and agricultural systems, food sovereignty should be prioritized politically and scientifically. Governments have an important role to play in implementing policy levers to respect and protect food sovereignty (Patel, 2009). Additionally, in the realm of international

trade, there is a need to overhaul traditional trade governance rules to make them more fair, inclusive, and democratic. This could involve incorporating small-scale producers and integrating principles of food sovereignty into international trade structures (Burnett & Murphy, 2014). Scientifically, there is a need to further explore the appropriateness of the concept of food sovereignty for international public development policies designed to contribute to the fight against hunger and poverty.

WE MUST HAVE:

Reconnection of human well-being to planetary health

The impact of human activities on the Earth has increased rapidly in recent decades, resulting in disruptions and changes to critical ecological functions and natural systems (S. S. Myers, 2017). These global environmental challenges not only threaten the health of our planet, but also pose a serious threat to human health and well-being (Tong et al., 2022), particularly for the most vulnerable populations who contribute least to the destruction of the Earth. With increasing urbanization and intrusion into natural habitats, zoonotic diseases are expected to increase, raising the risk of devastating pandemics and epidemics (UNEP, 2020). Anthropogenic air pollution is threatening our well-being by causing respiratory diseases and a large number of premature deaths (WHO, 2021c). As climate change progresses, the frequency of extreme weather events will increase. Critical health infrastructure needs to be adapted and available to tackle changing illnesses and injuries (Ebi et al., 2021). Climate change combined with land degradation and conflict will lead to increased food and water insecurity (Brown et al., 2021). As with other “must-haves,” in principle, humans have the knowledge and tools required to respond to these threats. In the COVID-19 pandemic, for example, there was rapid development of a vaccine to lessen spread and severity of the disease.

Must-do #1: Create legally binding frameworks to reduce the risks for zoonotic diseases

Reconnecting human well-being to the “well-being” of other life-supporting systems across the planet requires legally-binding frameworks and agreements to reduce the risk of zoonotic diseases. Approximately 60% of all infectious diseases in humans enter the human population via animal hosts (Woolhouse et al., 2001), i.e. are zoonotic. With increasing urbanization and the intrusion into natural habitats, zoonotic diseases and the associated risk for devastating pandemics is projected to increase (UNEP, 2020). As of early 2023, World Health Organization member countries have begun negotiating the Pandemic Preparedness Treaty (PPT) with the aim to better prevent, prepare and respond to pandemics (WHO, 2023). Adopting a one-health-approach (Rudall, 2022), as proposed in the PPT and defining key roles and responsibilities, obligations and enforcement mechanisms does not only reduce the risks for zoonotic diseases, but also contributes to higher biodiversity and a healthier environment (UNEP, 2020). Achieving the objectives of the PPT calls for increased cooperation, centering equity concerns during negotiation and implementation

phases, and establishing an independent monitoring system composed by independent experts to hold countries accountable to their commitments (Hanbali et al., 2023; The Lancet, 2023). Global expert groups, such as the Panel for a Global Health Convention, advocate for the PPT based on the principles of solidarity, transparency, accountability and equity (GPHC, 2022).

Other concrete measures to reduce the risks for zoonotic diseases include expanding protected wetlands and strengthening wetland integrity (Everard et al., 2020), improving wildlife regulation, e.g. by criminalizing illicit wildlife trade (Rudall, 2022) and strengthening the implementation of existing commitments on habitat conservation and restoration (UNEP, 2020).

Must-do #2: Strengthen the climate responsibility and resilience of the health system

Health-related impacts induced by extreme weather events are projected to increase with changing climate. This is overturning a declining trend of adverse health impacts from extreme events observed over the last few decades (Ebi et al., 2021). The increase in extreme events significantly increases the risk of damage of critical health infrastructure as well as the availability of health systems, and can further induce and alter the distribution of illnesses and injuries (WHO, 2021a). For instance, after the floods in Pakistan in 2022 the occurrence of Malaria increased from 400,000 to 1.6 million cases. To increase the resilience of the health system toward climate change, measures that ensure that health risks of climate change are prioritized need to be implemented in national adaptation plans (Ebi et al., 2021; WHO, 2014). Disaster risk management measures, such as climate-informed early warning systems (WHO, 2021b), community-based interventions to prevent heat-related illnesses (Hasan et al., 2021) as well as infrastructure resilience (WHO, 2020) have to be further developed and applied. Training transdisciplinary scientists in systems-based investigation to consider health and human intervention points methodically and in cultural literacy for engaging with different stakeholder groups are additionally supportive aspects of a more resilient global health system.

