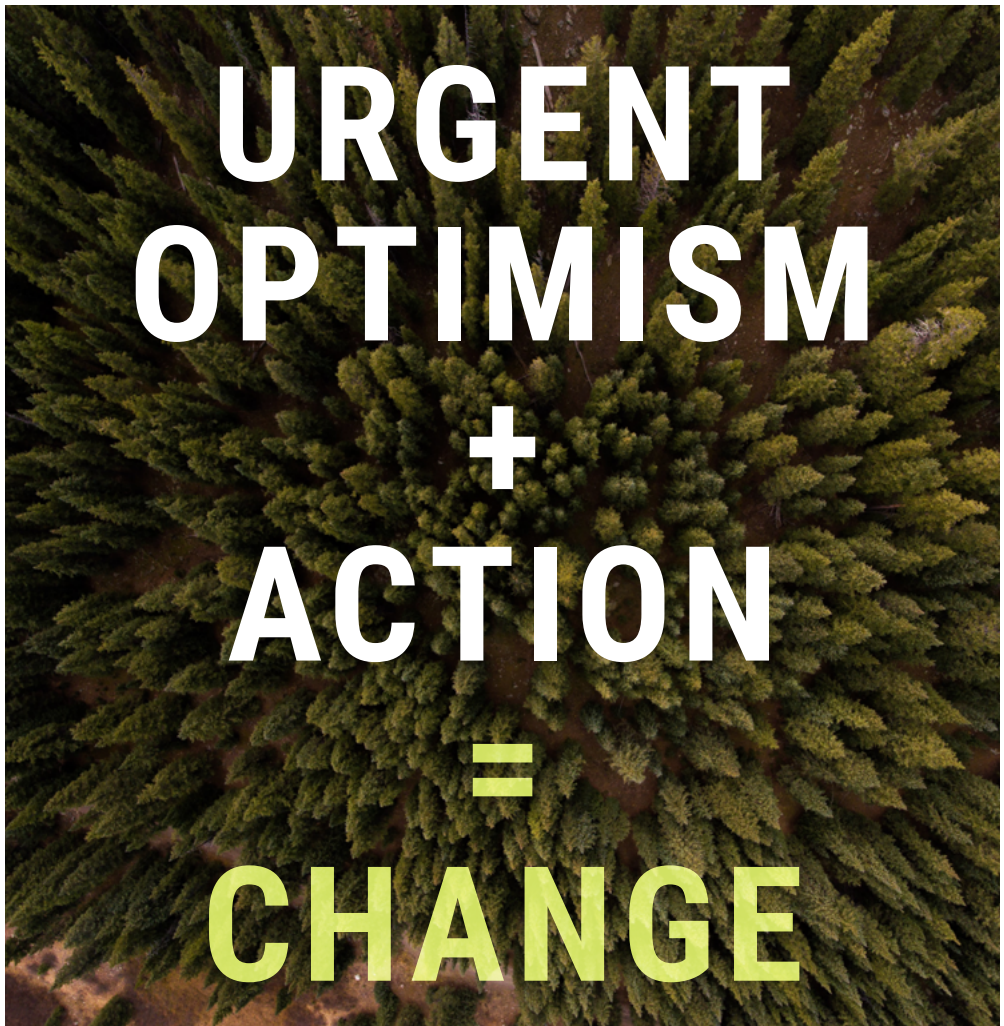

THE
EARTHSHOT
PRIZE
2022

THE
EARTHSHOT
PRIZE

ROADMAP TO REGENERATION

2022 SELECTION PRIORITIES

INTRODUCTION



Regenerating and repairing the planet while creating equitable and sustainable livelihoods is the largest transformation that our civilisation might ever go through. It requires system changes touching every level of society – political, economic, financial, cultural, legal. It upends mindsets, assumptions, norms and institutions. It requires innovation at every level of our systems, from microbial to global. And it all needs to happen at an unprecedented speed and scale.

With so much to be done, it's easy to become overwhelmed. If 59% of young people express climate anxiety, it's not just because of the forest fires, the rising seas, the storms and the floods – it's also because the change required can feel daunting, urgent, overwhelming and beyond our personal reach.

Many of us wonder "how can I make a difference?" Our answer is both simple and personal – pick something you're passionate about, something you can do that will make a difference and then focus on doing it.

When we created The Earthshot Prize, we asked ourselves the same question: "How can we make a significant difference?"

The first year of The Earthshot Prize far exceeded our expectations. So many of you around the world answered our urgent call for solutions to the world's greatest challenges. We have awarded our first winners and are supporting 15 Finalists to scale their impact around the world. This year, we seek to grow our impact even further.

After extensive consultation and research, we identified tipping points we passionately believe will be defining for this decade, and we drilled down into how we can uniquely contribute to accelerating change and scaling impact.

Our selection priorities are our transparent roadmap to trying to make a difference in this decisive decade. Akin to the investment theses of the impact investment world, but centred on how we search for and select the next Earthshot Prize Winners. We expect to experience exponential, disruptive, transformative times at an unprecedented level. We'll update and share our Selection Thesis each year to reflect this.

The Earthshot Prize Team

WHY THE EARTHSHOT PRIZE?

“The natural world on which we entirely depend is declining at a rate faster than at any time since the end of the dinosaurs. We know where this story is heading, and we must now write a different ending. This is what The Earthshot Prize was created to achieve.”

— Sir David Attenborough

We all know it. This is the decisive decade. When the world rings in New Year, January 1st, 2030, what should we expect? The simple answer is stark: The world will either enter the 2030’s firmly on the path towards a repaired and regenerated planet, or we will be hurtling towards ever increasing, devastating, exponential planetary and humanitarian crises that will make COVID-19 pale in comparison.

We are optimists. Despite all the challenges, we see plausible pathways to an era of regeneration and abundance. We see positive tipping points within reach. We are optimists, but we are also realists. Change is not yet happening fast enough or at the scale we need. Climate anxiety and despondency are at an all-time high, and political systems are moving with far too much slow incrementalism. We are in a race against time. We need urgent optimism, innovation and speed to scale.

“Stubborn optimism needs to motivate you daily; you always need to bear in mind why you feel the future is worth fighting for.”

— Christiana Figueres, Tom Rivett-Carnac

In 1962, President John F. Kennedy issued a collective challenge to the American people, to land a man on the moon within a decade. It was known as the decade of “the Moonshot”

THE DECADE OF THE EARTHSHOT

We believe we need a catalytic Earthshot challenge, which makes the seemingly impossible inevitable. A challenge to urgently encourage and scale solutions that can help put the world firmly on a trajectory towards a stable climate, where communities, oceans and biodiversity thrive in harmony by 2030.

SEARCH SELECT ACCELERATE AWARD AND SCALE

The Earthshot Prize doesn't hope to be everything to everyone. There are many of you, and others, doing incredible work influencing and shaping policy, funding the environmental movement, driving large scale R&D, mobilising voters, building new standards and rules, investing in new economic models, technologies, products, services, systems and more.

The Earthshot Prize is laser-focused on tipping two key levers that will impact the whole system. These are our strategic imperatives that shape everything we do.

SUPPORT ENVIRONMENTAL INNOVATORS AND SCALE THE IMPACT OF THEIR SOLUTIONS

We obsess about environmental innovation, and those who make it happen. Whether they're in a startup, company, government, a city or a not for profit, a foundation or movement. They're talented, determined and purpose driven. They're innovating, mobilizing, creating, building, and scaling solutions that are collectively tipping us towards a regenerative and repaired planet.

Innovation can happen anywhere and can take many forms. We look for innovation in all sectors – business, foundation, government, non-profit, hybrid, investor, activist, city, community, movement. We think anyone can be an innovator – and we welcome all. Innovation could be a process, a policy, a business model, a community model. It could be a technology-enabled solution, or a science-based solution. It could be behavioral changes that shift markets and mindsets.

We know, like every innovator, the eco-innovator will face hurdles and roadblocks. We are centered on delivering a unique, magical, and transformative nominee experience from start to finish that helps them overcome these challenges and accelerates the scaling of their impact. We will do that by leveraging our partnerships, our platform, our networks of capital, coaches, community, and influence. With the support of experts and organisations around the world, we are running a unique, global engine to Search, Select, Accelerate, Award and Scale breakthrough solutions that, if amplified, would significantly help repair the planet.

SPARK URGENT OPTIMISM AND ACTION THROUGH CULTURE-SHAPING STORYTELLING

Eco-innovators and their work give us a glimpse into a future of abundance, sustainable livelihoods, alternative narratives to today's extractive, depletive norms and offerings. By spotlighting eco-innovators and their solutions, we aim to spark the world's collective imagination, and drive a collective mindset of urgent optimism. When change is gasp-worthy, simple, powerful, delightful, tastes better, performs better, at the same price or less, creates sustainable livelihoods, and brings joy, then change doesn't need to be feared or blocked; it can be embraced and sped up.

It is easy to feel small, powerless, anxious. The stories of eco-innovators remind all of us that we do have agency and power to impact this decade, as individuals, as communities, as institutions.

Our mission is to become the world's most exciting environmental prize, catalysing global urgent optimism through our ability to story tell, engage, educate and entertain.

THE MISSION OF THE EARTHSHOT PRIZE

The Earthshot Prize supports environmental innovators with more than prize money. The Earthshot Prize provides successful nominees a platform to showcase their solutions, introductions to potential partners, and help with organisational capacity building (e.g., business planning, go-to-market strategy, talent planning, organisational design, fundraising).

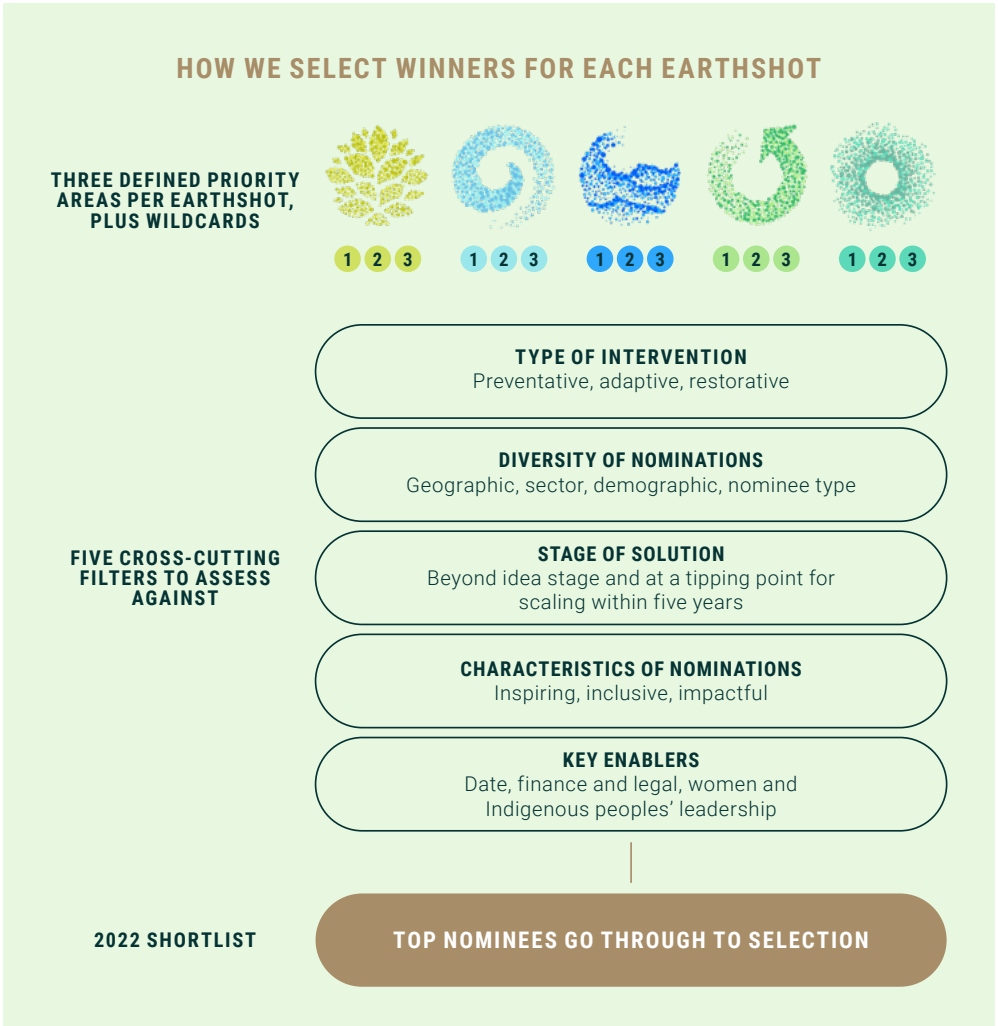
In 2022, we are building out a robust program of in-kind and material support for successful eco-innovators to benefit from, as well as building out tools to facilitate community building and the matchmaking of innovators to capital, talent, power, and advice.

When our Nominators put forwards eco-innovators and their solutions, this is what they can expect: a chance to have access to unprecedented support to scale their impact rapidly, and a chance to tell their story to the world.

OUR SELECTION THESIS

THE EARTHSHOT PRIZE

OUR SELECTION THESIS



This year, we are introducing "The Earthshot Prize 2022 Selection Thesis".

Akin to an investor's "Investment Thesis", our Selection Thesis represents our methodological strategy "to urgently spotlight and scale eco-innovations that can put the world firmly on a trajectory towards a stable climate, where communities, oceans and biodiversity thrive in harmony by 2030."

Our Selection Thesis defines our selection priorities for 2022 and provides transparency on our areas of particular interest and focus – and the rationale behind those priorities.

To craft these priorities, we have conducted research and analysis, and consulted widely with researchers, academics, institutions, experts and thought leaders. Based that work, we have identified priority areas of interest for each of the 5 Earthshots.

Leveraging insights from 2021, our theory of change and best practices in innovation management and systems change, we have outlined five common filters against which we will assess nominations and select our ultimate winners.

This document is a long-form paper outlining the science and thinking behind our Selection Thesis. This is a guide, and not a prescriptive and exhaustive set of criteria. Because the most disruptive innovation is often the one out on the edges of people's imaginations, we will consider nominations on any topic within any Earthshot.

We encourage 'wildcard' nominations and insights we haven't considered, particularly when those nominations have the potential to inspire people globally.

