Transformation towards sustainable and resilient societies

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With the human population set to surpass 7.67 billion by the end of this year, the environmental challenges facing us are becoming ever more pressing. More than 50% of the world's population already lives in urban areas, a figure that is estimated to rise to 70% by 2050 (or 85%, when the suburbs and peripheral municipalities are taken into account). Cities generate 70-80% of global GDP, and account for 70% of green-house gas emissions. The role of cities as economic engines is especially remarkable, considering they occupy only between 3-4% of the world's available landmass. Intense environmental challenges are becoming apparent in the management of land resources, water resources and air pollution.

The High-Level Political Forum (HLPF) 2018 will review SDGs 6 (clean water and sanitation), SDG 7 (affordable and clean energy), SDG 11 (sustainable cities and communities), SDG 12 (responsible consumption and production) and SDG 15 (life on land) in depth, as well as SDG 17 (global partnerships for the Goals), which is considered every year. Creating smart and manageable cities will be integral to the survival of human civilization. ITU believes that Information and Communication Technologies (ICTs) are critical enablers to helping make our settlements and societies more sustainable and resilient, as well as for achieving the Sustainable Development Goals (SDGs).

More than 50% of the world's population already lives in urban areas

6 CLEAN WATER AND SANITATION

Over 840,000 people die every year from water-borne diseases

SDG 6: Clean Water & Sanitation

There are today unprecedented challenges in ensuring that everyone has access to sustainable managed water and sanitation services. In 2017, out of a global population of around 7.5 billion people, some 1.8 billion people use a contaminated source of drinking water, 2.4 billion people lack access to adequate sanitation[1], and over 840,000 people die every year from water-borne diseases[2].

The greater the world's population, the greater the demand for water – the UN estimates that, by 2030, our rapidly growing global population will have at least a 40% gap between resources and water needs for drinking, washing and cooking[3]. And with more people lacking access to toilets or practising unsafe hygiene, the greater the risk of deadly disease outbreaks.

No person or community can function properly without access to safe water and sanitation. Water is needed to satisfy thirst and basic hygiene, as well as for running schools, hospitals and businesses. The wider impacts of the water crisis are profound. Diarrhoeal illnesses caused by unsafe water, poor sanitation and hygiene have been linked to around half of all cases of child undernutrition, leading to stunted physical and mental development[4]. WHO (2012) estimates that the loss of productivity due to these same illnesses may cost many countries up to 5% of GDP[5]. Water is now more expensive that petrol in five countries worldwide (although this also depends on petrol price movements).

Climate change risks further exacerbating this situation. Decreasing water availability will impact food security and health, which have already proven to be a trigger for the instability and insecurity that forces people to become refugees. More variable rainfall means much greater uncertainty, especially for smallholders or farmers. Groundwater, reservoir levels and water resources are falling in areas where the climate is getting drier, while conversely, floods can kill or devastate lives and ruin homes in areas where rainfall is heavier and more frequent. Rising sea levels can contaminate coastal groundwater with saltwater. And in all these situations, it is often the poorest and most vulnerable communities who are hardest hit and least able to cope.

1 WHO/UNICEF (2015): 'Progress on sanitation and drinking water – 2015 update and MDG assessment': https://www.wssinfo.org/fileadmin/user_upload/resources/JMP-Update-report-2015_English.pdf

2 WHO (2012): 'Global Health Observatory: Mortality and burden of disease from water and sanitation': www.who.int/gho/phe/water_sanitation/burden/en/

3 UN World Water Development Report 2015.

4 WHO (2008) 'Safer water, better health: Costs, benefits and sustainability of interventions to protect and promote health': http://whqlibdoc.who.int/publications/2008/9789241596435_eng.pdf

5 WHO (2012): 'Global costs and benefits of drinking-water supply and sanitation interventions to reach the MDG target and universal coverage': www.who.int/water_sanitation_health/publications/2012/globalcosts.pdf

Overall, the water and sanitation sector needs to be prioritized and well-funded. Water is increasingly scarce and the costs of upgrading sanitation and supplying water are rising. We need to become smarter in how we improve the sustainability and scalability of water and sanitation services.

