# Technology Justice

## A Call to Action

# About Practical Action

Practical Action
The Schumacher Centre, Bourton on Dunsmore, Rugby, Warwickshire, CV23 9QZ, UK
www.practicalaction.org.uk



A catalogue record for this book is available from the British Library.
A catalogue record for this book has been requested from the Library of Congress.

ISBN 978-1-85339-924-4 Paperback
ISBN 978-1-78044-658-5 Library Ebook
ISBN 978-1-78044-924-1 Ebook

Citation: Practical Action (2016), *Technology Justice: A Call to Action*, Rugby, UK: Practical Action Publishing, <http://dx.doi.org/10.3362/9781780446585>



Practical Action is a development charity with a difference. We use technology to challenge poverty by building the capabilities of poor people, improving their access to technical options and knowledge. We work internationally from regional offices in Latin America, Africa, Asia, and the UK. Our vision is of a sustainable world free of poverty and injustice in which technology is used for the benefit of all.



Cover design by Mercer Design
Typeset by Allzone Digital Services Ltd., India.
Printed by Hobbs the Printers Ltd., UK

# Contents

Technology is at the heart of human development. It enables people to produce food, access water and energy, and keep in good health.

But access to technology and its benefits are not fairly shared.

And the environmental impact of our use of technology is pushing our planet to crisis point.

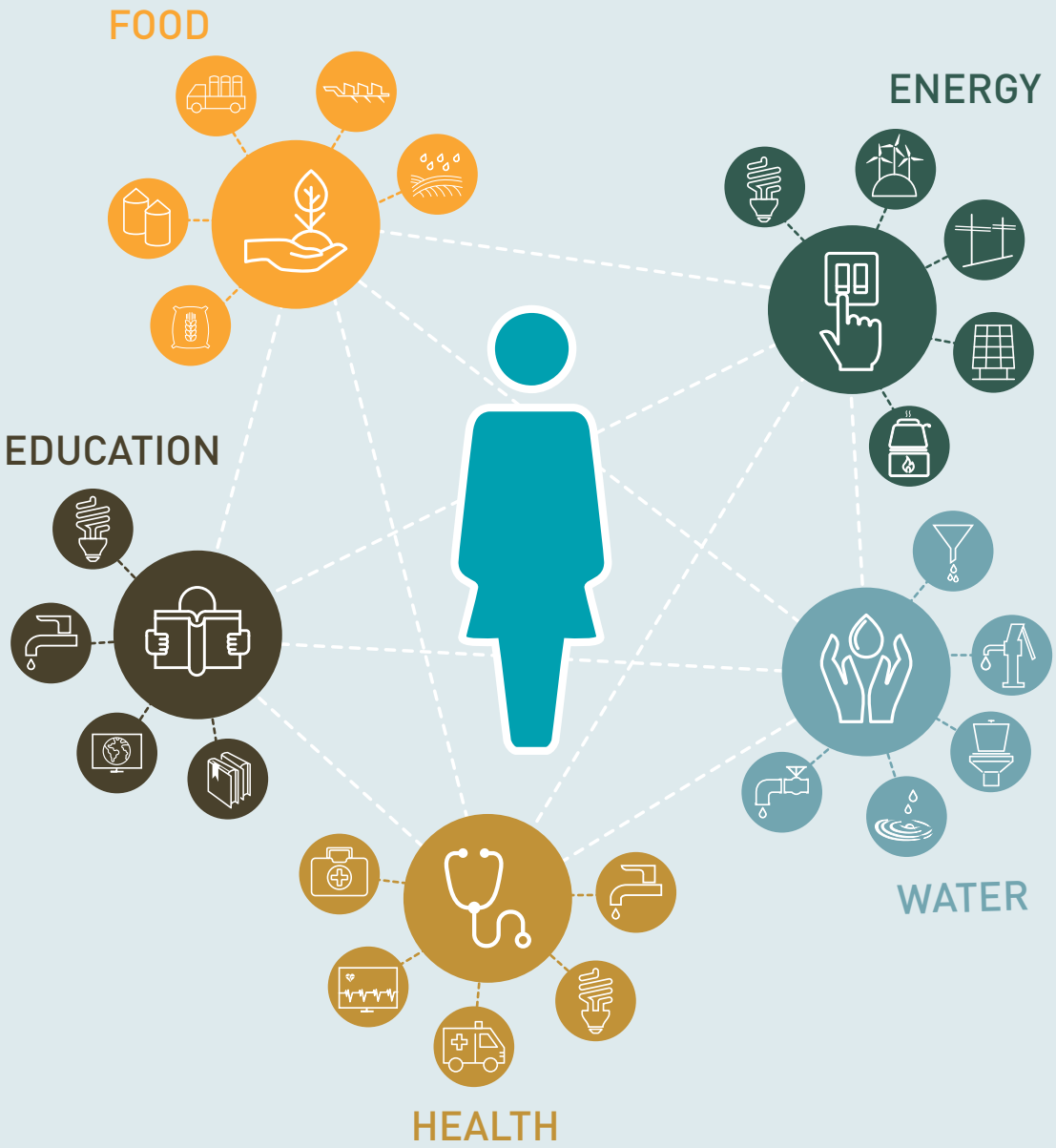
The current innovation system is not working. Without change, it will continue to drive injustice, inequality and catastrophic environmental damage.

It is time to overhaul how technology and innovation are governed, in order to ensure the wellbeing of all people and of our planet.

Be part of a movement for Technology Justice!

This is a call to action.

# TECHNOLOGY IS AT THE HEART OF HUMAN DEVELOPMENT



# The power of technology

## Transforming lives

Technology underpins all aspects of our everyday life and wellbeing: from how our food is produced and how we access water and energy at home and work, to the transport infrastructure we rely on, our health, and even how our children's education is delivered. It enables us to live well, with less effort and drudgery, with lower costs and fewer resources.

In the developed world, this technology is taken for granted, every day and in every aspect of life. It is so universal that it has become invisible.

But, in the developing world, the absence of technology is starkly obvious:

- 1.1 billion people still lack access to electricity (World Bank Group, 2015).
- 4 million people die prematurely each year from indoor air pollution, due to a lack of clean energy technology for cooking (WHO, 2014).
- 800,000 children die each year from diarrhoea, due to untreated water supplies and a lack of toilets (Liu, 2012).

The reality is that technology is cruelly polarized. The rich world enjoys more than its fair share. And, for the poor, the lack of technology is a defining feature of their poverty and their hardship.