Strengthening the resilience of the health system also calls for decarbonizing the health sector, which is currently responsible for 5.2% of global emissions (Romanello et al., 2022). Air pollution and climate change exacerbate health risks, posing an increased threat to public health, pointing to the measurable co-benefits decarbonization could achieve. The shift toward a decarbonized healthcare sector should be guided by the principle of “common but differentiated responsibilities,” outlining different approaches according to emissions generation and income levels (Health Care Without Harm, 2019). Achieving global decarbonization and bolstering resilience across the healthcare sector will demand increased international collaboration concerning access to finance and technology transfers, as well as increased cross-sectoral engagement, particularly with the renewable energy sector, at both national and regional levels. Coordination among activities and organizations across scales conducting research and governance of health, as well as agency awareness in response/mitigation methodologies, is key to connect upstream drivers and downstream consequences to manage and minimize impacts. The Global Heat Health Information Network is a strong example of effort to integrate and leverage scientific efforts, data, and solutions in climate and health science.

Must-do #3: Reduce PM2.5 emissions causing respiratory diseases

Serious adverse effects on human health are associated with air pollution by fine particulate matter PM2.5 (WHO, 2021c). It is therefore a health policy priority to control and reduce the formation of the main PM2.5 precursors (sulfur dioxide, nitrogen oxides and ammonia). Pollution control programs have so far focused on reducing nitrogen oxides, concentrating their efforts on emissions by the heavy industry and the transportation sector. This has led to a steady decline of nitrogen oxide emissions in developed countries since 1980 (Zhong et al., 2020). Meanwhile, new research shows that ammonia emissions, mainly occurring in the agricultural sector, have increased in many regions since 2008 (Luo et al., 2022), as efforts to regulate ammonia emission were limited to a few countries (Plautz, 2018). Ammonia emissions account for tens of

thousands premature deaths (Ma et al., 2021), with approximately 19.3 million years lost in 2013. But, ammonia emissions can be reduced in a particular cost-effective way by implementing policies to reduce fertilizer applications (Gu et al., 2021).

Must-do #4: Develop early warning signs for threats to food security

An urgent shift is needed in how national and international actors conceptualize food security, how food-related vulnerabilities are projected at the local level, how causal factors for food degradation are identified, and how nutrition-sensitive services are designed to mitigate the impact of climate and conflict events on households and communities (Brown et al., 2021) (refer to Must-have “Healthy,

Safe, and Secure Food for the Global Population” for a deeper look at food systems). Current early warning systems for food insecurity tend not to detect food crises until they are well advanced (Maxwell et al., 2020). For effective prevention, climate, conflict and health need to be considered together (Brown et al., 2021). There must be an increased scientific understanding of the nature and role of conflict, how it interacts with climate events, and how these interrelations impact the food system (Brown et al., 2020). Improved models and datasets incorporating this knowledge are required (Brown et al., 2021). Applying new methodologies using machine learning can further improve the prediction of food insecurities (Balashankar et al., 2023). The next step is to channel the findings to decision-makers and practitioners, to enable robust early interventions.

WE MUST HAVE:

An ethical digital world providing for human security, equity and education

Many of the world’s functions and information exchanges occur in the digital realm. Knowledge production and knowledge exchange platforms grow at an exponential rate. Open-source data sharing can strengthen local, regional and global responses to threats (UNDRR & WMO, 2022). The digitalization of education allows for expanding access to high-quality education and increasing learning opportunities from formerly disconnected regions (OECD, 2022a; UNESCO, 2021). Digital platforms can enhance coordination for discourse and action on societal issues and increase civic engagement (IPU, 2022; OECD, 2020).