5 EARTHSHOTS
5 FILTERS
15 AREAS OF INTEREST

ROADMAP TO REGENERATION

EARTHSHOTS

THE
EARTHSHOT
PRIZE

5 EARTHSHOTS

PROTECT AND RESTORE NATURE

BY 2030, WE CHOOSE TO
Ensure that, for the first time in human history, the natural world is growing — not shrinking — on our planet

CLEAN OUR AIR

BY 2030, WE CHOOSE TO
Ensure that everyone in the world breathes clean, healthy air — at World Health Organisation standard or better

REVIVE OUR OCEANS

BY 2030, WE CHOOSE TO
Repair and preserve our oceans for future generations

BUILD A WASTE-FREE WORLD

BY 2030, WE CHOOSE TO
Build a world where nothing goes to waste, where the leftovers of one process become the raw materials of the next — just like they do in nature

FIX OUR CLIMATE

BY 2030, WE CHOOSE TO
Fix the world's climate by cutting out carbon: building a net-zero economy that lets every culture, community and country thrive

FILTER 1
TYPES OF INTERVENTION

WOTA BOX, Finalist 2021

We seek three types of intervention:

PREVENTION

The Earthshot Prize's foremost emphasis is prevention. We primarily seek innovations that can change the trajectory of the planet by providing an alternative to approaches that cause harm, for instance:

— Renewable energy instead of fossil fuels, like Enapter's AEM Electrolyser

— Protecting forests with payment for environmental services, like Costa Rica

— Supporting protected areas, like Pristine Seas

— Halting burning of agricultural waste, like Takachar

— Holding polluters to account and encouraging reduction through citizen participation, like the Blue Map App

RESTORATION

We recognise that the systems in place today may not be able to change immediately. In those circumstances, we want to make systems we use today better.

In this, we seek innovations that are regenerative or restorative:

— Restoring corals, like Coral Vita or encouraging widespread ecosystem restoration like Restor

ADAPTATION

We know that much damage is already done. We seek innovations that help us adapt quickly to minimise the impact, both on people and on the environment:

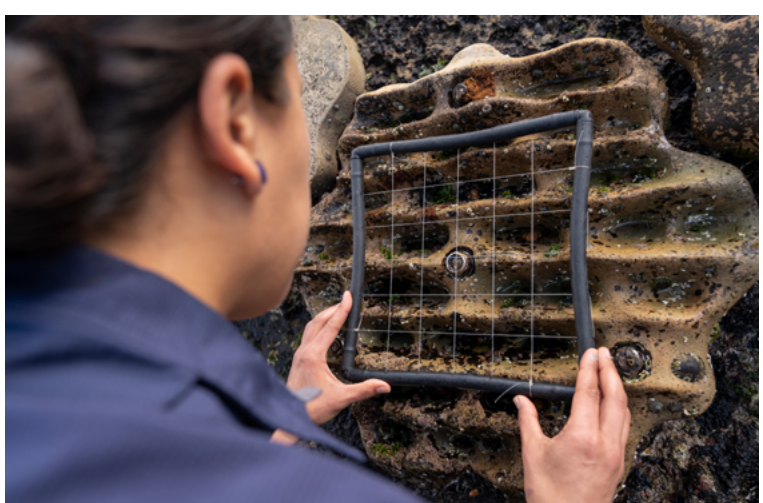
— Adapting man-made coastal defences into marine ecosystems like Living Seawalls

— Managing food waste through redistribution in the City of Milan

The Earthshot Prize recognises the important role adaptation can play and is seeking those innovations and solutions that take a systems-level approach.

While our selection process seeks nominations from all three categories, in 2022 we will put additional weighting on preventative solutions.

FILTER 2
DIVERSITY OF NOMINATIONS



We are agnostic to sector and nominee type. We consider solutions from any country or sector: for-profit, non-profit, hybrid, government, movement, or collaboration.

We do not prioritise any one type of nominee over another because it is by championing a diverse range of solutions that we identify new opportunities and connections, and demonstrate the collective action needed from all parts of society.

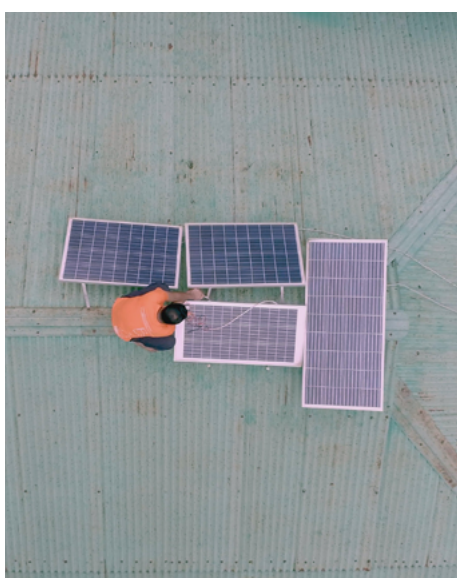
Last year our Finalists included a schoolgirl, a grassroots non-profit, tech-driven start-ups, global data monitoring systems, a city and country.

Diversity is our strength and will be a key consideration in our selection process to ensure our Finalists represent a diverse range of nominee types, sectors, geographies and demographics.

Vinisha Umashankar, Finalist 2021 (top right)
Republic of Costa Rica, Winner 2021 (bottom left)
Living Seawalls, Finalist 2021 (bottom right)

FILTER 3
THE STAGE OF INNOVATION

SOLbazaar, Finalist 2021



The Earthshot Prize focuses on solutions that can rapidly scale or be replicated with monetary, communications, network, and organisational support.

This means that solutions are well beyond the idea stage but may still have development requirements that must be addressed before they are ready to scale their impact. Conversely, solutions that have already entered growth stage and are limited only by capital will benefit less from The Earthshot Prize and are therefore less of a focus.

In practice, The Earthshot Prize is seeking solutions that:

— Are beyond the idea stage

— Have working prototypes or executed pilots that demonstrate the effectiveness of their solution

— Have tested their solution with the target users or recipients and received early positive impacts

— May already be in market with "customers" or audiences but to a limited scale

— Have line of sight to how the solution could be scaled

While it is difficult to forecast how quickly a new innovation can have meaningful impact, organisational momentum can often be a helpful indicator of how quickly an innovation can scale. The Earthshot Prize is looking for teams that have been able to make significant progress in the last year. What "breakthroughs", whether it be the solution or the organisation, demonstrate recent progress?

Examples of breakthroughs include:

— Creation/iteration of a functional prototype

— Launch of an in-market pilot program

— Close of a first customer/contract

— Successful fundraising

— Completion of major research trial

— Launch in new geography or sector

— Lobbying successfully for wider market changes

— Implementation of a new policy

The Earthshot Prize is looking for nominees that are ready for the support it can provide. This means they have a few fundamental building blocks in place for long-term success.

The most important of these building blocks is that a dedicated team or founder is in place that is committed to growth and scaling impact. This does not always mean a complete team, but there is a person or small team ready to execute the tasks required to bring their solution to the world. These people will bring deep knowledge of the challenge their solution addresses and how their solution results in positive environmental impact.

The Earthshot Prize is also seeking nominees that have the financial processes in place to track sources and uses of funds and conduct basic financial reporting. Ideally these processes would also include financial planning and budgeting to enable a disciplined use of resources.

While early-stage organisations often pivot their financial model, those nominations that have mapped out a model for generating the funding required for long-term viability will be prioritised.

FILTER 4
THE CHARACTERISTICS OF FINALIST SOLUTIONS

We will prioritise solutions that are:

— **INSPIRING**: spark the imagination with a powerful, simple, hopeful story so that people everywhere can feel part of the movement

— **INCLUSIVE**: build inclusion, equity, and benefits for people into the activities and impact of the solution

— **IMPACTFUL**: have proven impact, and when scaled or replicated they have potential to catalyse system change and significant global impact for one of our Earthshots by 2025

Sanergy, Finalist 2021 (top right)
Reeddi Capsules, Finalist 2021 (bottom left)
Blue Map App, Finalist 2021 (bottom right)

FILTER 5
ENABLERS AND WILDCARDS

We see four cross-cutting areas that are disrupting eco-innovations and unlocking new solutions across our five Earthshots.

We generally seek solutions where the current policy and regulatory frameworks are neutral or enabling. If, however, an idea is truly transformative yet limited by current policy, we will explore the feasibility of policy shifts in assessing the idea.

We will seek out and weight nominations that leverage one, some or all of the four enabling factors.

1. SOLUTIONS THAT LEVERAGE THE DISRUPTIVE FORCE OF WEB 3.0 AND DEMOCRATIZED DATA TECHNOLOGIES

We want to enable open access data systems. We want collective use of data tools to increase access, accountability, engagement, and systems change. We want to see and support transparent, democratised resource use, supply chains, rights, subsidies, and financial flows.

Provocation questions:

- Can supply chain transparency accelerate any of the Earthshots? Can we enable everyone to see where environmental impacts have been externalised, where payments have been made and by whom, how and where a product was made?
- How might emergent technologies such as NFT's and Blockchain radically unlock new solutions and financial models? How can DAO's (Decentralised Autonomous Organisations) enable new solutions?
- Can we build trust using democratised data systems by making compliance or certification information available? Can we accurately manage land rights and ownership, use patterns, and resource changes?
- Can we find ways to accelerate the use of smart data for carbon accounting without opening up unintended adverse consequences such as carbon hacking?
- What is the role of technology, EdTech and/or gaming in significantly nudging behavioral shifts?

Of our 2021 Finalists, Restor and Blue Map App are good examples of these approaches in action.

FILTER 5
ENABLERS AND WILDCARDS

2. SOLUTIONS THAT LEVERAGE NEW FINANCIAL AND LEGAL MECHANISMS

We want to enable consumers and investors to grow the value of environmental goods and services. We want stewards of the environment to be paid for their actions. We seek innovative examples of new financial and legal mechanisms that could trigger tipping points for entire new sustainable economic models.

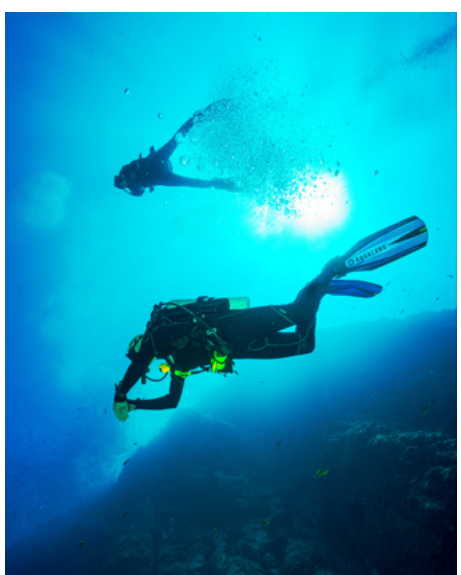
With the valuation of carbon, probably soon to be followed by biodiversity, it is now much easier for us to incentivise actions that regenerate the Earth. Wetlands, for example, now can have several revenue streams - not only tourism, but water purification, carbon sequestration and biodiversity enhancements. When we can monetize this, banks and individuals can invest and insurers can require this, knowing that there can be a return from the good management of a habitat.

New kinds of businesses are growing around the world. From listing forests on the stock exchanges as companies to invest in, to applying private equity finance to community environmental projects previously funded by charitable donations.

This requires equitable design and structuring. In much of the world, farmers, fisherfolk, and foresters are those who might need to sell an environmental resource to meet immediate cash needs, say cutting down a rainforest tree or selling a shark. What if their cash needs could be met by paying them to restore or regenerate nature? What if their intimate knowledge of the resource, combined with relevant technical assistance, served to help protect it? What if they could become a citizen scientist helping track progress? What if such efforts engaged multiple layers of the system, creating aligned incentives to the goal of protecting the Earth?

2021 Nature winner Costa Rica and Climate Finalist SOLbazaar are good examples where citizens receive financial benefit for engaging in solutions, whether that is as protectors of ecosystem services or sellers of excess solar power.

FILTER 5
ENABLERS AND WILDCARDS



Our legal systems have been developed to protect individual property and finance – maintenance of it, investment, disposal. But in today's world, we need legal mechanisms that act collectively to bear the costs of global change that benefit all. How can this be done? Similarly, we need to explore the rights of future generations and the rights of nature. How can the legal system help us value the Earth today?

We are aware of the scale of these challenges – and the potential pitfalls. We believe a new measure of GDP is needed to measure carbon impact, biodiversity, equity, and wellbeing, alongside money. Without this we risk never knowing the true value of the impact we have – and we welcome innovation in this area.

We know the efforts we galvanise need to be fast, transformative, collective, and far reaching. It is not an option for us to get better at environmental protection in one continent only to push environmental harm onto another.

We understand that polices and regulations are partners to our efforts, undergirding and enabling much of what we do.

3. SOLUTIONS LED AND INFORMED BY WOMEN AND INDIGENOUS PEOPLES' VOICES

We see deep sources of innovation and transformation from centering women and indigenous peoples as leaders in regenerative solutions and systems. We want to encourage and support solutions led by women and Indigenous people. We will prioritize teams that demonstrate inclusivity and representation and that put equitable sustainable livelihoods and community empowerment at the heart of their solutions. Around the world, we now know that indigenous peoples are exemplary stewards of our planet. They produce less waste, generate fewer climate impacts and air pollution, and nurture our oceans and natural land better than incumbent governments (FAO and FILAC, 2021). But they have few rights and little power in comparison to state apparatuses.

We believe there is a significant opportunity in increasing the power of indigenous people and the Prize aims to showcase their leadership by looking for indigenous-led solutions as well as encouraging solutions that include and benefit Indigenous communities, such as our Nature winner in 2021, Costa Rica. We believe that innovation is not always about new technology but can revitalise and amplify Indigenous wisdom and practices for our planet.

4. WILDCARDS

Magical, boundary-pushing ideas. You know it when you see it. Always look for the edges. Embrace divergence and peripheral vision. We don't know what we don't know. If it doesn't fit, perhaps the frame is wrong. Don't hesitate to nominate that disruptive genius one-in-a-million idea.

MAGICAL
DISRUPTIVE
WILDCARD
SOLUTIONS

ROADMAP TO REGENERATION

THE EARTHSHOTS

AREAS OF INTEREST

THE EARTHSHOT PRIZE

THE EARTHSHOTS: AREAS OF INTEREST

Each Earthshot has Priority areas of interest.