This injustice is a major obstacle to achieving the UN's sustainable development goals. These goals, launched in September 2015, are designed to end poverty by 2030 and to create a sustainable future for humanity and the planet. For the goals to succeed, technology – in all its many forms – must be at the heart of development efforts.

The UN estimates that women in sub-Saharan Africa spend 40 billion hours a year collecting water. This is equivalent to one year's labour of the entire French workforce (UNIFEM, 2008). Imagine, then, the potential impact of water technologies alone to free up these 40 billion hours for economic, household or recreational activity. Not to mention the 5 million lives that would be saved each year by introducing clean energy for cooking, a clean water supply and toilets.

But that's just the start. Essential technologies such as these lead to improved health and nutrition, higher incomes, better education, and opportunities for whole families and communities.

Our essential needs have been expressed by economist Kate Raworth as elements of a 'minimum social foundation' (see Figure 1). Throughout history, technology has played a crucial – but often overlooked – role in meeting each of these social priorities and in helping us avoid unacceptable deprivation in the form of hunger, ill health or poverty.

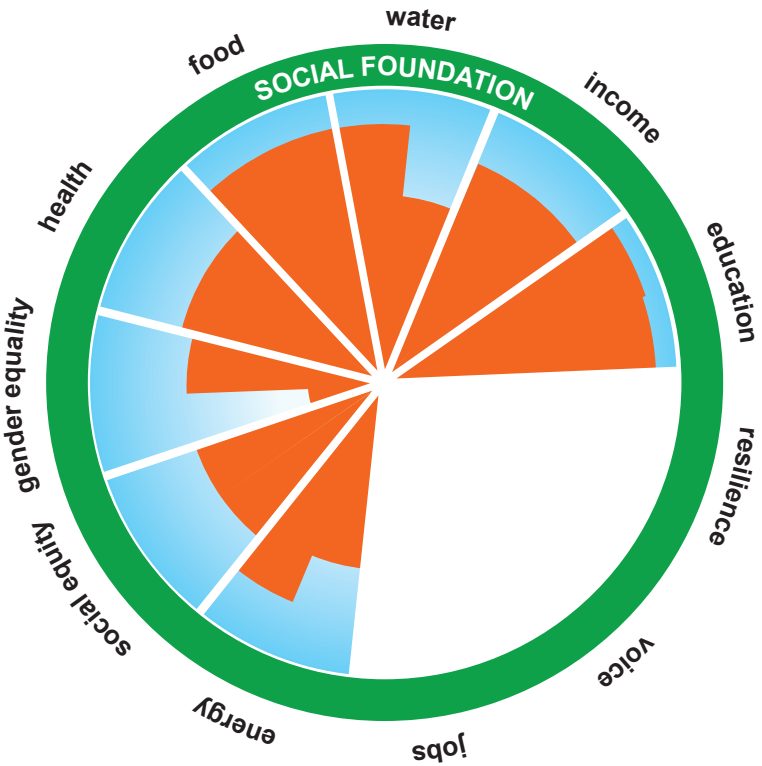



**Figure 1** The proportion of the global population meeting the minimum social foundation for each social dimension. In the case of food, for example, the dark shaded wedge represents the 87 per cent of the world's population who have sufficient food. The gap between that wedge and the edge of the social foundation represents the 13 per cent of the world's population (850m people) who are still undernourished. Where there are two indicators for a dimension, it is depicted by split wedges, showing both of the deprivation gaps. Where there is currently no indicator, it is blank. *Source*: Oxfam (Raworth, 2012)

Meeting the fundamental human need, for example, for food depends on a multitude of technologies: agricultural technologies such as improved seeds and technical knowledge to increase productivity; energy technologies for cultivation and food processing; water supply technologies for irrigation; and transport technologies to distribute inputs and products, among others.

Given that, in most cases, technology is needed to meet each of these social priorities, and that billions of people have limited access to technology, it is no surprise that we are still some distance away from achieving the social foundation and Sustainable Development Goals.

## A double-edged sword

Technology has enhanced the quality of life and wellbeing of billions of people through the rapid technological changes of the industrial and green revolutions.

But technology has proved to be a double-edged sword – the way we have used it has also led to vast and unintended negative consequences for the environment. Now we are faced with questions about the sustainability of human and other forms of life on this planet.

Leading scientists, led by Johan Rockström of the Stockholm Resilience Centre, have identified a set of nine planetary boundaries within which humanity can continue to thrive for generations to come (see Figure 2).

As Rockström's diagram shows, we have already passed three of these boundaries, our use of technology creating irreversible and catastrophic damage to our planet.

Our over-reliance on green revolution technologies in agriculture – such as chemical pesticides and fertilizers – has played a large part in breaching the nitrogen cycle barrier and in the devastating rate of biodiversity loss (ETC Group, 2012: 186).

Our unsustainable use of water in industry and irrigation is creating a freshwater crisis.

And our use of fossil fuel energy technologies has led to the warming of our entire planet – which in turn is having a range of negative impacts on food production, increasing the intensity and frequency of natural disasters, and leading to a rise in sea levels that threatens low-lying coastal zones in countries such as Bangladesh (Edenhofer et al., 2005).

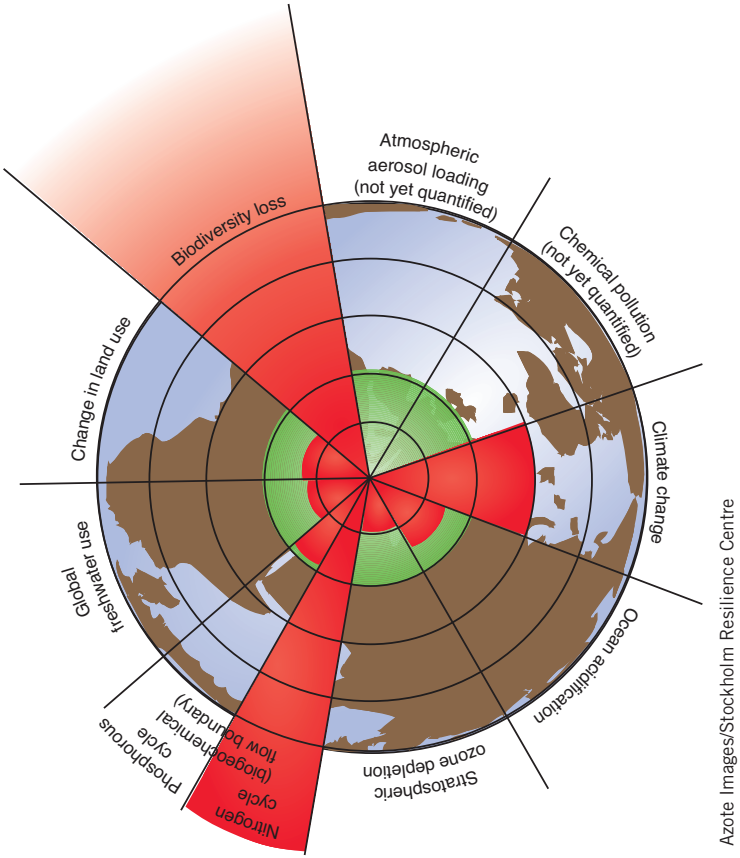



**Figure 2** Planetary Boundaries. A safe operating space for humanity (Rockström et al., 2009) Crossing the safe (green) boundaries could generate abrupt or irreversible environmental changes.

