Introducing Technology Justice

A new paradigm for the SDGs

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As national governments, development actors, and businesses negotiate, commit to, and begin to implement Sustainable Development Goals for the next 15 years, Practical Action makes the case for Technology Justice to inform their actions and ambitions. This briefing paper introduces the arguments and opportunities for harnessing technology to help achieve universal and sustainable development in a world of technology inequality and rapid technological change. Subsequent briefing papers in this series will take a deeper look at specific challenges to and opportunities for achieving Technology Justice. These will draw on Practical Action's programmatic and policy work with technology as it interconnects with agriculture, climate change, energy, disaster risk reduction, inclusive markets, and urban services.

PRACTICAL ACTION
Technology challenging poverty

Executive summary

For many people, technology is so pervasive that it is hard to imagine life without it, and harder still to keep up with the constant technological change and innovation. At the same time, billions of people living in poverty around the world lack essential technologies that could help them to meet their basic needs. A stark inequality in who shares the costs and the benefits of technology exists, despite a clear understanding of the critical link between technology, poverty reduction, and well-being.

There is a critical link between technology, poverty reduction, and well-being

This paper introduces three key global technology injustices: inequitable access to existing technology; innovation that ignores the poor; and unsustainable use of technology. It goes on to explore these within the context of Practical Action's policy and programmatic experience.

The concept of Technology Justice envisages a world where everyone has access to existing technologies that are essential to life; and the focus of efforts to innovate and develop new technologies is firmly centred on solving the great challenges the world faces today: ending poverty and providing a sustainable future for everyone on our planet.

This paper makes the case for Technology Justice to be a guiding principle for the design and implementation of the Sustainable Development Goals (SDGs). It recommends key considerations to guide development planning and approaches towards addressing injustice in the three areas of access, innovation, and use of technology.

Global efforts to address these challenges include two proposed UN technology mechanisms that are intended to support strengthening of innovation capacity in developing countries, and increase international cooperation and sharing of technological research and knowledge. The potential role of these mechanisms is explored, along with the key challenge of how to incentivize private sector investment in technological innovation that meets the needs of 'base of the pyramid' markets.

This opening paper frames the issue of Technology Justice in the context of current and future technology and development planning. Further papers in this series will explore the challenges and opportunities for Technology Justice in different sectors of Practical Action's experience and expertise. We will present new evidence and learning from our work to contribute to and inform current debate. Where necessary they will provoke a rethink of development policy and practice which reinforces the drivers of injustice, particularly in our key goal areas of agriculture, disaster risk reduction, energy and urban services, and with regard to our cross-cutting themes of climate change and inclusive markets.

Technology, innovation and the future of development

The Sustainable Development Goals (SDGs) agreed in 2015 will define global development targets and goals for the next 15 years. Over this period, science and technology is expected to continue to change and advance at a rapid pace. If governed well, this technological change offers opportunities to accelerate progress towards achieving development for all people in a way that conserves the environment. But if governed poorly, new technologies have the potential to reinforce established power imbalances, further widen the technological divide between rich and poor, and create new social and environmental challenges.

Technological advances have enabled more people to meet their basic needs, improving well-being and increasing productivity, income, and life expectancy. However, technology can also exacerbate vulnerability, create new risks, and undermine the coping mechanisms of people living in poverty. Technology and development are inextricably linked and the successes and failures of each are bound together (Smith, 2009).

Because technology interacts with existing patterns of inequality and exclusion, it presents different challenges and opportunities for women, men, youth, the elderly, and other social and economic groups. When influence over the governance of technology disproportionately resides with a rich and powerful minority, at local or global level, the rights, wishes, and needs of those living in poverty are often ignored. This can result in serious negative impacts on the livelihoods and well-being of those excluded, and an increase in inequality and vulnerability.

The design and implementation of the SDGs must be guided by the principle of Technology Justice in order to achieve a sustainable development.