Areas of interest are prioritised based on 2 key questions we posed to the diverse community of experts, researchers, thought leaders and practitioners around the world:

A. WHAT AREAS OF INTEREST ARE AT, OR CLOSE TO, A TIPPING POINT FOR SCALE?

We are prioritizing areas of interest that are at (or close to) a positive inflection point, and that with the right intervention or support, could be tipped into mainstream adoption and scale within the next 3-5 years.

We have engaged with experts, assessed research, and have mapped which areas of interest are early stage, emergent, at or near inflection point, saturated and mature, and what is required to move to the next stage. Multiple factors enable or disable an innovation going mainstream.

The kinds of questions we asked

— Is there a viable functioning technology, process, program, or science enabling this area of interest?

— Does regulation hinder or help in the scaling of this area of interest?

— Is capital available and flowing to this area of interest?

— Has there been a new disruption that is favourable or unfavourable?

— Are citizens, consumers, employees adopting and driving progress in this area?

— Is the market for this a white space, or conversely, is it overly crowded and mature?

— Could solutions shift markets and models, if repeated or scaled?

B. WHERE CAN WE HAVE THE GREATEST IMPACT IN THE SHORTEST AMOUNT OF TIME?

We expect our portfolio of Finalists to be heavily weighted towards solutions that are at a meaningful proof of concept, with line of sight to rapid, significant impact in the next 3-5 years if scaled or replicated.

We expect a smaller part of our portfolio of Finalists to represent solutions that may take a longer time to scale for external reasons (policy frameworks, technology development, financial frameworks etc.). This is deemed essential by our experts to help accelerate now by raising the profile and urgency of their work at a global level.

We define 'impact' based on two proxy indicators: metric tons of carbon and number of sustainable livelihoods created.

We seek innovations that have the potential to generate 'impact' which is meaningful at a global scale. The path to impact on a global scale could take many forms. It might mean that an innovation or solution is applicable and transferable to additional geographies or industry sectors. It could also mean that the solution has the potential to fully address a large problem – such as industrial air pollution in China or deforestation in the Amazon – which would have global benefits if solved. Regardless of the pathway, solutions that can be relevant to global populations are prioritised over those that address local or regional issues only.

Another indicator of impact potential is an innovation or solution's ability to drive systems-level change. Whether through partnerships or the architecture of the solution itself, The Earthshot Prize is looking for innovations that consider root causes and/or adjacent barriers to change that impede large sustainable impact. We want to see solutions that address those impediments.

ROADMAP TO REGENERATION

THE WORLD WE CHOOSE

THE EARTHSHOT PRIZE

Change comes in many forms.

It can happen so seamlessly, it's only when you look back that you realize how different your life has become. Do you remember a time when you didn't use a cellphone?

Other times, change happens so gradually, it's only in hindsight that you realise you were living a seismic shift. Forty years ago, solar panels were rare, today they're everywhere.

Other times, change happens abruptly, changing our lives 'overnight'. These last few years, we have all experienced and witnessed exponentially disruptive change. Overnight, COVID changed all our lives, upended the global economy, and galvanising a race against time in science and innovation. It's impacted every aspect of our world, reshaping how we think in the future about work, mental health, nation states, travel, business, community.

Much of the time, change happens to us. That can be unsettling, even frightening. When we get it right, change is something we've embraced, orchestrated, yearned for. Then it feels thrilling, purposeful. Think of the times when you've set your mind on something. Do you remember that pull? Do you remember how much you wanted it? When we have a sense of agency and we can visualise the change we want, we can prepare for it, embrace it, hurry it along.

We choose a to run towards a future that is filled with abundance and possibility for all. We choose to be architects of a just, sustainable world. We choose that vision of a future because it's better, but also because the alternative is too destructive, devastating and frightening to contemplate.

The Earthshot Prize seeks out eco-innovators with solutions that could help light up our path to the future we choose and to changes that will feel seamless, joyful, delightful. Better for us all, and better for the planet. A sustainable just world will come with changes for each of us. Those changes will affect our lives directly, impacting the food we eat, the way we travel, the houses we live in, the jobs we do, the way we define joy.

The solutions we seek will reshape all our future reality if they go to scale. Not in a far distant future, but within this decade. Imagine this within the decade:

We choose to ensure that, for the first time in human history, the natural world is growing – not shrinking – on our planet.

Cities and forests cohabit instead of competing. Corridors of biodiversity become assets to a region, stimulating sustainable livelihoods and conservation. By 2030 the financial equation has been turned on its head. It is now more lucrative to protect the forests than to cut them down. Indigenous people and generational wisdom is brought to the fore, guiding the world on how to reset our relationship with nature. Green space, rich in biodiversity, will be within reach wherever we live. Every city building will have a roof garden or walls trailing with greenery. We will be able to experience nature with all our senses without travelling far from our front doors.

By 2030 we choose to ensure that everyone in the world breathes clean, healthy air – at World Health Organization standard or better.

We imagine a world in which no child dies from air pollution related illness. We imagine blue skies over Delhi. We imagine low-cost renewable energy in communities: powering our transport, heating our homes, cooking our food. We imagine a world where the air wherever we live is as fresh and invigorating as it is in forests or mountains. Clean air will once again become an expectation, not a privilege. But we will never again take it for granted.

We choose to repair and preserve our oceans for future generations.

Clean, healthy oceans, replete with life will be an exponential force against climate change, and a source of livelihoods and food for us all. We want to dive in vibrant coral reefs filled with marine life. We want to see whales migrating, and turtles nesting. We want to see revitalised coasts that protect communities, and mangrove swamps teeming with life. We never again want to see plastic waste islands or oil spills. We want teeming schools of fish swimming through fields of kelp, grasses and algae to create abundance for those who rely on the oceans for their livelihoods and sustenance.

We choose to build a world where nothing goes to waste, where the leftovers of one process become the raw materials of the next – just like they do in nature.

We're thrilled by the potential of a zero-waste world. Just imagine it – like nature, where nothing is wasted. We're excited to watch entire industries transform as they realise that waste is an asset, and that one person's waste is another person's gold. We're excited to see food poverty being eradicated as food waste is repurposed and low cost, low tech cold storage systems innovated. Imagine a fashion show in 2030: reclaimed, reused, vintage, leased, or circular – designed for reuse. We see waves of new materials going mainstream – mushroom leather, biodegradable fabrics. Successful designers of the future will be eco-innovators. Imagine a time when resources feel more equitably plentiful, rather than excessive in some places and scarce in others. Everything will have a value beyond its form or function, its value will be in the story of its origins and its next life.

We choose to fix the world's climate by cutting out carbon: building a carbon-neutral economy that lets every culture, community and country thrive.

For all the complexity of getting to Net Zero Carbon, some changes are powerfully simple and within our reach. By 2030 we expect all of us will be eating more seasonal, plant-based foods, not feeling that this a sacrifice, because it is affordable, nutritious, plentiful and best of all: it tastes delicious. Meat and dairy will become a part of the solution as farmers transform their practices, funded by a new mindset around the role of insurance and financing models, leveraging science, data and Indigenous wisdom. We'll live in net-zero buildings, with plants greening the walls, solar panels on the roofs and community gardens below. All our transport - car, moped, public transport - will be fueled by renewable energy. Cities will be retrofitted to bring nature, walking, and biking to the forefront. When we walk to work, we see wildlife not smog, hear the noise of birds chattering not fossil fuel traffic.

For each Earthshot, we explain the current state of the Earthshot, the drivers of change and projections of future conditions. We then expand on three to five areas in each that we think are most suitable for Earthshot to back this year.

These areas are highlighted in terms of whether they are largely preventative, restorative, or adaptive, and we have also outlined where impact is likely within five, ten or twenty years.

Throughout, we ask provocation questions, seeking to stimulate ideas, and to tease out solutions that might go un-noticed.

This is a guide, and not a prescriptive and exhaustive set of criteria. We would love to see nominations from these priority areas, but will consider nominations on any topic within any Earthshot. We encourage 'wildcard' nominations and insights we haven't yet considered, particularly when those nominations have the potential to inspire people globally.

THESE ARE NOT DREAMS
THEY'RE A ROADMAP
TO THE FUTURE
THEY'RE WITHIN OUR REACH

LET'S RUN TOWARDS
THESE EARTHSHOTS
THE FUTURE IS A CHOICE
IF WE MAKE IT SO

THE 15 AREAS OF INTEREST

THE EARTHSHOT PRIZE

PROTECT AND RESTORE NATURE

1. Paying environmental stewards and improving land rights
2. Using agricultural commodity markets as a lever to reduce harm to tropical forests
3. Increasing yields in biodiverse, regenerative agriculture

CLEAN OUR AIR

1 Engaging citizens in data collection and advocacy

2 Stopping the burning of agriculture and forests

3 Addressing personal transportation

REVIVE OUR OCEANS

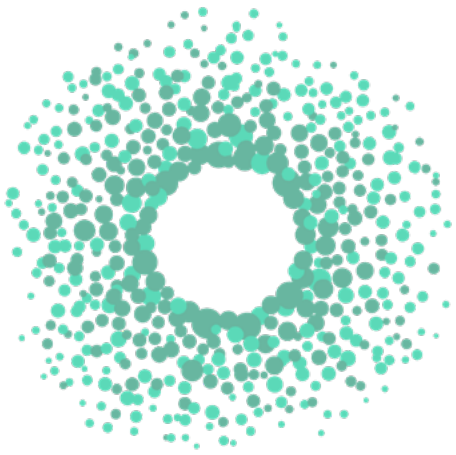
1 Reducing and addressing overfishing

2 Developing ocean ecosystem services that mitigate climate change: ‘blue carbon’

3 Advancing climate change solutions with ocean benefits

BUILD A WASTE-FREE WORLD

1. Preventing the excessive use of resources
2. Extending the use of goods (particularly food, clothes, plastics)
3. Better managing waste once it has been generated



FIX OUR CLIMATE

1 Transitioning to renewable energy

2 Reducing methane emissions

3 Constructing buildings fit for the future

ROADMAP TO REGENERATION

PROTECT AND RESTORE NATURE

THE EARTHSHOT PRIZE

PROTECT AND RESTORE NATURE

Tropical forests, peatlands, wetlands, boreal and other forests around the world harbour most of the world's terrestrial biodiversity today, with tropical moist forests holding half of earth's species richness in under 7% of its land (FAO, 2018). But between 2005 and 2013, we cut down 5.5 million hectares of forest annually of tropical forests (Pendrill et al., 2019). We upended magnificent stands of Asian dipterocarps and stilt-rooted peat forests and replaced them with mono-cropped, chemically laden plantations. We felled magnolias in the Amazon in favour of soy and beef farming, largely for export to Europe and the USA. We have cleared ebonies in central African forests for subsistence farming and cacao. More than 70% of tropical deforestation was caused by commercial agriculture and over 20% was caused by subsistence agriculture between 2005 and 2013.

When we clear habitats, we don't just lose the helmeted hornbills' slow swoosh of wings, the gibbons' dawn song, the chimpanzees buttress-thumping, and the howlers' ruckus. It turns out, we lose ourselves when we lose our forests. Carbon sequestration turns backwards, and the forest emits more than it absorbs (Gatti et al., 2021).

Areas lose their biodiversity and those living in them lose their language to describe the forest (Gorenflo et al., 2012). Chemicals, mechanisms of communication, vast systems of nutrient sharing and collective management of resources are lost to us too, just when we need to learn how to emulate them (Simard, 2018).

Luckily, we know what works to reduce deforestation and save biodiverse regions – and we also know what does not. Designating forests as protected areas works, though their effectiveness in doing so is mediated by strength of governance, land-tenure policies, monitoring, alternative income streams for agri- or forestry businesses, subsistence farmers, and even government officials who benefit from their sale (WRI 2021b). We know that consumer and investor pressure for deforestation-free commodities has made some impact on the behaviour of producers and buyers of palm oil and soy. And we've seen success at lessening forest conversion rates at micro levels when subsistence farmers have alternative income streams (WWF, 2021).

‘WE HAVE SEEN DIRE CONSEQUENCES WHEN GOVERNMENT LEADERS DO NOT CARE AND FOREST CLEARING SUDDENLY INCREASES’

The challenge with many of these approaches is that they rest on visionary government or business leaders who not only want to see the forest conserved but hold their governments or teams to account in doing so. We have seen dire consequences when government leaders do not care and forest clearing suddenly increases, as permits are given for land conversion and protection measures are abandoned.

Difficulty monitoring how the forest is being transformed or used has resulted in surprises such as recent revelations of palm oil in protected areas (Greenpeace, 2021) or companies admitting they don’t really know what is in their supply chain. We cannot assume all will be well if we convince companies to act differently – there is always the next buyer or trader who will come in, unconcerned about deforestation-free commodities in their market. There is the fundamental issue of money. Who will make the money when a tree stands in the ground or is felled? For a smallholder farmer in need of a little cash to pay medical bills, cutting a tree or tending a palm makes sense. For a businessperson, clearing forest to raise cattle makes more money than leaving the forest standing, and the act of clearing itself might allow them to claim the land and so de-risk growing a herd. Neither bears the cost of the lost biodiversity nor the increased carbon, but they might bear the lost opportunity cost.

Our priorities for 2022 are:

- **Paying environmental stewards and improving land rights** (preventative and restorative)
- **Using agricultural commodity markets as a lever to reduce harm to tropical forests** (preventative)
- **Increasing yields in biodiverse, regenerative agriculture** (preventative and restorative)

1. PAYING ENVIRONMENTAL STEWARDS AND IMPROVING LAND RIGHTS

Innovation and progress on both fronts are essential to enable resources to be managed well. We believe that protecting tropical rainforests, temperate and boreal peat forests and tropical wetlands in these ways is critical over the next five years.

This is important at the level of national governments incentivising their protection of natural ecosystems.

Many major financial institutions, mostly out of Europe and the US, though global in reach, recently have committed to direct over $10 trillion in investments away from those that harm biodiversity (e.g., Finance for Biodiversity, 2021). Pushed by analysis showing that around half the world’s economic output is moderately or highly dependent upon nature (Swiss Re, 2020), efforts launched this year will increase transparency of investment impacts on nature (TFND, 2021).

But there are many challenges – Brazil’s government refusing to deliver on commitments to maintain the Amazon and the recent expulsion of one government’s attempts to pay other governments for environmental services. Whose choice is it and whose interest is at stake? Who has the rights to the oxygen produced, biodiversity enhanced, or carbon sequestered? How would we pay governments in ways that can work? If industrialised nations caused the most greenhouse gas emissions, do they have a say in how tropical forest-rich nations use their resources?