Yet, the ever-growing digitalization of our everyday lives is a double-edged sword. Access to digital tools remains deeply inequitable. Rapid spread of disinformation and growing polarization, facilitated by digital platforms, erode trust and enhance friction (OECD, 2020). Important questions about

governance, oversight, protection and transparency remain unanswered. According to the latest UNDP Human Development Report (UNDP, 2022b) “new kinds of uncertainties layer and interact forming a new uncertainty complex.” Issues regarding ethics and governance in the digital transition become more complex and hard to keep up with (OECD, 2019). Addressing these concerns, anticipating future unintended consequences of the digital transition and developing action pathways is a must if we are to achieve an ethical and accessible digital world providing for human security, equity and education.

Must-do #1: Facilitate equitable and inclusive access to digital technologies.

While the use and development of digital technologies have grown at an impressive rate, the progress toward closing the digital divide has not. The digital divide refers to the “gap between individuals,

households, businesses and geographic areas at different socioeconomic levels with regard both to their opportunities to access information and communication technologies and to their use of the internet for a wide variety of activities” (OECD, 2001). Studies confirm that the access and use of digital technologies remains unequal among genders, age, socioeconomic status and racial groups (Gillwald & Partridge, 2023; GMSA, 2022; OECD, 2018a; Yoon et al., 2020). To bridge this gap, digital governance has to be structured so that it is not dominated by high-income countries and in which space and equal participation is given to low- and middle-income countries.

While digital tools can broaden engagement and promote digital access, educational and awareness raising campaigns focused on these tools must be developed to encourage their use to ensure that the digital transition does not create yet an additional barrier for the inclusion and active participation of marginalized groups (IPU, 2022). Potential action pathways for harnessing an ethical and equitable digital world include implementing inclusion policies to provide digital equipment, internet access and training for target populations (Yoon et al., 2020); investing in the education of women and girls in science and technology, and coordinating action among governments, civil society and the private sector for bridging digital access and literacy gaps (Mariscal et al., 2019).

In an era marked by the rapid advancement of digital technologies, such as artificial intelligence, it is crucial to develop and democratize digital education and literacy tools to ensure that everyone can reap the benefits of technological advancements. This will require the creation of age-appropriate educational tools tailored to the specific needs and skill levels of different age groups. These tools should focus on teaching baseline digital skills that are transferable and applicable in various contexts, complemented by a lifelong learning approach that continuously adapts to evolving technology. Additionally, in this context, it is crucial to identify the unique value of human contributions and prioritize the upskilling of generations, especially as artificial intelligence and other digital technologies become increasingly

advanced.

Must-do #2: Invest in open, people-centered solutions developed by and for communities to facilitate inclusive digital technologies with an emphasis on AI

Throughout the COVID-19 pandemic open access to science and data sharing played a crucial role in tracing the spread of the virus and accelerating the pace of research, ultimately allowing for a speedier development of the vaccine (OECD, 2022a; Paic, 2021). Artificial intelligence (AI) and other disruptive technologies, along with open source data sharing, such as through the WMO Unified Data Policy, can promote the expansion of early warning systems to better understand and respond to threats. Yet, only half of the countries in the world have multi-hazard early warning systems (UNDRR & WMO, 2022). Novel open-access digital tools should be utilized to further science-based policy, promote education, and harness a sense of shared global responsibility. Realizing the full potential of digital technologies for disaster risk reduction necessitates expanding open access to science and data collection and analysis tools, increasing international cooperation, and strengthening collaboration among local and global stakeholders to achieve early warning systems for all (UNDRR & WMO, 2022). Additionally, in the transition to open access models, there is a need to adjust regulations regarding intellectual property and digital ownership to ensure that scientists, authors, artists and other content creators are compensated fairly and not disadvantaged by this shift. These regulations would serve as a foundation for promoting ethical behavior in the digital realm and should be applicable across the public and private sectors.