Alongside conflict and global inequality, climate change has been cited as contributing to the unprecedented movement of refugees into Europe that made headlines around the globe in 2015 (O'Hagan, 2015). This could be the new norm. Controversial estimates suggest that up to 200 million people could be displaced by climate change by 2050 (Myers, 2005).

Universal access to technology is essential if everyone on the planet is to have adequate food, water, energy, shelter and livelihoods. But unfettered access to technology can create huge problems – and has already done so.

Now, we have reached a critical stage. Our technological prowess is impacting on our environment in ways we do not always understand and cannot always predict, but which are capable of making the earth uninhabitable.

## A force for justice

A more just and responsible approach to technology is fundamental if we are to solve these global social and environmental challenges, prevent more irreversible damage to our planet and defuse future resource-based conflict.

Financial and political commitments made in support of the UN's sustainable development goals now provide a platform to radically change the direction of technology and development.

Exciting and rapid innovations in big data and ICTs offer revolutionary opportunities to share information and hold people to account. Diverse actors are creating new partnerships with the aim of developing more shared and open technologies, more sustainable paths and circular economies, and innovations that positively disrupt the status quo.

Now is the moment to harness this energy to find a new path for technology development and use. One where technology is used to ensure everyone on the planet today can enjoy a basic standard of living. And where technology is used in an environmentally sustainable way that will ensure the same for future generations.

This is Technology Justice.

Technology Justice demands an urgent paradigm shift in the global approach to innovation, technology and international development.

- We must increase access to technologies, often existing ones, to ensure that all people are able to meet their essential needs.
- We need new governance mechanisms that can more effectively curb the use of technologies that adversely affect the environment that we depend on to survive.
- And we need technological innovation that can reduce the environmental and social impacts of technology use and the consumption of natural resources.

# ACCESS TO TECHNOLOGY AND ITS BENEFITS ARE NOT FAIRLY SHARED

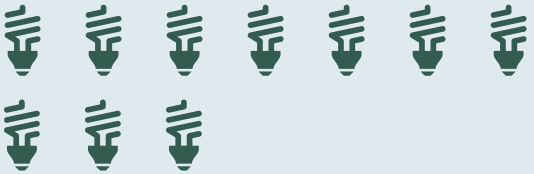
PRODUCERS OF FOOD IN DEVELOPING COUNTRIES

TARGETS OF EXTENSION SERVICES

GLOBAL HEALTH RESEARCH ON THE HEALTH PROBLEMS OF DEVELOPED COUNTRIES

GLOBAL HEALTH RESEARCH ON THE HEALTH PROBLEMS OF DEVELOPING COUNTRIES

ANNUAL ENERGY USE OF A TYPICAL A+ RATED FRIDGE-FREEZER



ANNUAL ENERGY CONSUMPTION OF AN AVERAGE ETHIOPIAN

# The injustice of who can access technology

There are many things that stop poor and marginalized people accessing or using the essential technologies that others take for granted, and many reasons for these barriers:

- Poor people are not regarded as priorities for public investment.
- Their rights to access technologies and technical knowledge are overlooked.
- Their potential as technology innovators is ignored.
- Technologies are often unaffordable for the poor.

These, and other barriers, exist to different extents and ways in different places and sectors. Each of them must be overcome to ensure that all people have an equal opportunity to access existing technologies that are essential to achieving a minimum standard of life.

## Inadequate public investment priorities

Nearly 1 billion people live in the dark, with no access to electricity. And at least another 1 billion have only intermittent access to poor-quality electricity (IEA, 2011). This means no energy to cook or keep warm, no energy to store or process food, no energy to repair or run machinery. It means no energy in schools or health centres, or to provide water or lighting.

Most of those without electricity live in rural areas. To reach them, 65 per cent of any additional investment will need to be in off-grid technologies, such as solar home systems or mini grids (IEA, 2011).

But governments and international finance institutions continue to focus on investing in grid-based technologies. The result is that those who already have access to the grid – mostly industry and urban high-and middle-income domestic consumers – are prioritized over the millions of rural poor and urban slum dwellers with no access to the grid.

Inappropriate institutions, policies and financial instruments drive and perpetuate this injustice. There is a perfectly feasible target – that by 2030, every household in the world will have access to affordable, reliable, sustainable and modern energy – but we need significant change to address the inherent bias towards grid technologies in order to achieve this goal.

A new generation of renewable and off-grid technologies makes it easier and more affordable than ever to provide the electrical energy people need – even in remote communities.

# The power of off-grid energy technologies for remote communities

In April 2015, an 80-kilowatt micro-hydro generator was commissioned in the village of Himalaya in Zimbabwe. The generator powers a range of applications, including electricity for 100 homes and two energy centres. At the centres, lanterns are recharged so that lighting can reach more far-flung households. The scheme also powers water pumps to irrigate 14 hectares of land, cold storage for crops, a saw mill and a grinding mill, as well as providing energy for the local health clinic.

## No right to access technology

In informal settlements in Dhaka, Bangladesh, many people lack access to safe drinking water. This is not because of the absence of technology – the mains water pipes are often already there, buried in the ground and providing supplies to their middle-class neighbours. It is because, as slum dwellers, they occupy informal settlements that are not recognized by government, and so they are excluded from entering any form of supply agreement with Dhaka's water utility.

Instead, slum dwellers typically buy drinking water from water vendors, at up to 10 times the price they would pay if they were connected to the water utility. Despite the fact that slum dwellers are able to pay for clean water, and the fact that the necessary technology is available, their lack of formal land tenure rights trumps their right to water and excludes them from access to this most basic of services. The injustice is not an absence of technology, but the unfair exclusion of certain groups to access technology that already exists.