‘CREATIVE MINDS ARE NEEDED TO PROGRESS’

Republic of Costa Rica, Winner 2021

Much of this is being discussed under the Convention on Biological Diversity and was also raised at COP26.

We believe many creative minds are needed to progress this effort, especially from the legal and financial sectors.

Around the world, we now know that indigenous peoples have managed tropical forests and other ecosystems better than incumbent governments (FAO and FILAC, 2021). But they have few rights and little power in comparison to state apparatuses, and it has only been in recent years that consideration of their knowledge has been included in land use planning (e.g., fire suppression in Klamath used by US Fish and Wildlife) (Oregon State University, 2020).

There is new evidence that diversity of languages is tied to biodiversity levels, and the speakers of those languages know ways in which those plants can be used for medicinal and food purposes. Many major medicines are derived from plants and finding them has often been linked to local knowledge of plant uses (WHO, 2019).

There are creative efforts underway to finance nature by categorising a defined physical area, say a particular forest, as an asset class and to allow investors to invest in it through stock exchanges. The first one, a natural asset company, was announced mid-2021 on the New York Stock Exchange (Fortune, 2021). By bringing more oversight, interested parties, and clear logics for return on investment, the effort is expected to better provide income as well as environmental benefits. There may be other inventive approaches to protecting ecosystems using finances, legal systems and data technologies.

We are open to them all and know that many ideas need to be brought to the table to reach the goal set out by some to protect half of the world’s nature (High Ambition Coalition, 2021).

Restor, Finalist 2021

‘WE THINK THERE IS SIGNIFICANT OPPORTUNITY OVER THE NEXT FIVE YEARS TO CHANGE THE DYNAMIC OF THE COMMODITY MARKET THROUGH NEW PRODUCT OFFERINGS’

Provocation questions:

— What solutions find novel ways of extending the return of value so that people are incentivised to keep the trees in the ground?

— What solutions deliver innovative financing modalities, novel and more secure legal structures, and advanced monitoring and democratisation of the data?

— What innovations are seeking to hold businesses and governments accountable for true costs, including to young generations?

— What solutions increase the power and mandate of Indigenous people in managing natural places as part of national planning and as part of Nationally Determined Contributions (NDCs)? What solutions are strengthening the primacy of Indigenous peoples’ land rights through legal processes and through direct payment?

— What solutions unlock ways to pay Indigenous people and those living around national parks directly for their efforts to protect the forests?

2. USING AGRICULTURAL COMMODITY MARKETS AS A LEVER TO REDUCE HARM TO TROPICAL FORESTS

Market concentration in commodities is high, both in the oilseeds sector and in soy – both of which are among the five largest drivers of tropical deforestation. It is estimated that 40% of palm oil is produced by smallholders, typically with complex land and tree use and access rights, conflated by crop and tree mortgaging run by local traders, and connections to global business that belies the small-scale nature of the operations (Greenpeace Indonesia, 2021).

A potentially game changing approach is to revolutionise land rights systems globally through blockchain certifications and invoicing for smallholders, starting in areas of dense tropical rain and peat forests. Without land rights, smallholders are uncertain of the income or produce they will gain from a season of planting, tending, and harvesting. Without this certainty, they will naturally seek opportunities that will give them cash in order to buy day-to-day necessities for their family – food, education, healthcare, housing, transportation. Typically, rights of resource use are exceptionally difficult for the smallholders to gain, not because it is not their right, but because the right is written in an obscure regulatory document perhaps even in another language and certainly in a far-away office that they can’t get to. We believe if there were a way to democratise the access to that information using smart phones to GPS and visually document locations, to connect to databases showing land rights, and to connect this with payment for environmental services, then the smallholders that would ordinarily plant or cut, could be paid instead – directly and with surety – for keeping trees in the ground.

This idea is applicable in many settings: coastal fishing communities, coconut growers and mangrove planters, indigenous tribes. We believe this model could galvanise the insurance and the offsetting industry: if insurers worried about investments in countries dependent upon natural resources, they might offer lower rates to those that have more payment for environmental services.

‘TRANSITIONS IN AGRICULTURE RELY UPON THE KEY CONCEPT OF DE-RISKING AND OF KNOWING WHEN YOUR RETURN WILL COME’

Likewise for offsetting. Right now, offsetting schemes abound. Over the next five years, we need standardisation to this process, an agreed valuation, and a way to include people who are at the coalface to be paid for their actions in offsetting.

We think there is significant opportunity over the next five years to change the dynamic of the commodity market through new product offerings - ones that might be cheaper or have better characteristics than palm oil and soy, in particular. This could shift demand away from those commodities and therefore lessen pressure on the rainforest. As our 2021 Waste-Free Finalist, Sanergy, demonstrates, using insect-based feed for poultry, pigs, and aquaculture presents enormous promise at reducing the demand for soy, one of the largest contributors to deforestation.

The promise is both for smallholder farmers as well as commercial farming. This, in combination with policies that would enable fast growth, and voluntary and formal regulations that would create moratoria on soy expansion, has been effective in Brazil. As Asian demand grows, the players involved in sourcing commodities will diversify and may not agree to moratoria. Therefore, building in competitive products and constraining voluntary and formal policies will help.

Transitions in agriculture rely upon the key concept of de-risking and of knowing when your return will come. Beet farmers in Oregon and Washington state transitioned to organic because their crop insurers provided extra coverage to do so. When combined with the expected higher price of organic beets, the growing market for it, and the technical assistance provided by the crop insurers, the farmers were able to take this on. The benefits of water management, biodiversity enhancement, and carbon management weren’t even accounted for, but in the future, as payment for environmental services becomes more nuanced, this will be the case.

This approach is applicable right through to the large asset management banks that focus on the food, agriculture and forestry sectors. Even privately owned companies need capital. With clear recognition from the likes of Standard and Poors (2021) and SwissRe (2020), we know that both assessors of financial risk and insurers are concerned about biodiversity losses.

We know that historically consumers in importing countries have been influential in changing agricultural production dynamics. Take the example of Max Havelaar and coffee in the Dutch East Indies (Multatuli, 1860). When the Dutch read the book, they were horrified at the conditions imposed on labor by the colonial officer in what is now Indonesia.

It caused sufficient unease that the government created the world’s first Ethical Policy in 1901.

Generation Z in particular is horrified by the conditions of the environment globally. What pressures can they successfully put on companies with their buying power? Recent analysis shows that of total deforestation caused by certain nations, 90% was ‘imported’ through purchases of commodities and products. The UK, Germany, France, Italy and Japan imported more than 90% of their national deforestation footprints and 46-57% of that was from tropical forests (Huang and Kanimoto, 2021).

Provocation questions:

— What new product offerings could disrupt the incumbent markets?

— What solutions are pioneering true costing mechanisms that asset management banks would use? What solutions are holding asset banks to their commitments to protecting biodiversity, to galvanise investor sentiment, and to shape consumer spending over the next five to ten years?

— What solutions exist that make it harder for the world's largest agriculture companies to keep discounting nature? For example through data, the revamping of subsidies, and development of insurance measures

— What solutions use data and finance to pivot the role of farm insurance companies, to help revolutionise how small and large-scale farming develops?

— What solutions leverage new technologies to trace provenance of foods and data systems, delivering open-source information on land use?

— What innovations are emerging in the form of microbial-based tracing technology, data platforms, or consumer-targeted campaigns?

3. INCREASING YIELDS IN BIODIVERSE, REGENERATIVE AGRICULTURE

Increasing the yield per hectare of biodiverse, regenerative agriculture for smallholder and large-scale farmers has potential to reduce pressure on forests over the next five to ten years. Improvements in agriculture globally have been underway for decades and there is a plethora of research on improving crop yields, agroforestry, and storage that is essential, but hasn't yet reached the kind of scale we need (FAO, 2020b). We think there are opportunities to greatly expand innovative ways to use new data, technology and finance tools in support of small-scale farmers, women and other farmers who typically have less access and control over resources necessary to secure returns to farming (Agarwal, 1995).

Providing market prices in different locations helps farmers know when and where to sell to get the best price.

‘THERE ARE NEW BUSINESS MODELS POSSIBLE’

Pole Pole Foundation, Finalist 2021

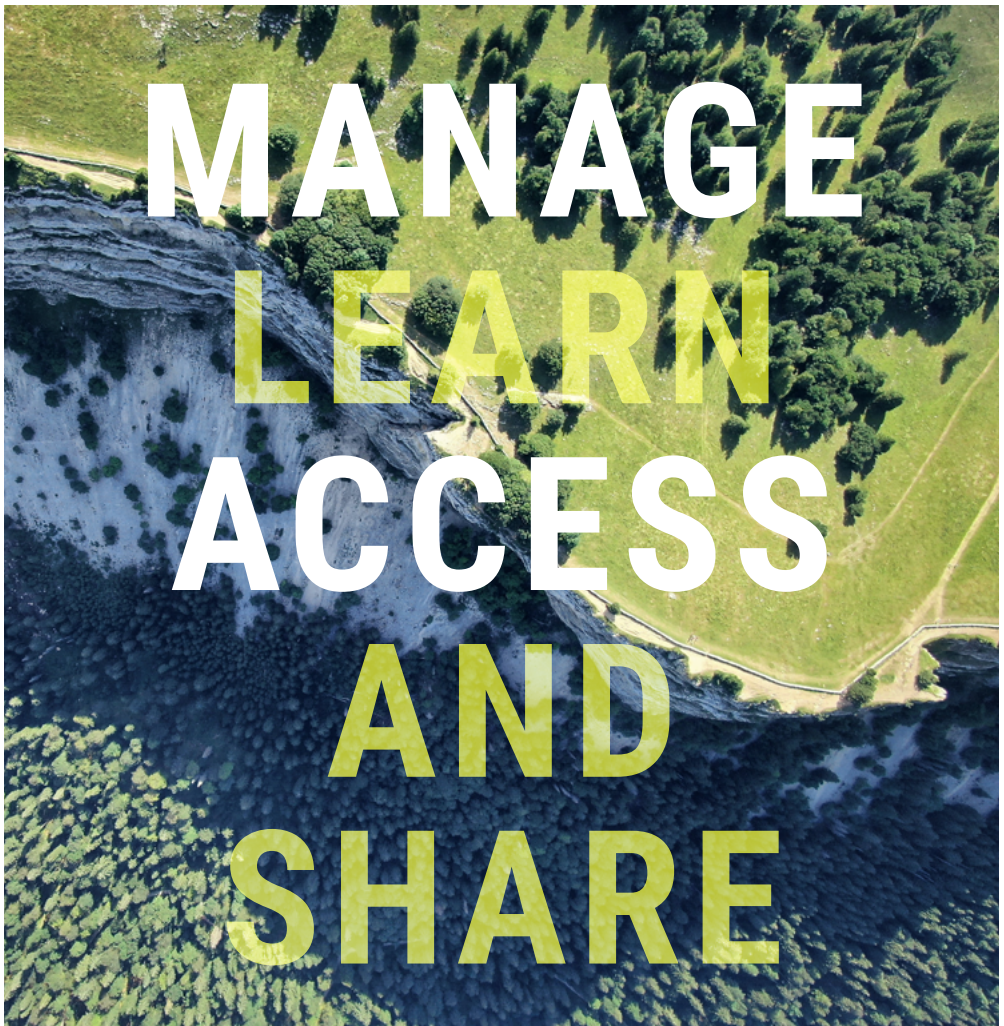
Accessing locally specific weather forecasts helps farmers know when to harvest or sow to get good yield. Training on smartphones on using different planting techniques or pre-planting seed treatment boosts productivity. Rotation planting, understory intercropping, and water management all can increase nutrient uptake while improving biodiversity levels (see John Ines Center, University of California at Davis, among many others). This could feasibly show impacts within five years.

There is tremendous digital potential when it comes to scaling effective practices. These techniques can all be shared online. Pest management and identification can be done remotely using camera functions (e.g., GrowAsia/WEF). Carbon sequestration can be calculated on phones and information uploaded to trustless data systems (see IndigoAg). Labour availability, especially for peak events like harvest, can be located, planned in, trained in advance on, say, technique or treatment of the crop, and they can also be paid using tech too, all of which are extremely impactful to farmers in ensuring their seasons or year’s investment in the crop does not go to waste.

Advanced credit – crop mortgaging – can be done using fintech and crop insurance too. Blockchain can revolutionize one of the largest challenges in smallholder agriculture and for women farmers in particular: land or tree use, access, and control rights (Fortmann et al., 1997; Peluso, 1995).

By documenting land titles, transfer access and use rights, transgression of commons management, invoices for payment, visas for migrant labour and so on, many of the supply and demand issues at the field level can be smoothed. Today, the ubiquity of smartphones and Wi-Fi even in remote places makes this possible.

We think there are new business models possible, although some policy or regulatory support may be needed. Certainly, helping farmers manage their land is important, but it will become critical as climate heating and extreme weather continue and crop ecology, pollinator behaviour, water availability, and other input factors change.



Almost half of food losses in low-industrialised countries are caused by storage failures due to fungal spread, dampness, or pest infestation (FAO, 2019). Innovations here are critically needed in the next five years. We imagine that the combination of knowledge of farmers on the ground with technologists could develop effective businesses.

We are certain that many of these actions can have profound impact on smallholder agriculture. Much of the knowledge is already available. What is missing is the ability for farmers to manage, learn, access and share what they need in order to get the best out of their efforts and their land.

Provocation questions:

— What solutions are supporting farmers to invest – even small amounts – in tech, data and finance services?

— What solutions are delivering climate- and pest-resilient varietals for orphan crops, such as millet and yam, staples within Africa and in some parts of Asia?

— What innovations in storage management and facilities are cheap and readily available? Would termite mound architecture or electricity-free clay cooling 'refrigerators' inspire new designs?

— Can simple technologies – humidity or chemical monitors – determine if a mite, pathogen, or pest has infected part of a store?

— Are there data tech or other technologies that can help farmers share storage facilities while being certain that their crop will not be lost among the others?

— There are current innovations to maintain bee populations in the US and Israel that use 20 different data points collected within the hive and when they indicate a problem, the beekeeper is notified and comes and treats the hive before total loss has occurred. Can this kind of sensor and communication technology be used with grain storage in sub-Saharan Africa?