Increased collaboration among universities, researchers, technology developers, and community users can promote the co-design of digital tools and solutions, including AI systems, tailored to address and tackle specific challenges that have been identified with local communities (Hsu et al., 2022). These collaborations can facilitate the identification of broad-ranging

questions that can be answered by AI (e.g., such as to call attention to pollution at the facility level, as provided by data from Climate TRACE). To assess the effectiveness and engagement of novel digital tools and solutions among diverse stakeholder groups, piloting them within community programs like science olympiads and certificate programs should be considered. Additionally, case studies should be developed to identify and disseminate best practices in their application.

Nevertheless, these co-creation and co-design processes, which engage various stakeholders, may encounter barriers and challenges, such as during the data collection phase, due to divergent perspectives and conflicts of interest among the diverse groups (Hsu et al., 2022).

Must-do #3: Improve oversight mechanisms and frameworks to provide equitable access to evidence-based information and promote digital ethics

Approximately 71% of countries have data protection and privacy legislation worldwide; however, “the share in the least developed countries is only 48%”, illustrating an important legislative gap (UNCTAD, 2021). The increasing pace of digital technologies and their embeddedness in our daily lives pose significant and novel challenges in terms of regulation (OECD, 2019). To address these challenges, improving regulation and advancing global and cross-sectoral cooperation in terms of data protection and public oversight in the face of micro-targeting, disinformation and other cybersecurity concerns is a must (Beaumier et al., 2020; ITU & World Bank, 2020; Mehta & Erickson, 2022). The EU’s 2018 adoption of the wide-ranging General Data Protection Regulation and the 2022 OECD Declaration on Government Access to Personal Data Held By Private Sector Entities represent significant advancements and establish international good practices in terms of data privacy and protection with a human rights focus. Additionally, regulations and oversight mechanisms need to be developed and enforced to prevent ‘digital giants’ from monopolizing the collection and control of data.

Must Do #4: Invest in access to digital tools to promote equitable, inclusive and intercultural education.

Digital platforms and the digitisation of education open new avenues for advancing the Education 2030 Agenda by promoting the effectiveness, equity and cost-efficiency of education systems access to education (UNESCO, 2021). The 2019 adoption of Beijing Consensus on Artificial Intelligence and Education and the \$4 billion dollar valuation of AI in the education market in 2022 (Global Market Insights, 2023) reflect the growing prevalence of disruptive technologies in education. Simultaneously, the digitisation of education raises important policy concerns, including affordability and access. Ensuring that these tools narrow the digital divide, will require government investment and support as well as public-private partnerships to enable affordable access to technologies and promote open and interoperable standards (OECD, 2021). Digital tools can also play an important role in preserving and expanding access to other knowledge systems (Haines et al., 2022). Involving Indigenous people directly through co-creation processes can drive digital inclusion and harvest symbiotic exchanges between traditional knowledges and digital technologies (Bala et al., 2022; Haines et al., 2022). An equitable and inclusive digital future will, essentially, involve a transition from “digitalization to human digitalization” requiring close collaboration between governments and research centers to advance and promote digital education and an ethical, human-centered digital transition (Trkman & Cerne, 2022).



WE MUST HAVE:

Stability and security in a global society

Weakening democracies, rising authoritarianism and a geopolitical shift toward heightened risk of armed conflict on account of a 'great powers' model distract from existential crises such as environmental degradation and increasing inequalities. Human-caused environmental degradation can increase the risks of conflict, causing implications across local-to-global scales. Amidst a global panorama of increasing tension and instability, understanding how different sources of inequality and marginalization, such as gender, socio-economic status and race, interact and distinctly increase risks and vulnerabilities is crucial (DPPA, 2022; OECD, 2022b; United Nations, 2020b).

Equity and peace are the cornerstones of a thriving, interconnected, and sustainable global future. This calls for an innovative approach to security and stability and a new agenda for peace – one that moves beyond military solutions and “ill-suited” forms of risk prevention, management and resolution and focuses on advancing an inclusive and just peace (The Stimson Center, 2022; United Nations, 2021). At the highest level, we must establish multilateral positive peace alliances, built on complex understandings of planetary health, human security, and a resilient and just global political economic system.