A world with Technology Justice would be one in which:

- **Everyone has access to existing technologies that are essential to life; and**
- **The focus of efforts to innovate and develop new technologies is firmly centred on solving the great challenges the world faces today: ending poverty and providing a sustainable future for everyone on our planet.**

Efforts to innovate new technology must be firmly centred on solving the great challenges the world faces today

This principle of Technology Justice presents a new paradigm to guide development planning and implementation through the constantly changing technology environment, to ensure fairness and inclusivity in how technology is governed, disseminated, innovated, and used. It demands that technology injustices are recognized and addressed through development and innovation approaches. It also demands a recognition that the way technology access, innovation, and use is governed will shape the implementation of the SDGs and development outcomes for billions of people living in poverty.

There are three interconnected types of technology injustice that exist and often undermine development and environmental efforts. These injustices can be explored within the context of different development sectors, in the case of different technologies, and in different local, national, and global contexts. The following sections introduce these three technology injustices, illustrated with examples from Practical Action's work.

Technology injustice: inequitable access to existing technology

Billions of people still do not have access to technologies that could assist them to meet their basic needs

Billions of people, particularly in developing countries, still do not have access to technologies that could assist them to meet their basic needs. The energy sector provides a clear example: 1.2 billion people have no access to electricity. In the least developed countries (LDCs) a staggering four out of five people are living without electricity (World Bank Group, 2015). Finding fuel is a daily chore, with high physical and time costs. This is despite the availability of the technology, the knowledge, and the means for everyone on the planet to have access to some form of modern energy.

Half of the world's population must still cook over open fires. As a result, close to 4 million people – mostly women and children – die from smoke inhalation-related diseases each year (ibid.) – considerably more than the 3.09 million deaths caused annually by malaria, TB, and HIV (WHO, 2014a). These people continue to live with the huge physical and time burden of finding fuel every day.

Traditionally, improving energy access has too often focused on connecting households to the grid. This approach fails to recognize the range of poor people's energy needs and available solutions, and neglects those living in remote, rural locations where grid connection is not prioritized, nor, in some cases, possible. A grid-dominated approach to delivery will mean that for hundreds of millions of people energy access will be as distant a prospect as it was decades ago.

Towards total energy access

To make progress towards achieving universal energy access by 2030 it is important that we recognize the range of services which poor people want, need, and have a right to. Practical Action has used its first-hand experience of working with poor communities to devise tools that will assist governments, NGOs, and the international community to understand these requirements. The *Poor people's energy outlook* series of reports from Practical Action pays special attention to the energy needed for households, livelihoods, and community services. It also proposes a framework for action along with indicators that can be used to measure country-specific progress.

Technology injustice: innovation ignoring the poor

According to the Royal Society, the world's total nominal research and development (R&D) spending was approximately one trillion dollars in 2010 (The Royal Society, 2011). This R&D remains mostly physically located in the global North, and is far more likely to be driven by market forces than global priorities. Health research is one clear example of this: just 10 per cent of worldwide expenditure on health research is devoted to the problems that afflict 90 per cent of the world's population – the so-called 10/90 gap that was first identified by the Commission on Health Research for Development (Viergever, 2013). Concerted international effort is required to set global R&D priorities that better reflect global social and environmental need.

One positive trend is the growing proportion of research and development is taking place in the global South, but significant investment is still needed to strengthen national innovation and research capacity in developing countries. Weak innovation capacity

An ‘eco toilet’ for improved sanitation in Bangladesh, Credit: Mehrab ul Goni © Practical Action

contributes to an over-reliance on technology transfer from North to South. Where transfer happens, significant adaptation is often required to make a technology appropriate to a new context. For example, the majority of flood research and associated technological development is conducted in temperate zones, while some of the most destructive floods occur in tropical zones. When this technology is transferred to a tropical zone, it is often ineffective because of differences in geography, infrastructure, local capacity, and data availability. In the worst case, this can put communities more at risk; it can create a dependency on external knowledge and capacity as well as displacing opportunities for local and more appropriate innovation.