ICTs can help us to manage water more efficiently. Smart water meters can help Governments and water utility companies assess the state of water resources to meet current demand and plan for the future. Networks of sensors, for example, can be used to measure groundwater levels, and satellite imaging is helping give decision-makers a clear picture of how the water system is prepared to respond to people's needs. Today, satellite sensing of groundwater in Somalia is allowing researchers to gauge water quality.

For sanitation, ICTs can be used to change behaviour and spark community-led change. In Kenya, the Ministry of Health has implemented an online, real-time monitoring system of smart water pumps and maps to assess progress. Agriculture accounts for some 70% of global water withdrawals[6], so knowing when to irrigate crops, and how much water to use, is crucial. Wireless sensors are being used in the fields in China and India to monitor humidity levels and soil moisture, and run irrigation systems.

Advanced monitoring methods allow for better planning and management during cycles of drought and flooding. For example, the Somalia Water and Land Information Management project developed by the FAO has developed sophisticated systems for monitoring surface and groundwater to support sustainable development of scarce water resources in Somalia.

ICTs can also help in the treatment and recycling of wastewater. A pilot scheme in the Netherlands is linking up five municipalities' sewerage networks and wastewater treatment plants, so sewage flows through the entire system under an automated centralized control. ICTs are now widely used in smart water meters and apps to monitor home usage.

Where water is concerned, we need to do much more, with less. ICTs have the power to revolutionize water and sanitation management by helping develop innovative, efficient and scalable solutions, based on data and evidence.

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6 UN World Water Development Report 2017.

with some estimates of up to 50% more energy needed to sustain humanity by 2040

SDG 7: Affordable and Clean Energy

According to IEA (2016), humanity consumes over a million Tera joules of energy. The growth in the world's population is driving an explosion in energy needs, with estimates of up to 50% more energy needed to sustain humanity by 2040, at current growth rates.

However, population distributions and historical energy consumption patterns are skewed and unequally distributed. For example, the US accounts for nearly 5% of the people on Earth, but consumes around 20% of the world's energy and generates up to 19% of the world's greenhouse gases in any given year. India accounts for some 18% or nearly a fifth of the world's people, but only 5% of the energy consumption.

There are still an estimated 3 billion people who cook and heat their homes using stoves or open fires, mainly in LMICs (WHO, 2018). Shifting patterns of consumption suggest that by the middle of the present century, the demand for cooling might outstrip the demand for heating (UN IPCC). The good news is that around a fifth of the world's primary energy supply already comes from renewable sources (wind, solar, hydro and geothermal) and this proportion is growing. Reliable transport connections and energy supply are key for stable economic growth.

ICTs can help make energy consumption more efficient, and drive a cleaner energy revolution. We must find cleaner, more efficient sources of energy (including renewable energy sources), cut back on our current consumption and introduce standards and regulations for cleaner, more energy-efficient technologies. ICTs can help 'green' existing sources of energy and manage the energy supply more efficiently, although there is also evidence to indicate that the energy needs of the ICT sector are growing, in parallel with rapid growth in Internet traffic.

ICTs can help monitor trends in energy supply and consumption through, for example, smart electricity grids and smart home meters, which can help match supply to demand more efficiently. Data on national infrastructure can be leveraged to build computational models for a deeper understanding of the properties of the system as a whole and the effects of factors such as demand and supply, demographic shifts, and climate change.

For example, Kochi airport in Kerala, India, has decided to try solar panels. After small-scale tests, Kochi airport invested in a solar plant that provides its energy needs and feeds excess capacity back into the grid. Solar panel projects are not luxuries – the project will pay for itself in six years.

11 SUSTAINABLE CITIES AND COMMUNITIES

Ericsson estimates that there will be 50 billion smart devices by 2020

SDG 11: Sustainable Cities and Communities

By 2050, more than two-thirds of the world's population is expected to live in urban areas, equivalent to a shift from rural to urban areas of some 2.5 billion additional people. Smart Cities are urban areas where ICTs can help improve city infrastructure (including energy efficiency), improve citizens' welfare and the nature and performance of government services. ITU finds that the sustainability of a smart city is based on four pillars: (1) *economic* – to generate jobs and incomes for inhabitants; (2) *social* – providing for the welfare of its citizens; (3) *Environmental* and sustainable in its operations; (4) *Governance* – the city must be robust in administrating policies and providing comprehensive services.