Must Do #1: Adopt the recommendations of the UN Secretary General’s calls for a New Agenda for Peace

Hazards posed by climate change, cyberwarfare, growing geopolitical tensions, disinformation, mass migration and pandemics diversify the nature, complexity and breadth of security threats (Opitz-Stapleton et al., 2019; Richards et al., 2022). In the context of climate change, the use of the term “threat multiplier” evinces a growing consensus surrounding the two-way interactions between climate change and security risks (Goodman & Baudu, 2023), even though debates persist as to the precise extent to

which climate change and natural disasters increase security risks (Arias, 2022; Brooks et al., 2022). As part of the “Our Common Agenda” report, the UN Secretary General proposed a New Agenda for Peace “to protect and manage the global public good of peace” (United Nations, 2021) and has presented a series of specific recommendations for action (United Nations, 2023a). For stability and security in a global society, UN Member States should embrace the SG’s calls for a new agenda for peace and adopt and implement the recommendations for action.

A new agenda for peace should account for Earth tipping elements, focus on advancing an inclusive and just peace, and move beyond military solutions and ill-suited forms of risk prevention, management and resolution (Hirsch Ballin et al., 2020; The Stimson Center, 2022). This calls for an innovative approach to security and stability: addressing the underlying causes that lead to conflict and instability, and reducing excessive military budgets to prioritize social spending.

Armed conflict prevents and reverses progress on achieving civil rights, climate protection and sustainable development. Governments must adhere to the UN obligations to resolve conflicts peacefully and refrain from the threat or use of force. All countries should accept the jurisdiction of the International Court of Justice in order to resolve international conflicts through the application of law rather than through force, when other peaceful means to resolving their conflicts fail. The threat of nuclear war poses an existential danger to humanity and contravenes international law. Nuclear-weapon States should pledge to never initiate a nuclear war by adopting no-first-use policies. Furthermore, they should work toward the global elimination of nuclear weapons under international verification and enforcement no later than 2045, the 100th anniversary of the UN.

Must Do #2: Advance international cooperation for stable, inclusive, reciprocal institutional structures.

To effectively respond to the evolving nature of conflict and address transboundary threats, 21st century peace and security efforts require increased cooperation and coordination across and among nations, sectors and generations (Hirsch Ballin et al., 2020; UN DPPA, 2021; United Nations, 2021). Multi-stakeholder partnerships and cross-sectoral dialogue spaces play a key role in promoting collaborative exchanges and building on comparative different competitive advantages for addressing specific problems (Fan et al., 2016). Mutual respect, trust, reciprocity and a shared commitment toward human rights, security and well-being should be at the center of peace and security efforts (UN DPPA, 2021).

A glaring example of the need for cooperation in transboundary issues is illustrated by the number of international migrants worldwide, which reached 281 million in 2020 (United Nations Department of Economic and Social Affairs, 2021). To ensure the security and well-being for both migrants and destination countries, there is a need for global principles and agreements formalizing labor mobility and policies centered on human security and sustainable development (UN DPPA, 2021). In July 2023 the Heads of State of the Caribbean Community (CARICOM) decided to sign a renewed agreement by March 30 2024 to allow freedom of movement for all CARICOM nationals. Such an initiative represents an important example of regional integration and can be an enabler of advancing sustainable development in the CARICOM region (Quesada, 2023).

Additionally, advancing inclusive global security governance requires, among other things, mainstreaming gender across institutional and policy levels. Efforts involving innovative programming and gender-focused financing are needed to integrate the Women, Peace and Security agenda within the climate-security nexus (UNEP et al., 2020).

Must Do #3: Promote, enable and prioritize meaningful civic and political youth participation and inclusion in peace and security decision making spaces.

The Institute for Economics and Peace estimates that in 2016 approximately 408 million youth (aged 15-29) live in areas affected by armed conflict or organized violence (Hagerty, 2017). Young people have had a significant role in advocating and advancing human rights, sustainable development and the climate emergency. Additionally, their meaningful participation in peace processes contributes to sustaining peace, while their exclusion is counterproductive as it can fuel violence (Luu & Rausch, 2017; Simpson, 2018). Yet, youth exclusion persists, based on distrust and lack of political will to advance meaningful inclusion, leading to a limited involvement of young people's participation in peace processes (Simpson, 2018). Youth is a highly heterogeneous, diverse, and dynamic category. As a result, youth participation should reflect this diversity. To achieve full and effective youth participation in peace and security decision-making, it is imperative to evaluate and comprehend the various structural and systemic barriers that different youth groups encounter.