The need for innovation in the water, sanitation, and hygiene (WASH) sector

Innovation must also happen in business and delivery models in order to ensure universal access. A recent analysis of investment in the WASH sector (WHO, 2014b) showed that the majority of investments in sanitation technology are made in urban areas, and that most is spent on large-scale infrastructure that does not reach poor people living in underserved or informal settlements. Meeting the SDGs on health, gender equality, water and sanitation access, equality, and inclusive cities, will require investment in on-site sanitation – toilets and waste treatment systems that are low-cost, safe, and effective. Innovative ways must be found to fund and encourage investment in small-scale technologies appropriate for underserved urban communities.

Practical Action is doing just this in Faridpur in Bangladesh, a city with no piped sewerage network. Despite 94 per cent access to on-site sanitation, inadequate containment, collection, and disposal of sludge poses significant health risks. By facilitating public–private partnerships, Practical Action is supporting Faridpur to develop an innovative, self-sustaining, city-wide sludge management system, that intends to lead to an increased demand for services, and enabling more effective use of existing technologies.

Technology injustice: unsustainable use of technology

The choice and use of technology can have both positive and negative impacts, on us, on those sharing the planet with us, and on future generations. Those who produce and use technology don't always bear the full costs of its production and use. One clear example is climate change, in part caused by a systematic reliance on fossil fuel-based technologies, particularly by industrialized states. Yet, it is some of the world's poorest people, often in countries with limited access to those same technologies, who are already bearing the devastating effects of climate change. These people, as well as generations to come will be forced to deal with the environmental impacts of the technology choices we are making today.

How technologies are designed, produced, and used can cause negative impacts at a more localized level, too. As we invest in increasing access to technology, we must ensure more sustainable consumption and production patterns are created, for example, planning sanitation systems that consume minimal water resources. Developed countries must also commit to and make dramatic improvements to sustainability in consumption and production.

Sustainable use of agricultural technology

The last five decades have seen massive advances in agronomy; for selected, high potential crops this has enabled staggering increases in yield. But, this requires that specific, controlled environmental regimes are maintained, including irrigation and the application of inorganic fertilizers, herbicides, and pesticides derived from fossil fuels.

Our knowledge of ecological systems has also developed, and we now have a deeper understanding of the synergies between plants, animals, and the environment, and the

Peruvian farmers displaying indigenous crop varieties © Practical Action Peru

connections between food production, market systems, nutrition, and well-being. There is now a widespread realization that such fossil fuel-based agricultural systems are not sustainable and, as the source of 13.5 per cent of global greenhouse gas emissions (Grist, 2015), make a significant contribution to climate change.

Those who plan policy and programmes, regulate and invest in agriculture need to re-evaluate how natural resources are used and the kinds of food systems we promote. Practical Action is calling for more investment in agro-ecological approaches that can rehabilitate degraded environments and increase productivity in a long-term and sustainable way. This more technologically just approach integrates traditional farming techniques with the latest scientific knowledge on ecological systems, to sustainably increase food security and well-being for billions of people.

Technology Justice and the SDGs

These three interconnected injustices in access, innovation and use of technology result from choices made in governing technological innovation and dissemination that exclude or bypass the poor. The SDGs present an opportunity to correct our global approach and set a new path towards more equitable and just use of technology for development that is both sustainable and universal.

The design and implementation of the SDGs must be guided by the principle of Technology Justice

The first step must be to acknowledge the critical role technology plays in delivering on each of the Sustainable Development Goals. Much of the discussion about science and the SDGs is narrowly concerned with big data and measuring achievement. New technologies undoubtedly have much to contribute in this area to further our understanding of development outcomes. However, this narrow focus risks overshadowing the more essential role of technology in implementing the SDGs in order to create development outcomes. The design and implementation of the SDGs must be guided by the principle of Technology Justice, to ensure that technology and innovation contribute positively to, and avoid undermining, sustainable development efforts. This approach demands that we address key barriers to fairer access, innovation, and use of technology. These will vary in different technology sectors and within different countries, but here we introduce some of the key global challenges which the SDGs must seek to address:

Equitable access to existing technology for meeting basic needs

- International collaboration around the SDGs provides a platform which should be used to jointly identify core technologies that underpin a minimum standard of life. Public funding and commercial regulation could then be tailored to create an environment that overcomes current barriers to universal access.
- Innovation and development approaches need to support a broader and more diverse technology choice. This is needed to open up a range of development pathways that can be tailored to different social, cultural, and economic environments.
- Communities and individuals must be supported to gain the skills and knowledge they need to choose, access, and use technologies that may contribute to their lives. This means investing in education as well as community-level services that can help people to access information and technical knowledge.