The Smart City revolution is coupled with the IoT, as city components get connected and smarter. Ericsson estimates that there will be 50 billion smart devices by 2020. From traffic congestion systems to (sustainable) energy supply, broadband network, safety devices, automatic translation apps or even environment friendliness, each and every area of daily life will be transformed. The potential of all these areas can be maximized by AI which is a key enabler of Smart Cities. IoT is integral to helping make cities 'smarter' or more energy-efficient; however, it also raises some concerns with regards to the use of data.

Sensor networks, digital data and urban dashboards, are becoming common concepts as part of urban development. ICTs offer new ways for citizens to take part in decision-making and governance and to hold policy-makers to account, providing an opportunity to contribute to the achievement of SDGs. ICTs and the Internet are playing a key role in raising young people's profile and awareness, helping them to mobilize, collaborate and communicate.

AI and big data have been used to monitor and improve public transportation services in the Rep. of Korea and Seattle. The City of Amsterdam has established a data lab and competition for app developers and is opening up algorithms in order to improve the city, taking onboard the ideas of young people. In Pittsburgh Smart PGH is the city's innovation center with a number of future smart programs to put the city at the forefront of innovation in predictive analysis, medicine, AI, robotics and autonomy of everything. Smart city applications have been used to calculate fuel consumption, raise awareness and make car rentals more efficient.

As cities' infrastructure and services improve and getting more efficient, they get 'smarter', and so does the city as a whole. A fully Smart City where everything is connected and interactive does not yet exist, although many promising initiatives are now underway, including Smart Amsterdam, a number of projects in Dubai and NEOM in Saudi Arabia.

However, gaps are apparent between urban and rural areas in terms of infrastructure. By 2016, it is estimated that mobile-broadband networks (3G or above) reach 84% of the global population, but only 67% of the rural population. 4G networks are layering in on top of existing 3G networks in urban centres, while universal service in remote areas is problematic.

In May 2016, 18 UN agencies including ITU and UNECE launched the United for Smart Sustainable Cities (U4SSC) global initiative to advocate for policies promoting the use of ICTs in smart sustainable cities. This initiative focuses on integrating ICTs into urban services and building new standards to help achieve SDG 11 and has developed a set of Key Performance Indicators (KPIs) to assess progress towards smart urban development. Over 50 cities have already implemented these KPIs. U4SSC is open to all relevant stakeholders.

SDG 12: Responsible Consumption and Production

The Earth faces unprecedented climate challenges with regards to climate change. The contribution of Earth and nature to the pillars of sustainable development such as our economy, social development, health and happiness is huge. Yet we take the Earth dangerously for granted – as the WWF has pointed out, "to date, our entire model for development has been based on destroying nature, rather than nurturing its resources" (WWF's Living Planet Report).

The WWF calls for us "to start using the resources our society needs within the boundaries of the Earth's regenerative capacity. We need to keep enough land in natural state to ensure the resilience of the vital ecosystem services. We must generate energy through clean technologies. We need to produce more food with less land, water, fertilizers and pesticides. We must harvest fish in a way that they can reproduce".

ICTs can help monitor consumption and production habits, as well as environmental damage. From last year, 2017, it is now possible to map and image the entirety of the Earth's surface every day. The latest high-resolution satellite imagery can now map down to, effectively the equivalent of 'global closed-circuit television'. Satellite imagery can potentially now be used to map carbon dioxide emissions for future conformance/compliance with climate change agreements.

There are countless other initiatives elsewhere on the web, driven not only by big business or government, but by entrepreneurs and students – for example, in applications such as Logging Roads (which maps over 10,000 logging roads in the Congo Basin to identify violations, degradation and highlight potential land right conflicts) or 'Hack The Rainforest' (which uses digital maps and drones to combat environment threats in the Amazon by empowering frontline communities). Satellite imagery is helping map and monitor agricultural land use, the spread of urban settlements, loss of forests and land degradation.