To enable meaningful civic and political youth participation in peace and security decision-making spaces, key strategies include investing in young people's capacities, transforming systems to address structural barriers limiting youth participation, such as through youth quotas, and prioritizing partnerships and collaborative action with young people as equal partners (Simpson, 2018). Actualizing this may come from leveraging philanthropy or development funding to scale best practices for evidence-based decision-making for the implementation of inclusive consultative processes, including greater transparency. Facilitating youth access to research and knowledge generation; centering youth in project design; promoting youth engagement in project implementation and actively involving youth in monitoring and evaluation processes can enhance the quality and depth of their participation (Ebenezer-Abiola, 2023).

Finally, education curricula should be continuously assessed and updated to adequately prepare young people for engaging with the complexities of modern media (Kahne & Bowyer, 2017; Lim & Tan, 2020) and socio-ecological realities (Taylor, 2017).

WE MUST HAVE:

A resilient global society ready to respond to planetary crises

We live in a world of rising turbulence. Extreme events, social and environmental shocks are increasing in frequency and severity, driven by the stresses of the Anthropocene. Droughts, floods, diseases, fires—hitting harder and more frequently—amplify the outbreak of conflict, food scarcity, displacement and migration (Dai, 2011; Folke et al., 2021). As inequality rises, democratic systems weaken, human rights abuses increase, distrust grows and polarization widens across the globe (United Nations, 2020a). To deal with shocks and stress, and the systemic risks their interactions create (Keys et al., 2019), social and environmental resilience must be built at all scales. This means developing and investing in the capacity to detect, prevent and respond to potential crises, recognizing the spillover effects of strife and collapse across scales, strengthening social equity, and enabling opportunities to develop sustainably.

Equitable resilience-building – socially, economically, institutionally and in terms of mutual trust – involves bolstering social and ecological diversity and human agency. To enable broader sets of options for all across contexts, equity and education are critical guiding concepts – for example concerning land use, human life, crisis management, and sources of energy. Indigenous communities generally exhibit the most advanced resilience-building capabilities (Bohensky & Maru, 2011). Social resilience in a global context can be achieved only through listening, sharing and developing human and ecological capacities. We seek a society that can not just withstand shocks, but a global community that can adapt and even transform.

To develop strategies for meeting the ecological and social challenges of the Anthropocene, we must define what “resilience” means in every political, economic and social context: outlining the socio-environmental landscape, relevant vulnerabilities, and

needed and potential resources (Reyers et al., 2022). This can only be achieved by being empathetic, responsible, and respectful to different communities, their knowledge and belief systems, histories and environments.

Must do #1: Empower civil society through education and participative policy-making.

Decision-making processes must include communities, and involve Indigenous and local knowledge systems to prepare for environmental changes (Black et al., 2022; Kallis et al., 2021; Klenk et al., 2017). Researchers should collaborate with communities for respectful, sensitive data-collection and knowledge co-production processes, especially where indigenous knowledge and interests are concerned (Chilvers & Kearnes, 2016; Klenk et al., 2017; TallBear, 2014). Developing decision-making processes that are equitable and just involves multiple knowledge systems coming together. This calls for a closer collaboration between scientists and Indigenous and local knowledge holders. However, it is important to recognize power dynamics and underlying structural barriers that may generate potential tensions and conflicts of interest in the coming together of these different groups in the context of decision-making (Wheeler & Root-Bernstein, 2020). In these contexts, the agency of the Indigenous and local communities must be prioritized, recognizing that their knowledge and practices are not merely sources of data but integral components of their people, history, culture and belief system in which they originate. The devolution of resources and responsibilities, along with community-based management, can serve as effective governance approaches that center the participation of civil society groups, affected communities and community users in decision-making (Berkes, 2010). These approaches result in increased interactions which can facilitate

feedback learning and, overall, lead to increased adaptability and resilience. The democratization of water infrastructure for community-based resilience to flood and drought is an example of one such recommendation.