- International treaties that govern intellectual property rights, such as TRIPS (Trade-Related Aspects of Intellectual Property Rights: an international agreement administered by the World Trade Organization) should be revisited to rebalance in favour of developing economies, environmental sustainability, and poverty issues.
- More investment is needed to facilitate and incentivize market development for locally appropriate technologies. This may require subsidization, the provision of credit, or improving market access in order to make existing technologies and practices commercially viable.

Inclusive innovation focused on the needs of the poor and environmental good

- International collaboration is required to agree key global research and development priorities and incentivize and track investment against them.
- Increased national investment in research and development is needed in developing countries, guided by a clear national picture of innovation needs. Many developing countries have recently undertaken technology needs assessments supported by the United Nations Framework Convention on Climate Change (UNFCCC). Though focused on technologies for climate change mitigation and adaptation, these provide a useful starting point for further national assessment and agreement of priority needs.
- Strengthened national innovation systems and capacity are required – in developing as well as developed countries. These systems must seek to be inclusive of the diverse society, specifically including women and poor people in the innovation process.
- Science and technology policies should place more value on the potential of indigenous and local knowledge and incorporate it in innovation processes. This is likely to result in technologies that are more appropriate and more successfully adopted.

Technology use that considers social and environmental impacts

- As natural resource scarcity becomes an increasing reality, developed countries have a responsibility to address the wastefulness of their current 'take-make-dispose' linear technological approach, where many products end up as landfil, and move to a circular economy approach (Ellen MacArthur Foundation, 2012). The developing world, having long faced these pressures, can supply many successful lessons in innovative repair, reuse, and remanufacture of technology.
- New technologies may present opportunities for developing countries, particularly those with less developed infrastructure, to 'leapfrog' older technologies and invest in modern, cheaper, and greener technologies. Such investment decisions must always be informed by the likely positive and negative impacts on different groups, particularly the ability of poor and remote populations to access technologies. Developed and developing countries alike need to consider the long-term economic and environmental impacts of technology investments.
- A focus on both sustainable consumption and production must be central to achieving universal and sustainable development. Progress to increase access to technologies must consider the environmental impacts, promoting green technologies where possible, and avoiding creating unsustainable consumption patterns. This must be built into each of the individual goals to avoid the risk that implementation will undermine efforts to achieve sustainability.

The UN Technology Bank and Technology Facilitation Mechanism

The UN has recognized that development, particularly rapid economic development, requires technological change, and that the LDCs must be supported to increase their science, technology, and innovation capacity if they are to achieve the SDGs. Two mechanisms have been proposed to support this process: the UN Technology Bank and the Technology Facilitation Mechanism.

The Technology Bank is intended to assist least developed countries (LDCs) to build in the near- and mid-term a robust scientific research and innovation base for future technological development. Three pillars for the Bank have been proposed: a *science, technology, and innovation mechanism* to invest in national scientific research and innovation capacity in target countries; a *patent bank* that would help facilitate greater access to intellectual property rights and protected technologies while protecting commercial interests; and a *science and technology research depository facility* that would increase access to global scientific literature, research, and networks.

The Technology Facilitation Mechanism is envisaged as a longer-term approach, for the 'development, transfer and dissemination of clean and environmentally sound technologies' (UNDESA, 2015). It would be used to support capacity-building for and technical assistance to all developing countries, for technology development, transfer, and use. The form and structure of this mechanism has yet to be agreed.