## Technical knowledge remains out of reach

Smallholder farmers, fishers and herders play a key role in global food security, feeding an estimated 70 per cent of the world (ETC Group, 2009). Yet many produce food for themselves and the market with little external support and poor access to the technologies and technical knowledge that could ease their physical burden and improve their productivity.

The right technical knowledge could be transformational for smallholder farmers. Techniques exist to improve soil fertility and moisture content, to manage pest and disease threats, and to sustainably increase productivity, but often this information is not available to those who need it.

Government extension services that traditionally provide this knowledge and advice to smallholders are underfunded and in decline. Services financed by donors and the private sector tend to focus on opportunities with the highest commercial return, not smallholders. And women are largely ignored – although they play a major role in household production and comprise 43 per cent of the agricultural labour force in developing countries, they receive just 5 per cent of all extension services (FAO, 2011).

As a result, smallholder farmers face increasing obstacles to accessing the technical knowledge that could transform the production of food on the often marginal lands they farm, with spillover benefits for local and global food supplies.

# Business model innovation gives slum dwellers access to water

In Mukuru, a slum in Kenya, land tenure issues have been sidestepped by including slum dwellers in the design of new business models for water delivery. A network of formal water points and accredited vendors overcomes the need for a legal land right and a tap in your home. This approach has also reduced water theft and has given slum dwellers access to affordable water and the technology on their doorstep.

## Affordability, cost and patents

For many poor people, even essential technologies are unaffordable. Around 30 per cent of the world's population has no access to basic medicines (WHO et al., 2009).

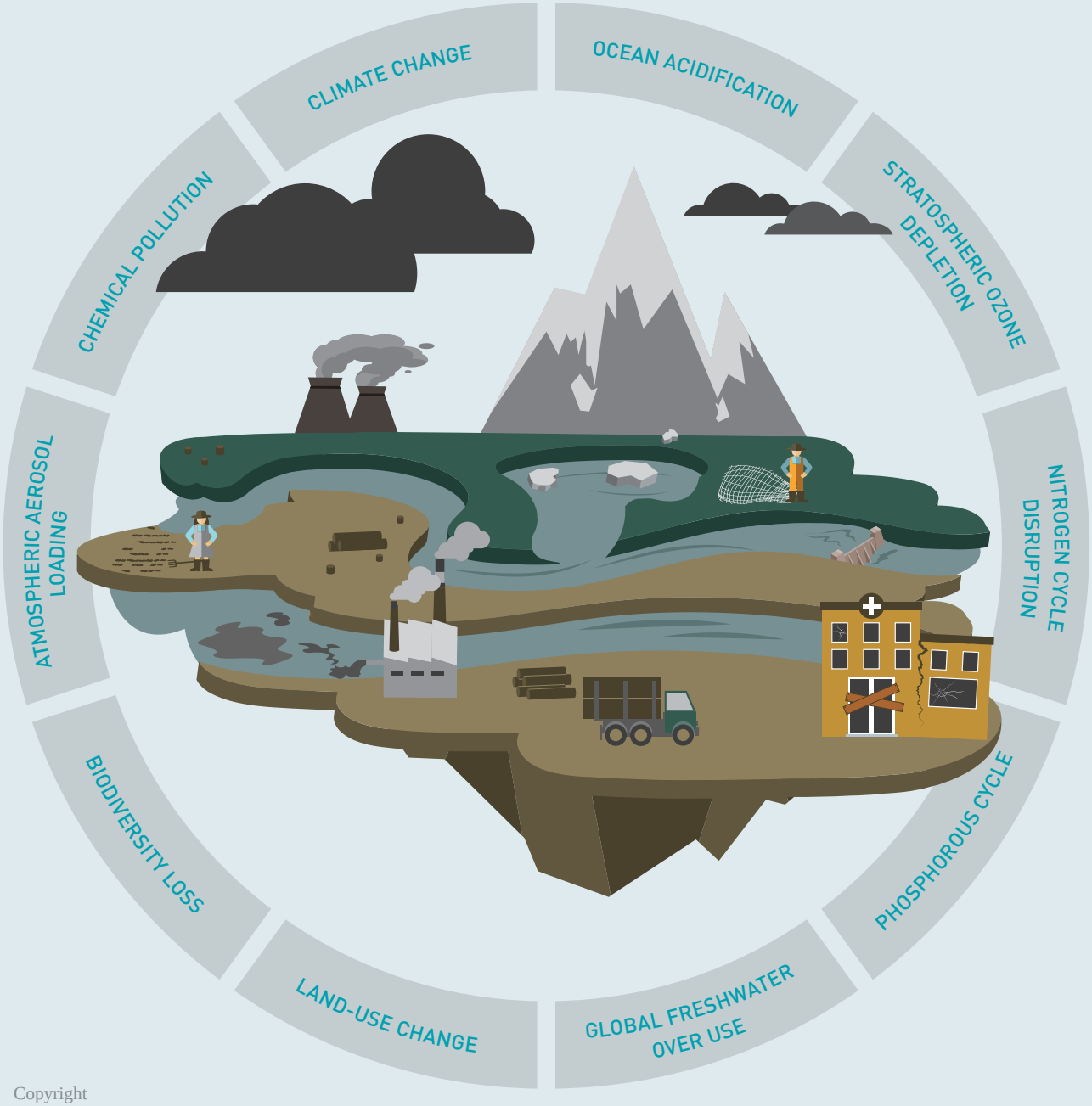
In the developing world, most medicine purchases are funded by individuals: they aren't provided by the state or by health insurance. Many people simply can't raise the money they need, even if the medicine is available. For others, the cost of a serious illness pushes the household into debt and poverty.

Low incomes make technologies less affordable. But poor people are also asked to pay more for those technologies.

Taxes, duties, procurement and distribution costs all have an impact on the price of medicines, but so does the source of those medicines. A survey of developing countries found that the average lowest-priced generic medicines cost more than six times the international reference price in the private sector, compared with 2.5 times in the public sector (UN, 2008). The public sector often subsidizes the cost or has a lower mark-up, but, in developing countries, medicines are more likely to be available through the private sector and so they cost more.

High levels of intellectual property protection in developing countries also exacerbate this injustice by delaying generic competition – one of the ways of reducing medicine prices in a sustainable way. One positive development is tiered pricing structures, which are operated by some companies to allow the same drug to be sold at different prices in different markets.

# OUR TECHNOLOGY USE IS PUSHING OUR PLANET TO CRISIS POINT



# The injustice of how technology is used

All people should have the right to use essential technologies that can help them live well. But the way we develop and use technology is creating another type of injustice – one that prevents others from achieving the same basic standards of living.