Satellite observation and advanced computer models have helped im-
prove weather information, meaning that, on the global scale, we can
now predict six days ahead with the same accuracy we could achieve for
a period of four days, 20 years ago. Society now has much more advance
warning of weather hazards than before, allowing people to prepare and,
thereby, limit the loss of lives and property. ICTs help both in the prediction
and forecasting of future weather, as well as with automated decision and
warning processes.

Improving and limiting our patterns of consumption and making them
more responsible, sustainable and efficient is key to helping prevent further
avoidable carbon emissions and climate change. The solutions – or at the
very least, the technology to create the solutions – are often already in
place.

The 3D printing revolution could slash the use of raw materials, dramati-
cally cut waste and produce better products. Lighter, smarter vehicles with
alternative fuels and flexible sharing options will cut emissions and conges-
tion. If we can crack the power storage hurdle (e.g. through better batteries
and smarter controllers), the roofs and walls of our homes could collect and
store power. Modern technology is turning citizens into a potential moni-
tor or database, and therefore, an activist. Global industrialists are sharing
big data for full lifecycle management across their supply chains. Remote
fishing communities are using mobile apps to balance supply and demand.

eWaste can also be mined as a huge urban resource waiting to be tapped
to recover and recycle materials worth USD 52 billion. For example, we are
literally throwing away 300 tonnes of gold a year – or 11% of global annual
production – even though huge levels of human and financial resources
have already been invested to extract it.

15 LIFE ON LAND

WWF's Living Planet Report shows us that wildlife is in a downward spiral, with a nearly 60% decline in abundance of populations on average in wildlife across land, sea and freshwater in less than one generation since 1970.

SDG 15: Life on land[7]

Productive land, clean and abundant fresh water, healthy oceans and a stable climate are arguably the foundation of all other goals, as well as our very survival. The rationale is simple: we cannot build a just and prosperous future for all of us, on a degraded planet with an impoverished and degraded nature. There are a cluster of several environmental goals (including SDG 12, "responsible consumption and production", SDG 15, 'Life on Land', SDG 14 ("conserve and sustainably use the oceans, seas and marine resources"), SDG 6 ("ensure availability and sustainable management of water"), but all these Goals highlight the need for maintaining rich, productive and diverse natural systems.

Globally, WWF has found that biodiversity is declining at an alarming rate. WWF's Living Planet Report shows us that wildlife is in a downward spiral, with a nearly 60% decline in abundance of populations on average in wildlife across land, sea and freshwater in less than one generation since 1970. The most common threat to declining populations is loss and/or degradation of natural habitat, but unsustainable exploitation, invasive species and pollution are also major threats. Climate change cuts through all of this.

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7 This section draws on the World Wildlife Fund, based on their WWF Living Planet Report 2016.

-38%

THE TERRESTRIAL LPI SHOWS POPULATIONS HAVE DECLINED BY 38 PER CENT OVERALL BETWEEN 1970 AND 2012

THE FRESHWATER LPI SHOWS THAT ON AVARAGE THE ABUNDANCE OF POPULATIONS MONITORED IN THE FRESHWATER SYSTEM HAS DECLINED BY 81 PER CENT BETWEEN 1970 AND 2012

-81%

-36%

THE MARINE LPI SHOWS A 36 PER CENT OVERALL DECLINE BETWEEN 1970 AND 2012

The story of this decline in nature is not just about the wildlife that so many of us love. Bio-diversity – all the animals, plants and microbial life – is the foundation for the health of the Biosphere we and all life on Earth constitute and depend on at the same time. This complex web of life is over 3 billion years old, and interacts in a very delicate balance. All life forms that have evolved alongside us are the bricks of the walls that sustain our common home: if you remove too many bricks, the walls collapse. A collapsed ecological balance will jeopardize the achievement of all the SDGs.

As biodiversity decreases, we deplete and weaken nature's vital services which we all depend on – clean water, fresh air, food, pollination, and a stable climate – but which are especially critical for hundreds of millions of vulnerable people in developing communities who directly depend on forests, rivers, lakes and oceans for their lives and livelihoods. As the UN Special Rapporteur John Knox recently pointed out in his powerful report on biodiversity and human rights[8], the loss and degradation of biodiversity and ecosystems undermines sustainable development and human rights, including the rights to life, health and an adequate standard of living, which is the exact promise of the SDGs.