Both mechanisms have the potential to contribute significantly to establishing improved national technology and innovation systems in LDCs that would be better able to create, adapt, and govern technologies for local and national needs. The success of these efforts will require significant financial and technical resources, long-term commitment

A market place in Bangladesh, Credit: Mehrab ul Goni © Practical Action

from international and national actors, and the political will to revisit difficult international patent and intellectual property negotiations for more just outcomes. Design and implementation of these mechanisms must strike a balance between increasing access to global innovations and technologies and supporting and not stifling robust and responsive national and sub-national innovation systems. They must also build on, not seek to replace, regional collaborations between key actors, including government, research institutes, financing bodies, private sector actors, and civil society.

The role of the private sector

Ban Ki Moon, Secretary-General of the UN, has called for 'urgent action … to mobilize, redirect and unlock the transformative power of trillions of dollars of private resources to deliver on sustainable development objectives' (UNGA, 2014). The majority of finance capital and expertise for technological development resides with the private sector; so how can development practitioners and policy makers incentivize private investment that is more inclusive of the needs of those living in poverty?

It has long been recognized that those living in poverty represent a great opportunity for the private sector, representing the base of a population pyramid, and a huge market for products and services (see, for example, Prahalad, 2006). It is therefore in the interest of companies to innovate products and services that are in demand by and affordable for this sector of society. Governments and other development practitioners have an important role to play in this process, through the facilitation of mutually beneficial and equitable working relationships between large, medium, and small enterprises and the end users they aspire to reach.

While this increased interest in the base of the pyramid brings great opportunity, it is also important to avoid a situation where solutions are parachuted in. Innovation should be user-centred and context-specific, where the situation, knowledge, and skills of those living in poverty are a fundamental part of the innovation process. Investment is needed in the process of facilitation, to support private sector actors to understand local contexts and the needs of end users. Market systems, despite their weaknesses and imperfections, often already exist, with actors positioned, existing laws and regulations, demands, and cultural preferences. Ideally, development practitioners should work to facilitate market system change and identify where private sector interests and development objectives align, for mutually beneficial outcomes.

The situation, knowledge, and skills of those living in poverty are a fundamental part of the innovation process

One constraint for businesses operating in developing countries that can also be tackled by development practitioners is the oft-experienced inability to access sufficient capital. Access to Capital for Rural Enterprise (ACRE) is a consortium project led by Christian Aid with support from Practical Action. ACRE facilitates access to finance loans of between £100,000 and £1 m for rural enterprises in developing countries with the potential to benefit rural consumers or to improve the ability of rural producers to engage with markets.

For example, through this type of investment mechanism, a water engineering company that Practical Action has been working with in Zimbabwe is seeking the capital to provide unserved rural communities with electricity through the construction of a hydropower station. The proposed installation will be 25 per cent owned by the local community and revenue from the sale of electricity will be used to enable sustainable agricultural production/marketing and other key community priorities.

Technology Justice: a paradigm for change

This paper has introduced a new paradigm to underpin the final design and implementation of the SDGs: Technology Justice. National governments, civil society, the private sector, and all other actors who will be central to delivering the SDGs must consider the fundamental role of technology in achieving those goals. There must be a deliberate effort to ensure that access, innovation, and use of technology is inclusive of poor communities, the impacts of technology on others and the environment are considered, and the benefits are more fairly shared. In this way we can overcome technology injustice and ensure that technology drives our universal well-being.

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Front page photo: A Tuin in Nepal that improves access to essential services for remote and marginalized communities
Credit: Anna de la Vega © Practical Action

Keywords: technology, technology justice, SDGs, innovation, sustainable development, sustainable development goals

Practical Action Publishing Ltd, The Schumacher Centre, Bourton on Dunsmore, Rugby, Warwickshire CV23 9QZ, UK
www.practicalactionpublishing.org

ISBN 9781853399107 Paperback
ISBN 9781780446240 Library PDF
ISBN 9781780449104 EPub

Meikle, A., and Sugden, J., (2015) Introducing Technology Justice: A new paradigm for the sustainable development goals, Rugby, UK: Practical Action Publishing, <http://dx.doi.org/10.3362/9781780446240>

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Design, editing and production by Practical Action Publishing
Printed in the United Kingdom