The unsustainable use of technologies is damaging the environment in which we live now, depleting resources and stacking up problems for future generations – sometimes in ways we do not yet understand and cannot control.

As a result, many of the technological advances of the last century, that seemed to promise better living standards for us all, are now pose the greatest threats to the living standards of future generations.

If we want to continue to enjoy the benefits of technology, without causing irreversible damage to our planet, we need to limit the use of some technologies, innovate more sustainable technologies, and adopt a just approach to how environmental costs are borne.

## Loss of biodiversity and our future food security

Large-scale commercial agricultural approaches and technologies are reducing the genetic diversity of the livestock and crops we rely on for food. This poses a significant risk to the long-term security of future food supplies and production systems.

Commercial agriculture prioritizes new high-yield wheat, rice and maize technologies and displaces traditional food crops and local varieties. This has led to gains in terms of yield and productivity, but at an unaffordable cost. Each year since the 1990s, we have lost 2 per cent of the remaining genetic diversity of wheat, rice and maize. And it's the same story in the livestock sector – on average, just five breeds now dominate commercial production of each of the five main livestock species (ETC Group, 2012).

This loss of diversity limits the genetic pool we can draw on to develop crops that will be able to cope with future climatic conditions and new pests and diseases. It also puts today's food systems at greater

risk of pandemics such as swine flu and avian flu. Large concentrations of genetically uniform livestock or crops can quickly be wiped out by disease outbreaks.

Compounding this, the use of pesticides and herbicides has had a variety of effects on the wider environment – from reducing the number of pollinators such as bees, to the destruction of species in our natural waterways.

With our climates changing, it is clear that this loss of biodiversity is threatening the resilience of our food chain. We must prevent further biodiversity loss and protect the ecosystem in order to reduce future risk. One way to do this is to develop agroecological approaches that increase productivity in a locally appropriate way, with the minimum use of chemicals. There is growing evidence that these methods can lead to significant and sufficient increases in yield (Henderson and Casey, 2015).

There are other advantages, too. More diverse crops mean a more varied diet, food availability for a greater part of the year, and more stable income-earning opportunities, particularly for low-income groups.

## Addiction to fossil fuels

The burning of fossil fuels accounts for two-thirds of total global carbon emissions (IPCC, 2007). We now know that to keep global warming under 2°C and avoid the most extreme impacts of climate change, we must rapidly reduce these carbon emissions and stabilize the amount of $CO_2$ in the atmosphere.

Global target setting, good policy prescriptions and post-Kyoto climate negotiations have not yet set us on this path. In part, this is because of opposition from the fossil fuel industry, which has acted to defend and prolong the injustice of fossil fuel use. Remarkably, these vested interests have ensured that fossil fuels continue to be subsidized to the tune of £5 trillion a year. Removing this subsidy alone would reduce global $CO_2$ emissions by an estimated 20 per cent (IMF, 2015).

The current rate of technological advances on alternative energy, including renewables and energy storage, is not fast enough. Sustained and serious action is needed. This must include significant investment in research and development (R&D) for affordable, decentralized, renewable energy technologies. We must finally agree and enforce effective global targets and policy prescriptions to avert the worst effects of climate change today and tomorrow.

# New farming systems that respect and protect biodiversity

In Peru, coffee farmers are using agroforestry approaches that encourage biodiversity. They do this by integrating coffee plants with local trees, rather than felling the forest. Using improved techniques, such as integrated pest management and the production of organic manure, farmers reduced coffee plant disease from 73 per cent to 18 per cent and increased production by 33 per cent in one year.

The UN Sustainable Energy for All initiative (SE4ALL) is galvanizing commitments in this area. SE4ALL has three objectives:

- ensure universal energy access;
- double the rate of energy efficiency improvements; and
- double the share of renewable energy.

Germany has led the way by setting a target of 45 per cent renewable energy by 2030. This target has encouraged major advances in the renewables sector, and these are already significantly reducing $CO_2$ levels and providing thousands of new jobs.

## Antibiotic misuse and resistance

The careless use of antibiotics has caused new antibiotic-resistant bacteria to evolve. Growing numbers of bacteria are already fully resistant to every available clinical antibiotic. Today, these bacteria are claiming 50,000 lives each year across Europe and North America alone, and, if new antibiotics are not found, the annual death toll could reach 10 million by 2050 (Review on Antimicrobial Resistance, 2015).

The primary cause of this situation has been the overuse and misuse of antibiotics and other antimicrobials in human and animal health. This includes the widespread and inappropriate prescription of antibiotics in the developed world, and the use of partial doses of weak antibiotics, which is common in the developing world where people may have poor advice or can't afford a full course.

Up to 80 per cent of antibiotics used in the USA are fed to animals; these are used not only to treat disease, but also in disease prevention and as growth promoters (The Scientist, 2014). This provides the ideal breeding ground for drug-resistant bacteria.

This global antibiotic resistance pandemic is one of the most urgent issues in modern healthcare. Yet the research response is insufficient, because the pharmaceutical industry is not ready to fully invest until commercial returns become clear – and that will only be when resistance has fully emerged.

# The injustice created by technological innovation

More often than not, patterns and processes of innovation mirror and exacerbate existing injustices in people's access to and use of technology. Technological innovation is not driven by a focus on the most pressing social and environmental challenges we face. It is not targeted enough on improving the conditions of those living in poverty. And the gains and risks of innovation are distributed unevenly between public and private sources of investment.

We must learn from past mistakes and today's injustices. We must change the way in which innovation is guided and governed to ensure that today's technological innovation – which is more prolific than ever – will deliver a sustainable future for all people and will safeguard our planet. First and foremost, we need to examine and re-engineer the drivers of technological innovation today.

## Rethinking the drivers of innovation

The case of health. In 1990, research revealed that just 10 per cent of global health research expenditure was spent on the health problems of developing countries, despite the fact that more than 90 per cent of the world's preventable deaths occur in those countries. This is known as the 10/90 gap.

Today, the distribution of the global disease burden is different, research funding has increased eight-fold, and a variety of new approaches to innovation have been suggested and tested to encourage action on previously neglected areas of health research. But there is still a mismatch between the R&D undertaken and the R&D required (Viergever, 2013).

Two major factors tend to ensure that the 10/90 gap remains. Firstly, there is no effective global mechanism either to prioritize health R&D investments or to coordinate investments and ensure that there is no duplication of effort. Secondly, about 60 per cent of all health R&D funding comes from the private sector and therefore focuses on products that will produce the best financial return, rather than meeting the greatest need.