ICTs and sensor technologies can play a big role and offer huge potential for game-changing solutions. With big data and technologies, the time for companies and governments underplaying deforestation, wildlife trade, poaching or illegal fishing is over. AI can be used to help boost protection and resilience of natural systems.

Remote sensing plays an important role in planning, monitoring, and evaluating WWF's work on the ground and has enabled WWF to monitor the developments of extractive industries in socially and ecologically-sensitive areas, including World Heritage sites. The Natural Capital Project uses remote-sensing-based natural capital assessment to guide jurisdictional development planning, mapping supply risk for corporate sourcing decision, and helping conservation organizations target investments in forest restoration.

ICTs can be used extensively to observe, monitor, track and protect our terrestrial wildlife from poachers as well as other destructive activities. WWF is working with governments and enforcement agencies to explore, fund, and test a wide range of technologies becoming available for wildlife conservation – from drones and wildlife tracking to radar, thermal cameras and gunshot detectors. WWF has found that unmanned aerial vehicles or UAVs function best as 'reactionary eyes' in the sky. WWF is testing civilian-grade UAVs for conservation applications with plans to rigorously test the technology in protected areas in Malawi, Namibia and Zimbabwe.

Thermal imaging cameras have been used by anti-poaching teams in Lake Nakuru National Park and in the Maasai Mara Game Reserve to increase the chances of catching poachers hunting antelope and rhinos by over 60%. Anti-poaching teams have also been able to achieve all this with smaller numbers of patrol teams. Wildlife management using tracking collars can also help conservation efforts – for elephants and lions in Kenya.

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8 https://documents-dds-ny.un.org/doc/UNDOC/GEN/G17/009/97/PDF/G1700997.pdf?OpenElement

According to ITU's most recent data, 2018 will prove a milestone year for the global Internet, with half the world's population online for the first time.

SDG 17: Global partnerships for achieving the SDGs

Every year, the HLPF reviews Goal 17 on the Means of Implementation and Global partnerships for achieving the SDGs. In 2015, UN Member States and the international community agreed and embraced the *2030 Agenda for Sustainable Development* as a comprehensive framework charting the way forward for the next fifteen years. However, such a broad-ranging and comprehensive roadmap cannot be achieved without the coordinated efforts of countries, regions, policy-makers, industry and all stakeholders.

At the most basic level, ICTs facilitate partnerships by connecting people. According to ITU's most recent data, 2018 will prove a milestone year for the global Internet, with half the world's population online for the first time. However, the other half of the world population have no, or minimal, or irregular access to the Internet. Existing digital divides among and within countries and regions, including the gender digital divide, need to be addressed in order for everyone to reap the full benefits of these technological advances and leave no one behind. There is good progress to report – currently over 208 economies now have operational 4G networks, while global 4G population coverage has risen from around 60% in 2015 to 77% in 2018 (GSMA, 2018). Even basic connectivity simplifies many things, from the ease of communications and ability to access information, to insertion in global value chains and the 'dematerialization' of letters and parcels.

In more advanced forms, ICTs can facilitate market access, access to funding and/or new ways of working, including crowdsourcing, micro-working and collaborative working methods in the broader 'sharing economy'. Depending on the industry or sector in which they operate, scale-up or high-growth firms require access to larger markets of tens of millions of people; however, many developing or smaller countries do not have the domestic market to support this, and need more open market access to global value chains. Export/import and delivery infrastructure is still developing in many countries.

A partnership of all relevant stakeholders is needed to establishing a common framework and terminology so that different solution developers and entrepreneurs are able to enter a global market and operate within a common ecosystem to advance the global sustainable development agenda. Compliance with international standards will be important to ensure interoperability and interconnection of smart city applications, services and platforms, reduce costs through economies of scale and avoid getting locked into propriety standards. Public/private partnerships are therefore key, including research institutes and academia, which can developed in organisations with wide membership such as ITU and through partnerships with industry forums such as GeSI.

These partnerships and these efforts prove that the SDGs are truly global goals, requiring concerted, multi-stakeholder effort, rather than merely goals for the international development community. For it is only by coming together that we can achieve the SDGs for the benefit of everyone, and ensure that no one is left behind.