Policy-makers and civil society actors must strive to implement reflexive systems to learn from disturbances, which can help to reduce response time to growing threats in the future. Such systems should prioritize emotional and social well-being in preventing and rebuilding after disasters, including providing trauma-informed care and transforming trauma (McEntire, 2021). The growing body of academic literature on Early Warning Signals for social and ecological regime shifts can support these efforts (Bauch et al., 2016; Bury et al., 2021; Lenton, 2020).

To ensure a resilient global society in the long term, education is of particular importance – both in general, and specific to climate change and other global challenges (Monroe et al., 2019). The Anthropocene has upended traditional views of humans' role in the Earth system, a paradigm shift that must be communicated effectively to equip coming generations with the tools they will need (Taylor, 2017).

Closing the gender gap in education is recognized as an especially crucial factor for development and resilience building. According to World Bank estimates, obstacles in girls' access to education, preventing them from completing a full 12 years of schooling, lead to a substantial loss of lifetime productivity and earnings, ranging from \$15 trillion dollars to \$30 trillion dollars for countries (Wodon et al., 2018). While global progress has been made in achieving gender equality in education over the past decades, it remains lagging in crisis-affected regions (UNSTATS, 2022). It is projected that by 2025, climate change will hinder the completion of education for at least 12.5 million girls (Malala Fund, 2021), posing a significant barrier to future resilience (Seguino, 2020). In the face of climate risks, girls' education is regarded as playing a key role in responding, adapting to, and recovering from disasters (Blankespoor et al., 2010; Striessnig et al., 2013). Implementing solutions and approaches

such as removing cost barriers, enhancing physical accessibility of schools, improving teaching methods and implementing gender-focused interventions beyond the academic realm can work together to advance gender equity in education (Evans et al., 2023).

Must do #2: Promote redundancy, flexibility, and the anticipation of crises

Optimizing for certain economic parameters, such as efficiency and short-term returns, systematically removes buffers that would ensure the resilience of a system during extreme events. This can have especially dramatic consequences in food systems. National policy-makers should aim for balanced imports, food self-sufficiency and more diverse agricultural output. Moving from monocultures to diversified plant selections and other traditional farming techniques can boost food security (Altieri & Nicholls, 2017; Gaudin et al., 2015; Lin, 2011; Waha et al., 2018), and may narrow the yield gap between conventional and organic farming practices (Ponisio et al., 2015).

A changing climate poses special challenges for many critical infrastructures (Forzieri et al., 2018). With life spans of many decades or even centuries, investments in new and modernized infrastructure therefore need to consider resilience under a variety of future climate scenarios. Infrastructure regulations and building codes must be updated to, for example, prepare electricity grids for extreme weather events (Panteli & Mancarella, 2015), ensure reliable access to freshwater (Poff et al., 2016), manage urban heat (Norton et al., 2015) and ensure human comfort and safety while bringing down emissions (Kwok & Rajkovich, 2010).

Furthermore, building information modeling, supported by artificial intelligence and other Industry 4.0 technologies (Sacks et al., 2020) should be employed to improve the collection and dissemination of monitoring data. This, in turn, can contribute to the resilience of infrastructure and the built environment (Achilopoulou et al., 2020; Argyroudis et al., 2022). Nevertheless, several challenges need to be addressed. These include ensuring equitable access to these technologies, safeguarding data privacy and managing conflicts of

interest among different stakeholder groups (Chester et al., 2021).

Must do #3: Enhance climate resilience through significant and immediate mitigation and adaptation capacity-building across scales including through shared innovation and technology

When considering resilience to increasing climate change impacts, adaptation and mitigation are intrinsically linked. Every tenth of a degree of climate change that we fail to mitigate threatens to overwhelm our global society’s ability to adapt. Conversely, many adaptation strategies are not climate-neutral, and threaten to exacerbate the problems we face. Ideally, adaptation and mitigation measures can be mutually reinforcing, such as in the restoration of Mangrove forests and peatlands.