A Global Heath Observatory was established at a World Health Assembly in 2013; this has the potential to provide an oversight function. But discussions on a pooled funding mechanism that might help fund prioritized research were postponed by member states until at least 2016, and commentators are sceptical about whether such funding will ever be made available.

The case of agriculture. In the developing world, private-sector investment in agricultural research is almost non-existent. In 2000, it accounted for just 2 per cent of total agricultural research, compared with 55 per cent in the US.

This leaves agricultural research in developing countries almost entirely reliant on public funding, which is in short supply. As a result, there is a big discrepancy in the resources available for technology innovation in the developed and developing world – in 2000, the US spent $574 billion on agricultural research in total, while the whole of sub-Saharan Africa spent just $4 billion. And this means that research into technologies that could transform the livelihoods of smallholder farmers in the developing world is minimal.

Private-sector investment in R&D tends to focus on areas where the products are more easily patented and monetized, such as fertilizers, herbicides, machinery, and hybrid seeds that have to be replaced every year or two. But these technologies are often not appropriate for subsistence farmers on marginal lands, such as in sub-Saharan Africa. Because of this, the private sector tends to view markets in many low-income countries as either too small or too poor to be worth any investment in new product development.

In the developed world, research often focuses on products with intellectual property rights that can be enforced. But this is itself a barrier to research investment in appropriate agroecological forms of agriculture, as these technologies emphasize knowledge and techniques that are difficult to patent. The lack of research into agroecology ensures the continued imbalance between this and conventional but unsustainable high-input forms of agriculture.

# Agroecological technology: great potential and great need

Building on local and regional knowledge, innovative small-scale farmers and the private sector in Nepal, have been working together to plug the agroecological research gap and create new market opportunities.
Integrated rice–duck farming is an agricultural innovation with many benefits. Ducks help the rice grow by eating pests and weeds, minimizing the need for pesticides and reducing the amount of labour required. The movement of the ducks also increases the oxygen and nutritional content of the water, resulting in increased yield.
New markets for ducklings and duck meat have created new revenue streams for farmers and have encouraged private-sector investment, both of which have been vital to the success and scale-up of the approach.

New drivers and a new direction for innovation. Looking at just these two sectors – health and agriculture – it becomes clear that the predominant global drivers of technology R&D are unjust. They do not respond to societal challenges or focus on improving the lives of millions of people living in poverty. Instead, they replicate existing inequities of access to technological innovation. New incentives are needed to ensure sufficient private investment, and to make sure that investment leads to public good in technology development – for health, agriculture, and all other sectors.

This is not just an issue of private-versus public-sector investment. Even publicly funded research does not always focus on the areas of greatest need. There is often duplication of effort and an emphasis on fashionable research topics at the expense of marginalized but potentially important areas for progress, such as 'orphan diseases' or agroecological approaches to food production. Improved global governance and coordination of research agendas are therefore fundamental in getting the right balance and focus in research and innovation investment.

## A fairer share of risk

Science and technology innovation also poses risks. We can't anticipate with certainty where a particular line of research will take us, how it will be used, or what its impact will be. Our history is littered with failures to heed warnings about some of these risks – from the neuro-toxic effect of lead in petrol to the disastrous impact of insecticides on honey bee colonies in France. We face many more challenges ahead – the as yet unforeseen consequences of our use of GM and nano technologies being but two.

In the 2008 global financial crisis, private banks made huge profits from speculation but then had to be bailed out by the state when these deals went bad. There is a risk that, in a similar fashion, the gains from technology innovation will be accumulated solely by private individuals while the risks have to be shouldered by the public.

The idea of a precautionary principle to better manage risk has widespread theoretical acceptance. There are 13 international treaties that reference aspects of it (Gee, 2013). But the lack of a consistent definition adds to the confusion around how it can be applied in order to avoid or reduce potentially serious or irreversible threats to society and the environment. Creating a common consensus around what the practical application of the precautionary principle would look like is clearly important if we are to manage the risks inherent in science and technology research and innovation.

## Fairer returns on innovation

A just system of innovation must also share any resulting benefits from technologies in a fair way. National innovation systems are founded on the interactions between a wide range of public and privately funded institutions. These systems create an environment in which innovation happens and they finance the basic research that companies can draw on. But the gains and risks arising from innovation are not always distributed fairly according to the public and private investments that allowed it to happen in the first place.

Research is now challenging the view that the state is a bureaucratic institution that should step back while commerce takes risks and innovates. Professor Mariana Mazzucato is a leading advocate of this view (Mazzucato, 2013). It is the state that makes high-risk investments in cutting-edge research, while venture capitalists are prepared to take on the challenge only once the basic work is completed.

Mazzucato uses the iPhone as an example of a product that seems highly entrepreneurial but in fact is almost entirely dependent on technologies developed through government-funded programmes – from the internet and GPS systems to its touch-screen display and the voice-activated Siri. In reality, the state plays a huge role, investing not just in fundamental research projects but in the systems that allow that research to take place. We need greater awareness of the state's role in research, and we need to recognize the possibility of the state recouping some of the investment on which successful innovations (such as the iPhone) depend. This would allow the state to reinvest in national innovation systems.

# TECHNOLOGY JUSTICE CAN DELIVER A DIFFERENT FUTURE

One which ensures the wellbeing of all people and our planet

# It is time to create a just future

A different future is possible, and a different future is needed urgently.

A future in which the benefits of technologies are shared more fairly. Where the risks are shared more fairly – and managed better too. And where innovation is directed towards our most pressing social and environmental challenges.

In this future, we understand the critical importance of technology for both rich and poor communities and for the future of our planet. Technology is firmly at the heart of efforts to achieve the UN's Sustainable Development Goals.

To create this future, there must be a radical change in the way technology is governed. We need to create a more just space for technology access, use and innovation. We need Technology Justice.

The following four key changes must be part of our approach.

## A just direction for innovation

We need to change the direction and purpose of innovation in order to deliver technologies that create just social and environmental outcomes. This will require global targets and commitments, and transparency on the incentives that support and direct R&D. We need to start to even up the geographical spread of innovation and its costs and benefits.

It requires the removal of barriers to just innovation. This means overhauling patent systems that are no longer fit for purpose and have become an obstacle rather than an incentive to creating technologies that can benefit everyone. It means adopting a precautionary principle that spreads the risks of innovation fairly.

And it means the long-overdue removal of subsidies supporting technologies that imperil our planet, such as fossil fuels. It is time to disinvest from these technologies and to invest instead in the accelerated development of sustainable alternatives, and in innovation that delivers on needs that are difficult to commercialize.