ROADMAP TO REGENERATION

CLEAN OUR AIR

THE EARTHSHOT PRIZE

CLEAN OUR AIR

Air pollution is deadly, killing more people annually than malaria, TB, and HIV combined. Aside from individual harm, it is a heavy burden to national economies too from work stoppages and health care costs. The UK spent £1.6 billion annually and India 3% of its GDP on the impacts of unclean air (Dalberg et al., 2021, CBI Economics 2020). It is also widespread, with nine in ten people globally breathing polluted air (WHO, 2018).

Our response to air pollution has been uneven and inequitable. People living in poverty and communities of colour are significantly less likely to be able to avoid pollution day-to-day and more likely to be affected by unhealthy air than others (American Lung Association, 2020). The drivers are known – primarily burning fossil fuels for agriculture, transportation, industry, heating and cooking (OECD/IAE, 2016). Our understanding and legislation of the impacts have advanced quickly in recent years (e.g., WHO, 2021).

Three characteristics of unhealthy air guide us as we identify areas for scaling impactful innovations:

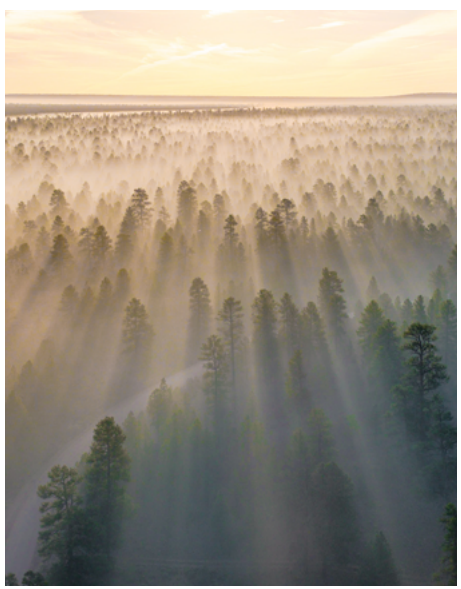
— The impacts of air quality are unequally experienced across economic lines
— Air is a global commons, within which it is extremely hard today to apportion responsibility for pollution
— The impacts are mostly felt in urban areas

Together, these elements lead us to believe that engagement by urban residents in addressing the drivers and impacts of air pollution will create change, especially when in collaboration with governments.

If we look at the recent past, successful approaches in cities globally have included:

— Legislative reforms controlling creation of pollutants such as banning coal burning or nitrous oxide production
— Citizen participation and engagement
— Wide-scale data collection and transparency
— Technological dispersion
— City planning changes such as moving industrial zones away from cities (Breathe London)

‘THERE ARE MANY INNOVATIONS THAT CAN DELIVER AIR QUALITY IMPROVEMENT AT SCALE QUICKLY’



In countries that have enacted clean air policies, legislation and investment, deaths attributable to air pollution have fallen by 30% on aggregate between 1990 and 2019 (Clean Air Fund, 2021). Whatever is done to improve air quality, it will almost certainly align with actions to address climate change. For example, switching to renewables especially for personal transportation and reducing methane production are climate-related efforts and have disproportionate impacts on air quality too (UNEP, 2019). One differentiator, however, is that people feel an immediate connection to air pollution because they experience what it is like to breathe it in.

There are many innovations that can deliver air quality improvement at scale quickly.

Complementing national and regional government legislation, policies, and regulation towards achieving WHO guidelines, we seek innovations that galvanize investment in public transport, walking and cycling opportunities, electric vehicle use including charging infrastructure and scrappage schemes, and renewable energy heating connections.

We believe that efforts that stimulate the creation of good regulatory environments will be critical game changers.

Many of those relate already to our Fix our Climate priorities.

Our priorities for 2022 are:

- **Engaging citizens in data collection and advocacy** (preventative and adaptive)
- **Stopping burning in agriculture and forests** (preventative)
- **Addressing personalised transportation** (preventative)

1. ENGAGING CITIZENS IN DATA COLLECTION AND ADVOCACY

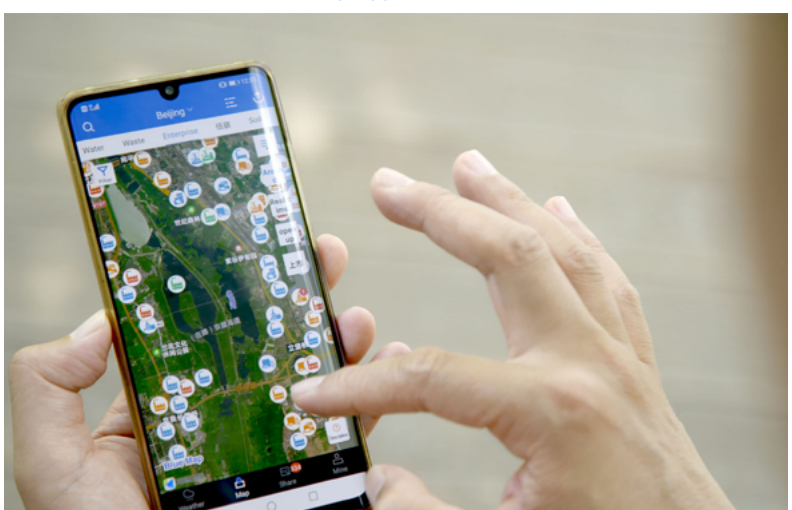
We believe citizens can play a key role in educating us, and in pushing governments and corporations to act. It is true that successfully addressing climate will improve air quality. Conversely, we believe that engaging people in improving air quality will effectively galvanize them to act on climate change because it brings home the connection with our collective health.

Air pollution presents actionable solutions to be taken, immediate impacts to be seen, and may provide an easier way for governments to commit funds and execute plans that are aimed at the quality of air but also address climate change. With this in mind, we think that air quality is a galvanising axis around which city dwellers, particularly in fast-growing cities in economies in transition, can mobilize. We already have wonderful proof points of children as air quality scientists, carrying mobile monitors around with them, encouraging their parents to make different choices in cooking fuels, and sharing data with communities where they live, as well as with city governments, to push for change.

Hospitals, medical teams, employment departments, and schools could broaden the data, catalyse wider awareness, and ultimately enable the city government to act with more certainty of impact. To build such campaigns, people need to generate data, make it available, and analyse it. Many cities around the world that suffer poor air quality have few air quality monitors, even fewer in areas of economic deprivation.

‘SOLUTIONS THAT EFFECTIVELY USE DATA’

Blue Map App, Finalist 2021



The sad truth is that many citizen scientists are vilified or attacked for bringing data to light. We believe that creating unquestionably good data at the hands of many, makes it much harder to attack individuals. How can we effectively address this issue collectively through technology over the next five years?

We encourage solutions that effectively use data to increase accountability by polluters. This is currently done to great success in China by 2021 Finalist Blue Map App. Despite this, in most of the world, most air quality problems are created by a polluter or polluters, but the externalities of clean-up, the health and climate impacts, are not paid for by that polluter. Even events with clear liability take years for legal cases to be resolved and payments to be made. Bhopal was one of the worst examples in history where the poorest suffered most, activists were hunted down, and reparations took years (Broughton, 2005).

Provocation questions:

— What innovations exist in data systems that track sources of air pollution?

— What new mechanisms for citizen engagement can we develop?

Are there opportunities for citizens to log health impacts, mitigating activities they have been involved with, and any costs, and for these to be linked to machine learning that can aggregate and provide close-to-real time data on impacts and costs from a pollution event?

— What innovations in monitoring tools are easy-to-use, quick, cheap and able to be used anywhere so we can deploy effective, low-cost sensor networks? Which solutions leverage monitoring systems across the globe, satellite data, and other innovations to improve data coverage?

— What solutions verify and publish the data generated, presumably leveraging blockchain, and share back the information with scientists, citizens, and government administrators?

— What solutions include efforts that can make it easier and quicker for cities to implement air quality management plans, learn from other cities, replicate efforts that have worked successfully?

Takachar, Winner 2021

‘2021 WINNER TAKACHAR PROVIDE TECHNOLOGY THAT TURNS AGRICULTURAL WASTE INTO HIGH-VALUE PRODUCTS FOR FARMERS TO USE OR SELL’

— Alongside true costing, which includes the environmental and social externalities in assessing business operations, what innovations help corporates and the financial entities that support them to act more responsibly?

2. STOPPING BURNING IN AGRICULTURE AND FORESTS

Forest fires of 2020 in the western U.S shocked the world as they tore through a staggering 4.1 million hectares of forest in a season (NASA, 2021), nearly as much forest cover as we lose to tropical clearing annually. Readings on monitors in Oregon exceeded the global air quality scale. Then the smoke blew east, choked the eastern seaboard of the US and Canada, and greyed September skies across Europe.

In 2021, towns in Western Canada spontaneously combusted in heat domes, Siberia taiga burned for months in blazes larger than ever recorded – 17 million hectares, and Greece suffered similar extremes (Greenpeace, 2021).

Some of these fires were started by lightening, some by people, and some by powerlines. If it is possible to create data and machine learning to pinpoint the starting location of a fire, and we can connect this with specific weather data, we can ask on whose land did the fire start and was it caused by lightening.

Farmers in India, Madagascar, and other parts of the world use fire to clear fields. It returns nutrients to the ground and requires little manual labour. But the impacts are dreadful for farmer and city dweller health.

Low tillage agriculture has been linked to increased carbon sequestration (Ogle, 2019). If farmers can document and monitor their practice, they can sell the carbon credits and so be incentivised not to burn their fields. Innovations such as 2021 winner Takachar provide technology that turns agricultural waste into high-value products for farmers to use or sell.

Low tillage, in which stubble is kept, is better for insect biodiversity and, when we have biodiversity credits as we do for carbon, they may be able to sell this too, being paid for an environmental service.

Provocation questions:

— What solutions dramatically reduce the use of fire?

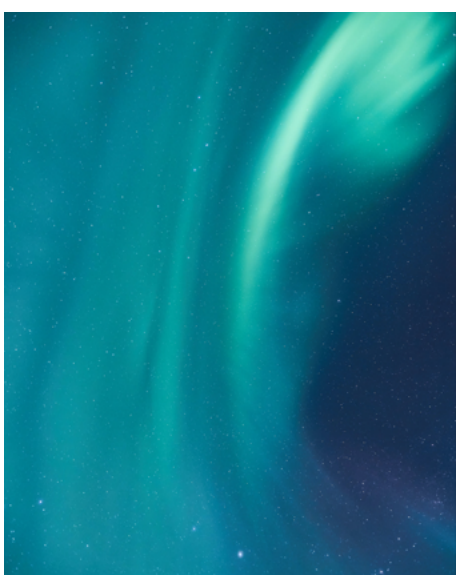
— Does it make sense for us to consider energy microgrids in areas of high fire risk, so that enormous power lines do not risk starting fires?

— How can we more extensively use indigenous knowledge on fire and forest management –and apply it across areas at risk of fire?

— Cattle ranchers use fire to claim land in the Amazon. In Borneo farmers use it to expand palm oil plantations. It is easy and effective at allowing land grabs. What if there were other ways to be certain about land ownership and access rights?

— What solutions, such as use of carbon markets, catalyse support to farmers as they deal with post-harvest stubble? What new treatments could farmers use on their fields post-harvest so they don’t have to remove crop stubble before planting again?

‘RATHER THAN CONSUMER DEMAND, INNOVATIONS MUST LEVERAGE CO-INVESTMENTS AND BLENDED FINANCE TO ENABLE A LARGER-SCALE SWITCH’



3. ADDRESSING PERSONALISED TRANSPORTATION

There is growing demand for personalised transportation or “Transportation as a Service (TaaS)” [concept framed by RethinkX 2021] in economies in transition and in highly industrialised countries. This presents an opportunity in both locations, with creative and equitable solutions possible.

In OECD countries, those with purchasing power will increasingly buy electric vehicles (EVs), bicycles, or scooters (IEA, 2019). The world’s biggest purchasers of combustion engine cars are China, with over 27,000 bought in 2020, Europe and the US, each with about half China’s number (Statista, 2021). This drove 250,000 metric tons of carbon dioxide into the air last year. Electric mobility is expected to transition at pace. Car manufacturers are already committing to EVs. Policy support is in place in many countries. Now we need to attract consumers, reach low-cost transport modes, and extend global reach.

As for many ‘waste’ products, the cars and trucks sold in favour of EVs in industrialised economies will move to economies in transition and poorer nations. Rather than enabling use of built-in, highly polluting transportation, we believe there is another opportunity for leapfrogging this stage. The commitment by car manufacturers selling in Asia, Latin America and Africa for EVs is significantly lower than in OECDs, and the policy support is thinner (IEA, 2019).

Rather than consumer demand, innovations must leverage co-investments and blended finance to enable a larger-scale switch. For example, the means to help whole cities provide charging stations, linkages to locations that are electrified already to provide places to charge (hotels, factories, government buildings), building roads that have solar charging built in, electrifying the entire tuk-tuk fleets and financing for e-motorcycles over the next ten years.

This particular priority overlaps significantly with the Climate Earthshot, since transport must be addressed in order to Clean our Air and to Fix our Climate. Therefore, transport-based solutions where the primary purpose is climate-related rather than to tackle air pollution may be nominated in the Climate category instead.

As the Earthshots are interconnected, there is significant overlap between priorities. Success for one Earthshot should not come at the expense of another, and indeed for one Earthshot to be achieved, all must be addressed in varying ways.

Provocation questions:

— Could this transition be accelerated with purchasing agreements to reduce the risk for the consumer, provision of information on buying and costs over time, and availability of charging facilities?

— What solutions show the potential to scale EV alternatives to low-cost personal mobility within the next ten years?

— Rather than consumer demand, what innovations are leveraging co-investments and blended finance to enable a larger-scale switch?

ROADMAP TO REGENERATION

REVIVE OUR OCEANS

THE EARTHSHOT PRIZE

REVIVE OUR
OCEANS

In 2022 we are looking to revive our oceans by:

- **Reducing and addressing overfishing (preventative and restorative)**
- **Developing ecosystem services that mitigate climate change: 'blue carbon' (preventative and restorative)**
- **Advancing climate change solutions with ocean benefits (preventative)**

While we are interested in critical areas like pollution from the oil and gas industry, shipping and plastic waste, for The Earthshot Prize in 2022, our key priorities are outlined below.