However, large gaps exist both in the funding of adaptation measures (UNEP, 2022a), as well as in their evaluation. There is a lack of global, systematic data on adoption practices, and few adaptation measures are rigorously assessed both in their efficacy, as well as their effect on climate change (Berrang-Ford et al., 2021; Biesbroek et al., 2018; Goodwin et al., 2023). The adoption of true cost accounting and innovative financing frameworks are needed within the development finance sector to

ensure the appropriate and efficient allocation and utilization of relief and development funds.

Immediate, massive upscaling of international adaptation financing (UNEP, 2022a) is thus not the only requirement to achieving a climate resilient society. Policy-makers from the international to the local level must facilitate the sharing of technological innovations that are relevant for building climate resilience. Focused research should be directed at the outcomes of such measures and systematically made available especially in low- and middle-income countries, where vulnerability is highest and large research gaps exist (Global Commission on Adaptation, 2019; Goodwin et al., 2023; Kowarsch et al., 2016).

Local policy-makers and communities play a vital role in this endeavor. A dependence on foreign knowledge and providers precludes long-term, independent resilience-building (Blanco et al., 2022). Community champions and leaders, particularly indigenous and local actors, should be identified to help guide and mobilize communities, in envisioning the creation of better futures. Even more importantly, only local and indigenous knowledge can support the necessary work of developing, or contextualizing innovations to specific local circumstances, especially for nature-based solutions (Peng et al., 2019; Reise et al., 2022).



Action-forward:

Human activities—in the forms of GDP-chasing nation-states, transnational corporations, and profit-driven production systems—have defined a new geologic epoch, the Anthropocene. The modern world has used all environmental space and exploited natural capital to, and in some cases beyond, its limits (Blythe et al., 2018b). This is particularly true of high-income nations. Scientific evidence underlines the high risk for irreversible and catastrophic global change and the inability to transform our unsustainable paths within the structural constraints of our existing systems. Six of the nine so-called “environmental planetary boundaries” are assessed to be outside of the “safe operating space,” putting societies, as well as the life-supporting systems and stability of the entire Earth system, at risk (Gupta et al., 2023; Rockström et al., 2009; Rockström, Gupta, et al., 2021). Human decisions have led to a rise in extreme, unpredictable climate events that are increasingly frequent. And because the societal systems cannot be decoupled from planetary systems, humans are also burdened through increases in disease, water and food insecurity, costs of living, biodiversity loss, violent conflict and beyond (UNCTAD, 2022; UNDP, 2022a; UNRISD, 2022; World Economic Forum, 2022). Yet, these pressing challenges are not unavoidable – they are design flaws of our current systems (UNRISD, 2022).

We must transition from calamity to opportunity by leveraging coordinated political will, private sector innovation, and the demands of an informed civil

society. Scaling solutions, trust in science and governance institutions, indigeneity and inclusion of diverse knowledge systems, gender equity, youth participation and accountability are among the cross-cutting themes evident in the report. By identifying the most critical actions needed to respond to each Must-have, the 10 Must-haves Initiative provides a global contingency plan that spans disciplines, sectors and geographies to halt the path toward irreversible and destructive changes to planetary systems and promote the transformations that are urgently needed. Accompanied by multi-stakeholder working sessions and an emerging coalition of actors across sectors, knowledge systems and the world, the “10 Must-haves Initiative” will clarify pathways of action and accountability rooted in evidence, aligned with leaders in different domains to get to work on implementation. This iteration of the “10 Must-haves Initiative” document will be shared for discussion at the COP28 Blue Zone, and exist dynamically thereafter, open to evolve to reflect the changing realities of the world and input and insights from its endorsers.

Looking ahead to 2024, the plan is to continue enriching and promoting the 10 Must-haves Initiative and the work of the Global Futures Conference by participating in events like the Planetary Health Summit in Malaysia, the World Economic Forum Annual Meeting in Switzerland and the UN Summit of the Future in the United States.



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