We need new global mechanisms, such as the proposed Global Health Observatory, to identify and agree key technologies that are essential for the wellbeing of everyone on the planet. The key technologies that do not yet exist in a form that is accessible by all must become global innovation priorities. In this way, innovation can be connected to and driven by the technologies that we need to meet the UN's sustainable development goals.

There are exciting possibilities to be seized in this new connected age. The growing open source movement is creating new channels for non market-driven innovation and for sharing technical knowledge and technology. This, along with the ICT and data revolutions, provides an opportunity to challenge and disrupt traditional innovation systems. It means we can open up, inspire and connect global and local innovation potential.

## Building strong and inclusive national innovation systems

Countries with strong national innovation systems are more able to make just technology choices and investments, nurture locally appropriate technology adaptation and innovation, and manage the opportunities and threats of today's fast-moving technology environment.

In many developing countries, innovation systems can be strengthened at local, regional and national levels through increased spending on local R&D and by building on existing technical and innovation skills, knowledge and capacity. Improved technical skills and knowledge are also important as a technology resource for the wider population. Knowledge systems must work for poor people, women and marginalized groups, and enable and encourage their participation in technology innovation and decision-making.

Greater and more diverse participation from local to global level is key to ensuring that innovation serves the needs of the whole of society. And participation can also start to redress power issues that prevent certain groups from accessing or using existing technology.

# New technologies breaking down barriers to knowledge

A new generation of ICTs can enable people to access knowledge in innovative ways. In Zimbabwe, a country notable for its efforts to focus extension services on its many women farmers, podcasts on farming techniques have been a huge success. Shared by MP3, podcasts are preferred to radio or printed literature, as users do not have to be able to read and they can listen whenever it suits them. Podcasts can easily be recorded in local languages too. Mobile phones also enable farmers to access market data and make informed decisions based on up-to-date agricultural information.

## A greater role for the state

The state has a part to play in creating and supporting national innovation systems.

Through regulation, it can shape innovation in ways that either support or work against the development of socially and environmentally useful technology. It plays a crucial role in ensuring that technology, innovation and knowledge reach the most marginalized: those sections of the public that cannot express demand in a way that allows a commercial solution. And it finances a wide range of elements of national innovation systems and much of the basic research that private-sector entrepreneurs rely on when developing commercial products.

There needs to be greater recognition of these roles and of the entrepreneurial and risk-taking capabilities of the state. This must be factored into the development of investment strategies and rules that can deliver innovation that is socially and environmentally useful. This may include the state sharing in the benefits of successful commercial innovation in order to reinvest in further support to R&D – not just acting as the risk-holder of last resort.

## New market rules

Market activity, guided by the right incentives and regulation, can have a significant role in providing access to technologies and steering innovation towards solutions for a sustainable future (Cross, 2013).

But current market rules have largely failed to ensure justice in people's access to and use of technology. They have led to wasteful and often harmful technology use, and to a divided world in which those with the ability to pay enjoy more than their fair share of the benefits of innovation.

New market rules are required to fix this. Above all, these rules must recognize the cost of critical impacts such as environmental damage. Currently, businesses do not account for these costs to any sufficient extent. We cannot allow the gains to be privatized while the risks are not.

But we also need new market incentives, both to take a more sustainable approach and to reach out to people with needs that are not met by current markets. A number have been tried already – advance commitments by donors to guarantee an initial market for a critical drug that's yet to be developed and grand challenge prizes, among others. We need to see more public funding being used to stimulate R&D into problems that are critical but currently lack market drivers.

# A call to action

These changes won't happen on their own. They require massive political, social and technological shifts. And there is much at stake. Our success or failure will affect us all – north and south, rich and poor.

We have a strong platform from which to start: the evidence is clear, the aims compelling, and the costs of failure catastrophic. Practical Action wants to build on this to mobilize a movement for Technology Justice: a clamour of voices demanding urgent change and working to fix a broken technology system.

Do you share this vision? Do you thirst for a technology revolution? Then we want to work with you. We are seeking like-minded individuals and organizations who want to take action for a different future, and who believe we can achieve this together.

We see three key areas for action.

## Strengthening the case for Technology Justice

We want to build a body of evidence and knowledge, highlighting the barriers and opportunities to achieving Technology Justice. With this evidence, we can build a groundswell of understanding, rage and urgency to create change.

Let's blow the cover on continued technology injustice. Help us complete the picture of who, how and where people are unable to access the critical technologies that they need for a decent life. How and where are technologies and innovation being used in a way that perpetuates injustice and imperils our shared future? What needs to change? And who needs to do it?

Let's highlight and share stories of success. Where is technology being adapted, adopted and innovated by and for local communities to meet their basic needs? How are technology and innovation being applied to create a more sustainable future? Who are the Technology Justice heroes making it happen at local, national and international levels, in the private sector or in government agencies?

## Raising our voices to challenge technology injustice

Let's confront those who need to change with our evidence of technology injustice. And let's advocate a new direction. We can all make a stand: technology innovators, technology users, civil society, policy-makers, private sector and researchers. Together we can raise our voices and use our influence in local, national and international forums to demand that the technology needs of all of humanity are met and our planet protected. For example:

- Pushing for technology injustice to be addressed in the national implementation of the Sustainable Development Goals.
- Advocating for Technology Justice in access to, use of and innovation in technology to inform the design of the new UN Technology Facilitation Mechanism.
- Driving national implementation the Paris Climate Accord with new vigour.
- Challenging approaches that are over-reliant on markets or patents, or are prone to misuse.

## Forging a new path together, for a Technology Justice revolution

Let's create new alliances and partnerships. Overhauling the technology system to achieve Technology Justice will require a shake up of how we work, independently and also together. This will include:

- Support strengthened local, national and international innovation systems.
- Create innovative ways of working that include bottom-up, pro-poor technology development. and lead to better access, greater innovation, and a more sustainable use of technologies.
- Champion environmental and climate justice movements seeking to ensure that poor and marginalized communities have a voice in how environmental change is managed.
- Support movements working to build scientific independence and capacity in the developing world.
- Work with open-source movements seeking to break open the innovation system and break down barriers of intellectual property rights.
- Support circular economy movements seeking to create a new economy that values reuse, recycling and regeneration of resources, and reduces waste and over-consumption.
- Pilot, innovate and test new approaches to overcome technology injustice.