1. REDUCING AND ADDRESSING OVERFISHING

Our priority is a protective and regenerative measure: to find solutions that protect fisheries from overfishing and build healthy fisheries across the oceans.

Fishing – both industrial and small-scale – has a significant impact on ocean health. When fisheries are healthy, they drive ecosystem processes that revive the wider ocean and create resiliency.

Despite this, fisheries are not globally managed as organs within a wider health system. Instead, in much of the world, their access and use is as a global commons.

Approximately 70% of our fisheries are in poor health and more than 30% are overfished as of 2015 (Costello et al., 2016; FAO, 2020a). Farming fish, shellfish, and molluscs – aquaculture – now accounts for 100mt catch annually. The data available show that the open ocean catch has only slowly increased in the past decade. As the data doesn't accurately account for most of China and Southeast Asia's catch, we can assume this is larger and probably growing (Hilborn et al., 2020). Aquaculture grew by 527% between 1990 and 2018 and is projected to grow further, fulfilling demand from city dwellers, and requiring the conversion of an estimated 5 million hectares of land to use for farming fish (FAO, 2018). The continued growth of aquaculture, however, relies on good ocean health, in part driven by the fisheries in the open ocean.

Commercial fishing serves trade between countries and uses highly advanced technologies to find and land fish.

‘PROVEN APPROACHES TO OCEAN REGENERATION HAVE BUILT BACK HEALTHY ECOSYSTEMS AND SPECIES LEVELS’

Pristine Seas, Finalist 2021

Artisanal, small-scale fishing is nearshore (0-50 nm) and supports the livelihoods of approximately 120 million people directly, many of whom live in economic poverty with little flexibility of income generation and high dependence on fish and seafood as their sole source of animal protein (FAO, undated). Currently, artisanal fishing accounts for over 40% of the global catch annually. It is affected by increases in commercial fishing, losing catch to the technologically advanced fleets, but commercial fishing is rarely affected by artisanal fishers’ actions. They have different drivers, but both affect this critical resource.

There is cause to be optimistic. Proven approaches to ocean regeneration have built back healthy ecosystems and species levels, whether through catch management, regulations or protected areas or species (NOAA, 2021). Implementing these approaches can sustain fisheries, mitigate the impacts of, and adapt to climate change, revive ocean health, and protect coastal areas (Laffoley et al., 2019). These critical solutions have not yet been scaled.

We see insufficient political will at the global level, poor data, a lack of valuing fisheries for ocean health, and lack of clarity on how best to use the ocean as a carbon sink.

To regenerate fisheries, we know we also need to expand and maintain Marine Protected Areas and implement a High Seas Treaty. A leading solution in the MPA space is 2021 Ocean Finalist Pristine Seas. However, as the Convention on Biological Diversity is addressing these imperatives, we will not prioritise marine protected areas in 2022.

We believe that leading organisations, countries, businesses, and visionary innovators can create a marketplace for industrial fisheries while addressing the overfishing of the ocean commons. We know already that a marketplace of access and use rights can work within the limits of the fishery ecology.

This requires:

- Allocating access and use rights
- Transparently monitoring user rights and use of the resource
- Agreeing terms of use including quotas
- Implementing shared governance by interested parties
- Providing disincentives for lawbreaking

In United States’ waters, a similar approach has reduced overfishing by 60% since 2000 and many of its fisheries have rebounded (NOAA, 2021). There are differing views as to whether the rights should be time-limited for a season and not transferable, long-term and transferable within families or a country’s fleet, or some other system. What we don’t yet have available are the mechanisms to achieve marketplaces.

Recently, jurisdictional approaches aligning incentives for local governments, international NGOs, community organisations, resource-users, and others with an interest in the resource, are being implemented in terrestrial ecosystems (LEAF, 2021).

‘TRUSTED AND TRANSPARENT DATA’

Coral Vita, Winner 2021

A recent study estimated three-quarters of exploited fisheries could recover within ten years using this practice (Costello et al. 2016). Not only will that be important for fishery and overall ocean health, but it will also increase income for artisanal fishers. If such approaches were successful, by 2100, we would see “$14 billion US dollars increase in fishing profits, 25 billion additional servings of seafood and 217 million more metric tons of fish in the sea” (Gaines et al., 2018).

If artisanal fishers receive their share of increases in income, they will be more resilient to the changes in climate coming (Cheung et al., 2016).

We recognise that industrial/offshore and small-scale/nearshore fishery management regimes could benefit from being improved separately, but industrial fishing could still undermine the advances made by nearshore fisheries. As climate change impacts more on tropical fisheries, artisanal fishers will increasingly lose out to commercial ones (Davis and Ruddle, 2012).

Innovations around the access to trusted and transparent data are a central necessity to the industrial fisheries marketplace, the jurisdictional approach to nearshore fishery management and the negotiation between industrial and small-scale fishing. Good data means we can monitor fishery health, fish stocks and movements. It means we can track access, use and catch so we can maintain large-scale agreements as well as community-level ones. Alongside good governance, it means we can facilitate collective accountability and monitor free riders.

Yet fisheries information is highly patchy. The University of Washington runs a RAM Legacy Database used by the UN Fisheries Division. Started in 2009, it covers 50% of catch but, despite being the best available, it does not have data from most African, Latin American, and Asian fisheries, exactly where the demand for seafood driven by increasingly affluent urban dwellers is expected to increase (Hilborn et al., 2020).

Data systems could be a mechanism to connect artisanal fishers to commercial partners. For example, if small-scale fishers use smartphones to geolocate fish or to document transgression of fishery access agreements, this

‘BLUE CARBON IS AN OPPORTUNITY TO SEQUESTER CARBON, PROVIDE PROTECTION TO COASTAL LAND AND SEASCAPES, AND CREATE INCOME STREAMS FOR COASTAL COMMUNITIES’

will provide data from locations that scientists and monitoring organisations might not be able to reach. It may even be possible for data-scientists to be paid for corroborated data, incentivising investment by them in management. We see this as an area to be prioritised for significant impact in the next five years, although this may come towards the end of five years.

Provocation questions:

— What sort of innovation would enable a global marketplace for offshore industrial fisheries?

— Are there new jurisdictional approaches and community-led quota management approaches to fisheries that consider profit, food supply and conservation?

— What are the solutions and innovations that can help balance the needs of industrial and artisanal fishing? Are there creative, transparent mechanisms and tools for industrial and small-scale fishing agreements, such as open data systems that enable collaboration, monitoring, and visibility?

— How can we dramatically improve both the data we have and the technology and data systems in operation so they are easy to use, open, and can be accessed using a smartphone?

— What solutions exist using new financial approaches and incentives to enable sustainable marketplaces and the rebounding of fish populations?

2. DEVELOPING ECOSYSTEM SERVICES THAT MITIGATE CLIMATE CHANGE: ‘BLUE CARBON’

While our seas are affected by rising temperatures, they can help mitigate the impact of climate change by sequestering carbon (Lafolley et al. 2014). Coastal and marine ecosystems can store more carbon than terrestrial forests. Their management is even more critical from a carbon storage perspective because, when degraded, they emit significant amounts, much like peat forest on land. We need to find ways to keep them intact (Weber et al., 2019).

‘Blue carbon’ also means coastal communities can generate income while protecting the integrity of their seascapes. Planting mangroves to engage in carbon markets is one pathway, and wetlands conservation in the US is being made profitable through blue carbon financial markets (IUCN, 2021). Products can be grown to sell into local and global supply chains. Algae are now being sought as feed for burgeoning aquaculture, and seaweed is considered one of the feeds that reduces methane-rich enteric emissions from cattle. Seaweed is being used as a base for bioplastics. Payment for environmental services not related to carbon is also an option, such as has been done recently in the Seychelles in a public-private partnership to protect 30% of its waters for their rich biodiversity (TNC, 2021).

Blue carbon is an opportunity to sequester carbon, provide protection to coastal land and seascapes, and create income streams for coastal communities. We see enormous potential for growth and impact, but with risks that coastal communities could be overlooked during accelerated expansion. People who know the local terrain should shape how and where these efforts are expanded – and benefit from them. We need to learn from the Indigenous communities whose practices sustained the resources, such as kelp in the Pacific Northwest (Siletz group, undated).

‘RISING GLOBAL TEMPERATURES ARE THE PRE-EMINENT FACTOR DRIVING CHANGE IN THE OCEAN’

Like terrestrial agriculture, kelp, seagrasses, and seaweeds require specific growing conditions.

The health of the ocean and the location of the grow area is critical to health of a blue carbon resource. We need to see effective policy as well as proven models (IUCN, 2021; Verra, undated). Significant impact is required in the next five years for more algal/grass-based ecosystems, and within ten years for mangrove-based ecosystems.

Provocation questions:

— What solutions are proven models of blue carbon at work?

— What solutions address algal/grass-based ecosystems?

— What solutions address mangrove-based ecosystems?

3. ADVANCING CLIMATE CHANGE SOLUTIONS WITH OCEAN BENEFITS

Rising global temperatures are the “pre-eminent factor driving change in the ocean” (Laffoley et al., 2019), heating the waters, changing currents and flow processes, and increasing acidification levels (Wiseman, 2019; Boers, 2021; NOAA, 2020). The temperature rise in oceans is linked to a plethora of worrying phenomena: increase in algal blooms toxic to marine life, hypoxic sea masses devoid of life, movement of marine species to new parts of the ocean, falling levels of phytoplankton, decline in fish populations, and a loss of its capacity to act as a carbon sink (IUCN, 2017).

Leading scientists agree that the interconnectedness of ocean processes means that impacts compound and once a tipping point is met, like climate, inexorable and rapid change ensues (Laffoley et al., 2019). Ocean scientists see climate change prevention, mitigation, and adaptation as essential.

Coastal areas hold half of the ocean’s sequestered carbon in the form of mangroves, various forms of seaweed, kelp and algae, and tidal zones (Sifleet et al., 2011). These areas are the lifeblood of coastal communities, providing shellfish and mollusks as protein, habitat for fry or fingerlings, and a tempering of the eroding power of the ocean water.

Many Indigenous communities around the world, from the Siletz Federation of Tribes in Oregon to Aboriginal people and Torres Strait Islanders, have spiritual practices associated with their management (Bailey and Hatch, undated; McNiven, 2003). Yet, coastal habitats are highly threatened by sea-level rises and temperature rises, expected to be higher in the shallower waters (Kirwan and Megonigal, 2013). And most of the people dependent on coastal habitats are among the least able to withstand loss of livelihood, income, and shelter (e.g., in Thailand, Panpeng and Ahmad, 2017).

Most critically we need preventative measures that reduce the global temperature rise, and we see this as a priority where significant impact is needed in the next five years.

Provocation questions:

— What preventative ocean-based solutions are reducing the global temperature rise?

— What coastal area solutions are addressing Indigenous peoples’ rights and sustainable livelihoods as a means to protecting those areas and their marine life?

ROADMAP TO REGENERATION

BUILD A WASTE-FREE WORLD

THE EARTHSHOT PRIZE

BUILD A WASTE-FREE WORLD

As a society we use three times as many resources as we did in 1970, increasing with GDP and population (IPCC, 2021; WRI, 2021a). We are currently clearing forests in excess of approximately 2 million hectares annually (FAO, 2018; FAO, 2021). If we continue as we have been, our global resource use is expected to continue to approximately double by 2050 and waste with it (Lamb et al., 2021).

We use the products our resources create once, and we forgo the opportunity to use them again. We overlook the opportunity to waste less – and to generate revenue from post-first use. An estimated 91% of waste is not used after it is discarded, representing over $4 trillion opportunity for new value generation by keeping materials in continuous use (IRP, 2018; WRI, 2021a).

We produce waste that itself creates methane in landfills or pollutes the ocean with plastic. Food waste rotting in landfill releases 20% of human-caused methane annually (UNEP, 2021).

For the Earthshot Prize in 2022, we are prioritising three ways to build a waste-free world:

- **Preventing the excessive use of resources** (preventative)
- **Extending the use of goods** (preventative —preventing use of new natural resources — and adaptive)
- **Better managing waste once it has been generated** (adaptive)

Transforming the waste system requires us to address inequality. To galvanise a new relationship with our global resources, we need more transparency around who is benefitting and who is bearing the costs of the overuse of raw materials and the underuse of food or products already in circulation.

It is inviting but deceptive to see waste challenges as efficiency problems only. Provide the right amount of food. Create new businesses using waste. Become better at managing waste. But waste in the form of clothes, plastics, batteries, cars, among other things, are sent from high-income countries to low-income countries – and from economically wealthy parts within a country to poorer regions (Kaza et al., 2018).

‘WASTE HAS BEEN INEXORABLY LINKED TO THE GROWTH INCENTIVES BUILT INTO THE ECONOMICS OF CONSUMPTION’

The distribution of waste relies on structural inequalities, allowing those creating waste to not see or be responsible for the impact. It is enabled by often very reasonable subsidies – such as for replacing old cars with EVs (IEA, 2019), a centuries-old system of resource extraction and dumping, and a culture across much of the world that drives consumption. It is also unreasonable: the lifestyles of industrial nations were built and, especially through commodity supply chains, are reliant upon the resources of low-industrialised countries (IRP, 2018; OECD, 2019; UN, 2019). We need to use less overall, and we need all resource use to be fairer.

Waste has been inexorably linked to the growth incentives built into the economics of consumption. Single usage multiple times implies multiple purchases. Yet we see emergent models that decouple growth from excessive consumption.

There is an enormous value stream in extending the life of goods – one that isn’t saturated with incumbent businesses. Waste can become an asset and a hotbed for innovation and new opportunities. Twenty years ago, we would not have thought a spare bed could be an income stream, today, how can we reimagine waste as an asset? Such business model innovations, combined with material and supply chain innovations, can drive systemic change, operating at scale to deliver more equitable outcomes.

Likewise, regulatory frameworks, laws and policies are yet to be fully fleshed out. This represents an opportunity to create mechanisms that allow speedy action to reduce raw material use and support trade in post-use goods and materials at a global level (EMF, 2014).

Provocation questions:

— What approaches increase accountability for the excessive use of resources?

— Will increased visibility of end-to-end value chains create collaboration in solving overuse?

— Can the finance sector engage powerful actors to address their role in creating unneeded surplus, by showing the impacts of false subsidies or misaligned incentives?