# We can all be part of a movement for Technology Justice: a clamour of voices demanding urgent change and working to fix a broken technology system

# Be part of a movement for Technology Justice!

## Join the debate:

**On LinkedIn:** Join the Technology Justice group

**On Twitter:** #techjustice @tecjustice

**Online:** policy.practicalaction.org/technologyjustice

This is where the technology revolution starts. This is a call to action.
What can you do to drive more just technology choices and investments?
Get in touch, share your ideas, challenge ours, and let's act together for Technology Justice.

# Get in touch:


**In the UK**

Amber Meikle
technologyjustice@practicalaction.org.uk
practicalaction.org

**In Southern Africa**

Abisha Damba
technologyjustice@practicalaction.org.zw
practicalaction.org/southern-africa

**In East Africa**

**Regional office:** Diana Ngaira
technologyjustice@practicalaction.or.ke
practicalaction.org/eastafrica

**Sudan office:** Muna Eltahir
technologyjustice@practicalactionsd.org
practicalaction.org/sudan

**In South Asia**

**Regional office:** Prem Thapa or Achyut Luitel
technologyjustice@practicalaction.org.np
practicalaction.org/south-asia

**Bangladesh office:** Faruk Ul-Islam
technologyjustice@practicalaction.org.bd
practicalaction.org/bangladesh

**In Latin America**

Carlos Frias
technologyjustice@solucionespracticas.org.pe
solucionespracticas.org (Spanish)
practicalaction.org/latin-america (English)

**In West Africa**

Mary Allen
technologyjusticewa@practicalaction.org.uk
practicalaction.org/fr (French)

# References


Cross, J. (2013) 'The 100th object: solar lighting technology and humanitarian goods', *Journal of Material Culture* 18 (4): 367–87.

Edenhofer, O., Bauer, N. and Kriegler, E. (2005) 'The impact of technological change on climate protection and welfare: insights from the model mind', *Ecological Economics* 54 (2–3): 277–92.

ETC Group (2009) *Who Will Feed Us? Questions for the Food and Climate Crises*, Ottawa: ETC Group.

ETC Group (2012) 'The ETC report: the poor can feed themselves', in P. Pojman, *Food Ethics*, Boston: Wadsworth.

FAO (2011) *The State of Food and Agriculture 2010–2011*, Rome: Food and Agriculture Organization of the United Nations (FAO).

Gee, D. (2013) 'More or less precaution?', in EEA, *Late Lessons from Early Warnings, Science, Precaution, Innovation*, pp. 643–69, Luxembourg: European Environment Agency (EEA).

Henderson, C. and Casey, J. (2015) *Scaling Up Agroecology Through Market Systems: Using Technology Justice in Agriculture to Leave No One Behind*, Rugby, UK: Practical Action Publishing.

IEA (2011) *World Energy Outlook. Energy for All: Financing Access for the Poor*, Paris: International Energy Agency (IEA). First presented at the Energy for All conference, Oslo, October 2011.

IMF (2015) *How Large are Global Energy Subsidies?*, Washington: International Monetary Fund (IMF).

IPCC (2007) *Climate Change Synthesis Report*, Geneva: Intergovernmental Panel on Climate Change (IPCC) <www.ipcc.ch/publications_and_data/ar4/syr/en/figure-spm-3.html> [accessed 15 October 2015].

Liu, I.J.H. (2012) 'Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000', *Lancet* 379 (9832): 2151–61.

Mazzucato, M. (2013) *The Entrepreneurial State: Debunking Public vs. Private Sector Myths,* London: Anthem Press.

Myers, N. (2005) 'Environmental refugees: an emergent security issue', in *13th Meeting of the OSCE Economic Forum, 25 May 2005, Prague*, Vienna: Organization for Security and Co-operation in Europe (OSCE).

O'Hagan, E.M. (2015) 'Mass migration is no "crisis": it's the new normal as the climate changes', *The Guardian*, 18 August< www.theguardian.com/commentisfree/2015/aug/18/mass-migration-crisis-refugees-climate-change>. [accessed 4 November 2015].

Raworth, J. (2012) *A Safe and Just Space for Humanity: Can We Live Within the Doughnut?*, Oxford: Oxfam.

Review on Antimicrobial Resistance (2015) *Securing New Drugs for Future Generations: The Pipeline of Antibiotics*, London: Review on Antimicrobial Resistance.

Rockström, J., Steffen, W.L., Noone, K., Persson, Å., et al. (2009) 'Planetary boundaries: exploring the safe operating space for humanity', *Ecology and Society* 14 (2): 32.

*The Scientist* (2014) 'Overcoming resistance', *The Scientist*, 1 April <www.the-scientist.com/?articles.view/articleNo/39512/title/Overcoming-Resistance/> [accessed 17 July 2015].

UN (2008) *Delivering on the Global Partnership for Achieving the Millennium Development Goals: Millennium Development Goal 8*, New York: United Nations (UN).

UNIFEM (2008) *Progress of World's Women: Who Answers to Women? Gender and Accountability*, New York: United Nations Development Fund for Women (UNIFEM, now UN Women).

Viergever, R.F. (2013) 'The mismatch between the health research and development (R&D) that is needed and the R&D that is undertaken: an overview of the problem, the causes, and solutions', *Global Health Action* 6: 22450 <http://dx.doi.org/10.3402%2Fgha.v6i0.22450> [accessed 4 November 2015].

WHO (2014) *WHO's First Global Report on Antibiotic Resistance Reveals Serious, Worldwide Threat to Public Health*, Geneva: World Health Organization (WHO) <www.who.int/mediacentre/news/releases/2014/amr-report/en/> [accessed 13 October 2015].

WHO, UNICEF and World Bank (2009) *State of the World's Vaccines and Immunization*, 3rd edn, Geneva: World Health Organization (WHO).

World Bank Group (2015) *SE4ALL Global Tracking Framework*, Washington: World Bank Group <www.worldbank.org/en/topic/energy/publication/Global-Tracking-Framework-Report> [accessed 28 October 2015].

# Acknowledgements

*Technology Justice: A Call to Action* was produced by Practical Action. It was written by Amber Meikle. Simon Trace provided invaluable input, support and information from his book *Rethink, Retool, Reboot: Technology as if people and planet mattered*. Astrid Walker Bourne, Jonathan Casey, Paul Smith Lomas and Toby Milner joined Amber and Simon on the steering group that provided the direction for the content of this publication. Achyut Luitel, Carlos Frias, Diana Ngaira, Faruk-Ul-Islam Omer Fadlallah and Prem Thapa provided valuable feedback and insight. We would like to thank the peer reviewers who provided feedback:  Megan Lloyd-Laney, Neil Morisetti, Tamsyn Barton and Tim Clarke.