— What innovations are finding ways to use discarded goods to generate revenues locally?

— How can local governments create the conditions to manage waste and create economic wellbeing at the same time?

1. PREVENTING THE EXCESSIVE USE OF RESOURCES

Our first priority is preventing or reducing the use of resources, especially for food, in order to decrease the pressure on natural resources and raw materials.

Thirty-six per cent of the forests we cut for agriculture are to make way for beef farming, with over 45.1 million hectares of lost forest cover between 2001 and 2015 (WRI, 2021b; Curtis et al., 2018). In the US, meat accounts for 27% of food wasted, the equivalent 8.6 billion pounds in 2010 (USDA 2014). Reducing the waste of beef by half could save a million hectares of forest. Halving food waste in general by 2030 would reduce the conversion of land to agriculture by an area the size of Argentina by 2050 (WRI, 2019a).

Efforts to reduce excess use have largely been focused on individual consumers.

‘LOVE FOOD HATE WASTE’

In the UK, the campaign ‘Love Food, Hate Waste’ discouraged consumer over-buying and sought to move retailers away from over-selling through promotions such as ‘buy one, get one free’. But the provision of subsidies and financial support to corporate food producers, traders, processors, and retailers generate disproportionate market power – monopoly control in some instances. This allows them to shape what size, amount and price of food individual consumers get (Vorley, 2003).

The global food system is extremely complex, built into national agendas on food security and/or sovereignty, and many experts continue working hard on improving it (DeJanvry, 1981; Pimbert, 2009). But if there were ever a time to upend the system of overproduction and overconsumption, it is now.

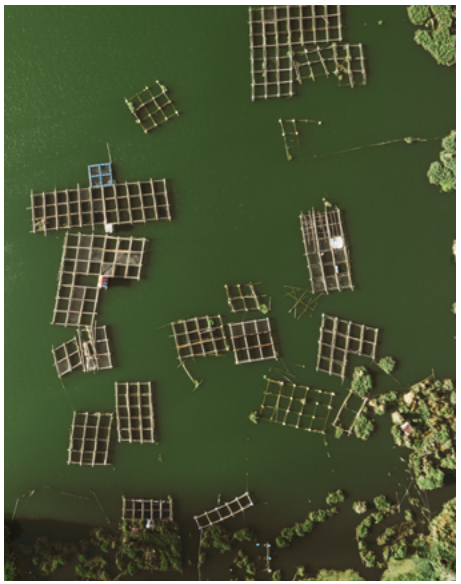
Today, asset managers are asking food industry clients about the true cost of their operations, costs that include environmental and social externalities. Risk evaluators for leading insurance, re-insurance, finance, and ratings companies are identifying risk to operation – and are recognising that, as costs of carbon are factored in, under-priced food commodities may become too heavy an investment (Swiss Re, 2020; S&P, 2021).

Arguments to extend producer responsibility and to require reductions in operations that negatively affect biodiversity are influencing how insurers are supporting farmers. Both of these processes are increasing the value that the food has while in production, which may also drive to smaller portion sizes in the supermarket. With obesity also now recognised as a structural problem (Lee et al., 2019), and a genetic propensity, rather than an individual behaviour (Loos and Yeo, 2021), it is likely that the role of corporations in the food system in driving excess will attract increased scrutiny.

Provocation questions:

— How can we enable and use stronger demand signals from consumers — a just-in-time approach to food availability?

— How can we learn from hyperlocal energy grids in food or clothing supply chains, so they are more attuned to buyers and sellers?



‘REUSE, REPAIR, AND REMANUFACTURE’

— Will new technologies that extend the shelf life of food allow greater agility to consumer demand signals and support better food storage options?

— Can new financial mechanisms such as green bonds be used within the food sector, allowing investment and accountability in environmental operations?

— And can data technologies and systems more readily locate what is being produced and consumed?

— Will regulatory efforts at the city level affect consumer behaviour, such as portions in restaurants (e.g., sugary drinks in the State of New York 2021). Are there approaches that will work particularly well in the urban areas where we expect greatest growth both in numbers of people and in wealth?

2. EXTENDING THE USE OF GOODS

The second priority is extending the use of goods – such as clothes, food, and plastics and packaging – that have been produced already through circular economy principles. Principles like reuse, repair, and remanufacture.

The combination of these approaches can decrease the pressure on natural resources and raw materials.

We need national infrastructure, as well as policies, to enable remanufacturing and repair. For items intended to be moved to other countries for processing, we need a new regulatory framework. This should cover trade in pieces of products or stages of processing. It should enable import and export and the distribution and sale of value retained products. All of these processing steps need technologies to support faster, more efficient processing. De-dying processes, processes that sort different types of trim on clothes or shapes of bottle top, processes to degrade plastic and reform it. Transitions to these new processes could benefit from subsidy and financing (IRP, 2018). Incentivizing the growth of this new sector would happen faster if carbon accounting were accelerated and if this was included in Nationally Determined Contributions (WRI, 2021a).

With the recent development of the shared economy, we have learned to generate value from a product that was otherwise idle, such as cars parked in the driveway or camping equipment not used every day of the year. We believe there is about to be the same kind of revolution in the value of waste. Today, when goods become waste, they quickly lose their value. But, with changes in how carbon and biodiversity are valued and who is accountable for their change in state, the value at the end of the waste stream will be transformed.

CLOTHES

The fashion industry accounts for 10% of GHG emissions (Climate Watch/WRI, 2020). Revenue from clothes thrown away could be as large as $460B annually (EMF, 2021). The textiles industry uses resources that are then wasted, siphoning off 4% of global freshwater. Globally, only 1% of material used to make clothing is recycled into new clothes (Ellen MacArthur Foundation, 2017). Reports projected that if consumers in the US had bought one used item instead of new in 2020, it would have cut 200 million kilos of waste and 100 billion litres of water (EMF, 2021).

Driven by high-street brands, the idea of consuming more than one needs is central to individual expression through clothes.

‘THE OPPORTUNITIES FOR CHANGE IN THE FASHION INDUSTRY ARE PRIMARILY AT THE GLOBAL LEVEL’

The City of Milan Food Waste Hubs, Winner 2021

But some incumbent brands are leading the change, with some high-street fashion, couture, and outdoor wear developing targets around durability of their products, renting clothes, and transitioning from four seasons to one palette for the year, challenging the idea of continuously new (Primark, 2021; Patagonia, 2021; Stella McCartney, 2021; Burberry, 2021; Jean-Paul Gautier, 2021). Smaller brands across all continents, often new and started by young entrepreneurs and designers, are challenging the relationship between buyer and seller, developing a closer connection and a sense of co-design and tailoring (ABLE, Girlfriend Collective, Allbirds). There are opportunities to use the leadership and disruptive nature of these efforts to make more industry-wide change over the next five years.

In addition to reducing the number of new products created and purchased, some fashion has started adopting circular principles that could have an impact over the next ten years.

Starting with design – building products that can be unseamed, sorted, broken down and remanufactured – forces designers to solve for entirely different outcomes than reducing material use (see examples at Fashion for Good).

Working further back in the production processes, some brands are engaging mills and chemical companies to develop materials that are more durable, more easily recycled, and able to take on different colours upon reuse (EMF, 2017).

The opportunities for change in the fashion industry are primarily at the global level. There is huge scope for collaboration and alignment on issues that otherwise hamper rapid adoption of circular processes. This includes regulations around product labelling, provenance, and content; transparency and democratisation of sustainability data of products and processes; and ways in which emissions can be reduced in shipping and logistics through supply chain visibility. Without solving the structural elements that shape what kinds of reuse can be done, we believe smaller brands will struggle to thrive.

The industry’s largest players have a responsibility to galvanise aligned approaches, and quickly.

FOOD

We have already seen success in novel approaches to redistributing leftover food from restaurants and shops to those in need already (e.g., Milan). Further opportunities for the next five years could include applying new data technologies to improve the supply chain of food beyond the supermarket shelf. Or leveraging the idea of payments for environmental services.

There is still a significant amount we do not know about the food waste stream. To develop good waste management strategies and businesses we need better data systems revealing where food is lost and wasted.

PLASTICS

While today, 6% of oil and gas production goes to making virgin plastic (Neufeld et al., 2016), it could account for 17% of global emissions by 2050 (The Pew Charitable Trusts and Systemiq, 2020). Reusing plastics could generate 37% lower emissions than relying on virgin

plastic (Nordon, 2015). Plastics waste is acute in East Asia, home to the most rivers with plastic flowing into the ocean and the most mismanaged plastic (Jambeck et al., 2015). Globally, most plastic waste is from packaging. And around the world, plastic is burned to reduce landfill and, in some instances, to generate heat and potentially capture carbon through incineration (Geyer et al., 2017). Seemingly sensible solutions to replace plastic with bioplastics and paper can have damaging effects on mangroves, seaweed habitats and forests. As ever, we need to be careful not to replace one negative environmental consequence with another.

For plastics (and clothing), there are new possibilities for extended product life that generate new value streams. Businesses can prosper by extending customer relationships through re-used products, by upgrading products, and by matching potential consumers and remanufactured products.

Provocation questions:

— What solutions are catalytic and game-changing for the scaling of circular fashion?

— What solutions successfully unlock the incentives for supermarkets to pay to have food taken away and distributed to others instead of customers having to pay for that food waste?

— There are UK apps that find food that is for sale at its sell-by date – but what solutions make this a shared responsibility between suppliers, retailers, and consumers?

— Are there solutions exploring a future scenario that creates different pricing for food based on how it can be used?

— How can the current low level of visibility to flow of goods be turned into an opportunity for the next five years?

3. BETTER MANAGING WASTE ONCE IT HAS BEEN GENERATED

We must better manage waste once it has been generated, particularly food waste and plastics pollution. Food waste generates methane which, within 20 years, is 80 times more powerful than carbon dioxide at heating the planet (UNEP and Climate and Clean Air Coalition, 2021). Food waste is the third largest driver of methane emissions after

the oil and gas industry and agriculture (Climate Watch data) contributing between 6% and 11% of human caused GHGs (WWF-UK, 2021; WRAP, 2021). European and North American countries create ten times more food waste per capita than sub-Saharan Africa, South and Southeast Asia (UNEP, 2021). But as the population of cities and the GDP of economies grow across Africa and Asia, food waste is expected to increase significantly.

We can drastically reduce the production of methane through waste management, with some data suggesting that by halving food waste we can reduce methane by as much as 45% by 2030. (UNEP and Climate and Clean Air Coalition, 2021). Because methane has such a potent effect on warming, this could represent as much as 0.3°C of our temperature reduction goals. By reducing the flow of organic waste to landfill, innovative businesses can shape and share in major revenue streams. Innovations around composting, especially when combined with local regulatory changes, have been successful in many cities (e.g., Mexico City).

Plastics pollution is forecast to increase by at least 40% by 2050 (The Pew Charitable Trusts and Systemiq, 2020). Trade in recycled plastic is hampered today by a paucity of regulatory and tracking mechanisms. Plastic bags used to be sent from the US to China to be put into landfills, but recently the Chinese government clamped down on this trade. However, there is inconsistency in global regulations that define who can account for the waste within their Nationally Defined Contributions (NDCs), or the data needed to allocate those contributions that would show the provenance or location of plastic waste. It is vital to work out how different plastics are labelled, categorised, and managed. We need to create mechanisms in the next ten years to standardise trade, and to define who is responsible when bottles, sachets, and packaging flow into rivers and oceans.

The opportunity to manage waste is important and growing, though it cannot be at the expense of the prevention of waste in the first place.

Provocation questions:

— What solutions dramatically improve recycling and reuse?

— What solutions use immutable data systems, such as blockchain, to enable different parties in this emerging set of supply chains to interact and develop trade and information about collection, sorting and recycling?

— What solutions are successfully innovating approaches in the next five years that use methane to generate heat – or that find ways to burn plastic to capture carbon?

— What solutions are addressing the opportunity to trap or redirect methane from landfills?

— What solutions use the knowledge of those who derive livelihoods from picking over landfills for certain plastics to shape new plastic recycling methods?

— What solutions leverage biological treatments or sorting tools that would render all plastics able to be recycled together?

‘PLASTICS POLLUTION IS FORECAST TO INCREASE BY AT LEAST 40% BY 2050’

ROADMAP TO REGENERATION

FIX OUR CLIMATE

THE EARTHSHOT PRIZE

FIX OUR CLIMATE

While there is growing awareness and concern around the climate crisis, highly industrialized nations in North America and Europe are continuing to use significant fossil fuels and natural resources. People in the US use roughly ten times as many resources as those living in non-industrialized economies. Nations in industrialised zones are only slowly reducing the in-built resource use in their infrastructure and cultures (IPCC, 2021; Lamb et al., 2021).

If we allow past resource use to predict future trajectories, over the next decade coal will provide about half the energy supply in the Asia Pacific, though their growth as a proportion of total energy use is expected to slow (IEA, 2021a; IPCC, 2021). Growth in heavy industry, building, transport, and agriculture sectors – large GHG emitters – will dominate the region, with a projected 5.7% growth overall for 2022 continuing to push emissions up (IMF, 2021a).

The drivers for the clearance of over 4 million hectares of tropical forest per year have not significantly changed their trajectory since analysis averaging the past fifteen years (Pendrill et al., 2019).

Annually, around 41% of tropical forest will likely be cleared for cattle pasture, mostly in Brazil. In Southeast Asia palm oil expansion will likely drive 18% of tropical forest loss.

We need to take action in new and urgent ways. Because the same drivers of emissions exist today as yesterday – growing populations spending more money on food, transportation, housing, energy, goods – we need to act differently now to solve the climate crisis. We must:

— Use new data systems that can show carbon accounting and supply chain transparency (SBTI, 2021)

— Leverage ground-breaking financial flows and tools that value natural resources (Task Force on Nature-related Financial Disclosures, 2021; The Nature Conservancy/NatureVest, 2021)

— Redirect finances – we currently put forty times more money into financing the drivers of deforestation than protective and regenerative efforts (Climate Focus, 2017)

— Deploy pioneering policies that align to protect nature (Convention on Biological Diversity, 2021)

‘IF WE ARE TO REACH NET ZERO, WE NEED TO TRIPLE THE ANNUAL INVESTMENT IN CLEAN ENERGY TO $4 TRILLION BY 2030’

— Scale innovative businesses creating significantly fewer emissions

— Nurture a revolutionary awakening of care for the Earth in ways we have only typically seen among indigenous populations across the world (see efforts of Cultural Survival, Indigenous Environmental Network, FUNAI, Climate Justice Alliance).

To act differently, industrialised countries must help growing populations to not repeat or replicate their trajectories. Instead, economies in transition must be able to boldly innovate better ways of living. Industrialised countries must redirect finances to pay for the fast transition from an extractive to a regenerative system. Now we have a clear and global understanding of the risks of failure, we must accelerate together towards a low-carbon future.

We are optimistic for a new future together and are focussed on three priorities for this year’s Fix our Climate Earthshot:

— **Transitioning to renewable energy** (preventative)

— **Reducing methane emissions** (preventative)

— **Constructing buildings fit for the future** (preventative and adaptive)

We believe that a combination of government policy and regulation, new business operations and consumer choices will enable low carbon living to be adopted quickly and widely. Regional, national and city level governments must play a leadership role in creating the enabling conditions of the transition - and attracting blended finance to accelerate change. They can subsidise renewable energy use in residential and commercial settings, including manufacturing (e.g., Vietnam’s power purchase agreement efforts over the past decade). They can create regulation around green building investment, develop ordinances for transportation and recycling, and focus on the education of girls and boys (see examples in C40’s network of city leaders around the world).

Green business growth in Asia and Africa is already outstripping conventional growth (S&P Global Market Intelligence, 2021). Even faster growth will come from standard measurements of impact, carbon accounting and reporting, insurance based on projected climate impact as well as risk, new ways to invest, and transparency of supply chains.

Galvanising the role people can play in funding, buying, and demanding environmental innovations will make them durable, equitable, and fast. Among the world’s top scientists, there is strong agreement that behaviours affect emissions “through energy use, technological choices, lifestyles, and consumption preferences” (IPPC, 2021).

1. TRANSITIONING TO RENEWABLE ENERGY

Fossil fuels in 2019 accounted for 84% of energy production globally (BP, 2021). If we are to reach net zero, we need to triple the annual investment in clean energy to $4 trillion by 2030 (IEA, 2021b).

‘TRANSITION TO LOW-EMISSION MACHINERY’

AEM Electrolyser, Winner 2021

Economies in transition, for example India and Indonesia, are expected to grow by 6% or more in the next two years – higher than the global averages (IMF, 2021b). Cities such as Nairobi and Lagos are expected to reach similar levels of growth stimulated by increases in population. In Lagos alone, this represents 5 million new people (World Population Review, 2021). This is a huge pool of potential new customers, able to demand green energy and a move away from the heavy dependence on wood for energy use across the continent (WRI, 2021b). As cities grow in Asia, Africa and Latin America, manufacturing is expected to increase, as is the growth in new residential consumers of energy.

We believe the transition will be accelerated over the next ten years by innovations in financing for the transition of manufacturing to low emissions processes and distributed grids for residential energy use.

Energy use in industry drives 24% of GHG emissions today, much of which is driven by the high heat processes used to make steel, concrete, chemicals, textiles, and plastics (Climate Watch/World Resources Institute, 2020).

The manufacturing industry needs to stop driving up methane emissions, increase efficiency of its equipment, and use electricity instead of gas to catalyse processes. To do so, it needs to transition to low-emission machinery. As a rule, the industry does not make risk-laden investments or pay more than necessary for capital investment in very expensive machinery or equipment. These machines last decades, and so decisions today will lock in levels of emissions for years to come. These manufacturers tend to operate on a low margin, getting return from the high number of clients they have, typically across many sectors selling to consumers (apparel, electronics, home goods). Consequently, pressure from a given sector to adopt less emission-intensive technology bears insufficient power, even if manufacturing leaders are open to change.

We believe there are innovations in finance that can de-risk this change and advance sector-wide ambitions, such as Green Bonds for companies or power purchase agreements brokered by governments (World Bank, 2021a).

SOLbazaar, Finalist 2021

‘PEOPLE LIVING ON LOW INCOMES ARE LEAST ABLE TO MAKE THE SHIFT TO ELECTRIFICATION’

Distributed energy generation through micro-grids smooths energy supply and minimises overuse. They can be more agile than centrally controlled energy in the face of extreme weather. The UK, for example, has been developing such grids since a 1987 hurricane that took down electricity for thousands of customers and halted critical security and infrastructure systems.

As cities grow around the world, people living on low incomes are least able to make the shift to electrification. But these people will constitute a sizable and growing portion of the demand for energy and will likely find it by burning wood. Developing easy ways for these people to buy green electricity will increase demand for renewables over the next five to ten years, reduce pressure on natural resources around cities, and improve air quality.

2021 Climate Finalist Reeddi is a good example of a solution where affordability of clean energy is at the core of the innovation. It can provide income to those generating the energy (as is the case with SOLbazaar) and enable easy entry to electricity markets to low-income buyers (IEA, 2021b). And it can enable greater equity, providing lights, heat and cooling for schools, health care centres, and homes in places that may have few resources to adapt to extreme weather (Randell and Gray, 2019).

Sustainable residential building will also create an opportunity to build three billion new customers for green energy, provided we integrate renewables in building design and make energy readily and cheaply available (World Bank, 2021b). In poorer economic areas, people may have fewer resources at their disposal to mitigate the impact of climate change, including cooling in heat extremes and heating in the sub-zero temperatures occurring in normally temperate zones.

This means supporting the ability for poorer people to make capital investments for change, perhaps through collective investment or subsidy. Policy instruments will support the change, as well as new forms of finance, access to capital, and legal mechanisms to smooth costs and processes of transition over the next ten years.

We know there is an enormous opportunity here and that current systems of energy supply are dominated by incumbent business, state actors, and old infrastructure. There are many different approaches to increasing distributed microgrid energy, such as 2021 Climate Finalist SOLbazaar, a peer-to-peer energy exchange network with 100 microgrids in Bangladesh. We are looking for businesses – large or small – that are ready to scale and manage those microgrids over the next five years.

This priority has significant co-benefits for the Clean our Air Earthshot, and so energy-based solutions where clean air is the primary purpose may be nominated in the Air category instead.

Provocation questions:

— What solutions are creating mechanisms to support the scaling of Green Bonds or other financial innovations?

— What solutions are creating opportunities to go faster in the transition of heavy manufacturing to low emissions?

— What innovations are creating energy systems to serve all customers?

‘WE CAN AND MUST MAKE SIGNIFICANT AND FAST PROGRESS AT REDUCING METHANE EMISSIONS’

— Which governments are proactively transitioning away from centralised control over the next ten years?

— Which financers are getting behind innovations and for data systems firms that can support energy flow management over the next five years?

2. REDUCING METHANE EMISSIONS

We can and must make significant and fast progress at reducing methane emissions. Methane’s potency as a GHG means we must find solutions that can scale now. Emissions growth through 2030 is expected to be 8% from 2020 levels, driven by fossil fuels, agriculture and waste (Höglund-Isaksson et al., 2020 in UNEP and Climate and Clean Air Coalition, 2021). Currently methane comes from venting from wells, pipe and transportation leaks, emissions in production, coal mining processes, ruminants, wet rice farming and landfills.

Waste-driven methane generation is expected to increase the most annually, due to growth in cities that have poor organic waste management systems. Gas production will grow in part because transitioning away from oil to gas is a common mid-step taken in the transition to renewable energy. Growth in ruminants drive the remaining increases, representing about half the rate of growth as waste. Though rice production already accounts for 8% of methane production today, its growth is expected to be stable, so we focus less on finding solutions here.

The abatement of methane driven by oil and gas demand large business, policy and technological and data solutions. In agriculture, we need change from both producers and consumers. Reduction efforts can impact quickly, most are cheap or have a return on investment within a few years. These efforts have the potential to reduce human-generated methane by 45% by 2030 with 0.3C reduction in temperature (UNEP and Climate and Clean Air Coalition, 2021).

In addition to reducing food waste (see ‘Build a Waste-Free World’ section) we believe we need to rapidly cut methane by reducing gas leaks and by accelerating reductions in beef production and consumption, including by developing and adopting alternative proteins.

We have seen advances in the use of satellite technology to identify methane emissions globally. This provides an opportunity for global action.

Oil and gas leaks are primarily in the Middle East, North America, Russia/ the Former Soviet Union countries, and Africa. Fines for leaks and attempts to capture methane have not proved economically viable so far.

It is also important that reduction in leaks is part of an overall move away from fossil fuels, so that companies are not encouraged to minimise leaks as a foil for continuing fossil fuel heavy business as usual.

Emissions related to ruminant husbandry (cows) make up over 30% of total anthropogenic methane emissions (UNEP, Climate and Clean Air Coalition, 2021). In China, Latin America, North America and Europe, beef consumption is already high. Consumption of meat proteins is expected to grow in most areas with growing populations, such as across Latin America, China and Africa. Consumption is not expected to increase significantly in Southeast Asia with higher growth in other protein sources (OECD/FAO, 2021).

For this reason, we have a priority focus on beef production and consumption. Farmers will typically need help to make investment transitions.

Engaging with traders to supply nutrients or provide technical assistance at scale will help – and financial reporting and incentivising of insurers will help that transition go faster. Determining whether those mechanisms are working to scale will be essential to checking and adjusting the approach. Speed and agility are critical.

Better options for consumers can also help drive change. Societies globally have responded to massive campaigns for low-fat or sugar-free foods by FMCG and supermarkets.

This is a developing market with opportunities to supply easy-to-make, healthy foods that have a global reach – well beyond North America and Europe. These food options need to use low processing, engage smallholder farmers, support biodiverse and deforestation-free landscapes, treat farmers and processors well, and use biodegradable packaging.

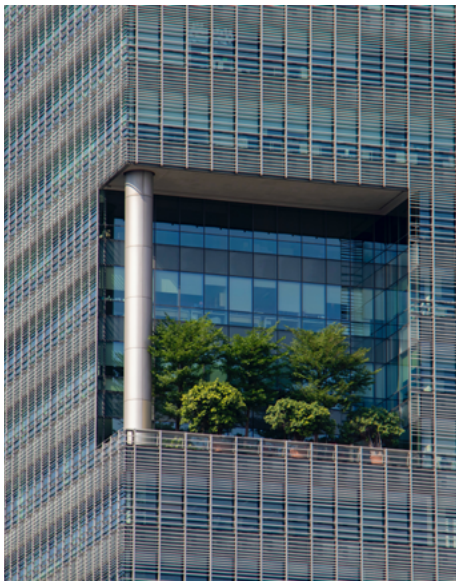
Start-up companies and some major retailers have already begun to make an impact here, switching beef for beans in America's favourite food, the hamburger. If Americans switched half of their beef to plant-based, and if Europeans reduced beef eating by a quarter, we would not need to expand agriculture for beef even as the population increases (WRI 2019b).

Provocation questions:

— What solutions are successfully changing production process (from treating manure to changing breed types) to reduce the impact?

— What solutions are supporting farmers in this transition and championing farmers with sustainable practices in agriculture?

— What solutions are innovating ways to leverage satellite data on methane detection or machine learning to pre-emptively mitigate an emission event?



‘DECISIONS WE MAKE TODAY WILL SHAPE WHAT RESOURCES – AND PRACTICES – WE USE TOMORROW’

— What solutions are improving data availability and quality to allow for independent verification and contribute to the information on Nationally Determined Contributions (NDCs), as well as supporting the much-needed policies to quickly galvanise widescale adoption?

— What innovations generate measurably sustained lower meat and dairy foods in a community? What innovations are developing alternative proteins to push the transition away from unsustainable beef production and consumption over the next five years?

3. CONSTRUCTING BUILDINGS FIT FOR THE FUTURE

Cities with increasing populations in Latin America, Africa and Asia have the potential to drive rapid transition towards buildings that are fit-for-future – and green solutions in hard-to-abate sectors like steel and concrete.

Buildings, like infrastructure and capital investments in manufacturing, are some of our most energy-intense and durable investments (Breakthrough Energy 2021). Decisions we make today will shape what resources – and practices – we use tomorrow. This is a priority with expected impacts over the next ten years.

We expect that growing cities, especially in Asia, Africa and Latin America, will add approximately 1.2 million km² of built-up areas by 2050, as their inhabitants double in number. We expect this to increase demand for residential buildings and therefore for concrete and other materials. And because we believe residential buildings respond to consumer choice more so than infrastructure or commercial buildings, we think this represents an opportunity to use market demand to reduce emissions in construction.

The buildings sector creates demand signals to manufacturing, whether for solar roofs or heat pumps or for green cement and sustainable steel, especially when combined with city, regional or national policies that subsidise green building materials, which is a win-win.

Low-emissions can be designed into the architecture and engineering of buildings: cooling and heating, reused materials, low-emission materials, and green energy use.

Solutions such as these can help subvert the behemoth materials production through distributed manufacturing processes for example and can help create new products that have a low-carbon footprint.

Provocation questions:

— What innovations are unlocking opportunities for blended finance or subsidies to enable transitions by de-risking the investment in new technologies before they deliver returns?

— Which solutions operate across low-income areas, by creating novel financial approaches or by creating opportunities within social housing?

— What solutions are providing affordable products and services and that take the small and distributed ethos of just-in-time delivery rather than always-available for materials needs?

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With gratitude to Dr Lea Borkenhagen, who researched, analyzed, consulted and wrote the report, and to all those that contributed insights, wisdom, expertise.

Lea serves as a strategy advisor to businesses and organizations developing new approaches to valuing the environment equitably. Bridging on-the-ground knowledge on agriculture, forestry, and manufacturing to business opportunities, Lea today focuses on the levers of data, tech and finance to create shared incentives, accountability, and benefit in developing low-carbon futures and managing natural resources.

Earlier in her career, Lea worked at Nike, delivering accelerated impacts on sustainability across the industry. Prior to Nike, Lea led Oxfam GB's livelihood work globally, co-founding the Roundtable on Sustainable Palm Oil. The first part of her career focused on biodiversity and forests conservation, including contributing to the first WRI-IUCN-UNEP Global Biodiversity Strategy, where she pioneered a focus on gender and was awarded by UNEP as a New Generation Leader.

Lea holds a PhD in Environmental Science, Policy and Management from the University of California at Berkeley, she was a Fulbright Scholar, and holds an undergraduate degree from Harvard University.

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