EXPO 2020 إكسبو
دبي الإمـــارات العربية المتحـدة
DUBAI, UNITED ARAB EMIRATES

المجلس العالمي
WORLD MAJLIS

WORLD MAJLIS REPORT

INSIGHTS FROM GLOBAL GOALS WEEK AND INNOVATION

16th January to 15th February 2022

What if we really achieved the Sustainable Development Goals in 2030?

Download the report or watch the full World Majlis session at:
virtualexpodubai.com/about-history/detail/world-majlis

This document has been prepared by the World Majlis team for Expo 2020.
All graphics and illustrations are created by the Visitor Experience team (VEI).

SUMMARY AND CONTENTS

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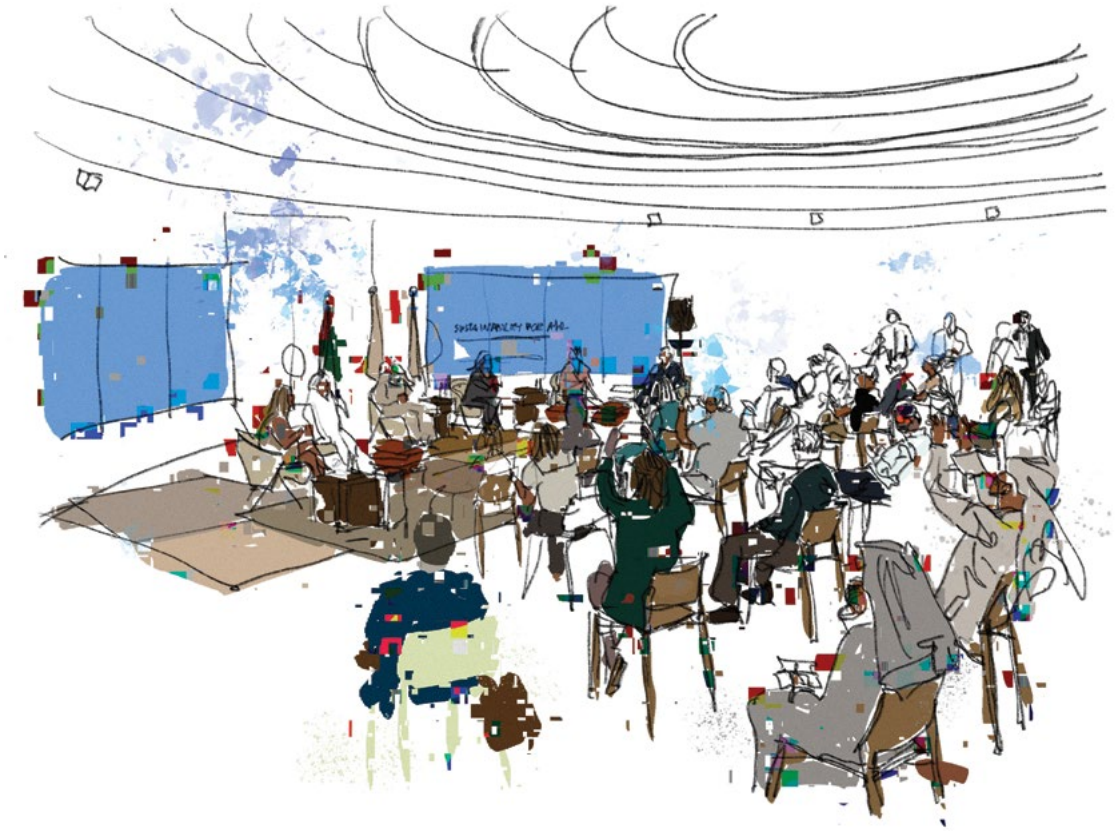
Deeply rooted in the traditions of the UAE, the majlis is one of the cornerstones of Emirati society, a space that welcomes friends and strangers to share news and ideas.

The Expo 2020 Dubai World Majlis is an inclusive, open and informal conversation space, physical and digital; one that brings together diverse voices from all over the world to reflect on complex challenges for the well-being of people and planet.

Between 16th January and 15th February 2022, Expo 2020 hosted eight World Majlis sessions to explore the theme of Global Goals through the lenses of gender equality, energy, the Fourth Industrial Revolution, youth and innovation.



1 **Power to Change the World**

Fuelling a Sustainable World in 2030

Population growth combined with global development require more and more energy. How can we power growth with the least damage to the planet?

2 **Gender Equality, the Mother of all SDGs**

SDG 5 as the Foundation to Sustainable Development

In collaboration with the Women's Pavilion

How can we ensure that gender equality is a part of all the SDGs including creating sustainable economic growth, reducing poverty, combating climate change, or fostering educated societies?

3 **Extending the Revolution to Every Doorstep**

Fourth Industrial Revolution for Everyone

Co-curated with Morocco

Can the Fourth Industrial Revolution power a new sharing society driven by the Global Goals, or will technology continue to widen inequities?

4 **Everyday (S)Heroes**

Leading the Charge Towards the Global Goals

Co-curated with Hungary

Can empowered women be the real changemakers on a path that places profit on equal footing with positive social and environmental impacts

5 **Innovation Nation**

Creating innovative societies to solve humanity's greatest challenges

In collaboration with Spain

How can governments create systems of innovation in which all sectors of society participate to address challenges—what are the structure, mechanisms, funding, and policies required to make this happen?

6 **ChangeMake(h)er**

Advancing diversity in the tech world

In collaboration with Australia and New Zealand

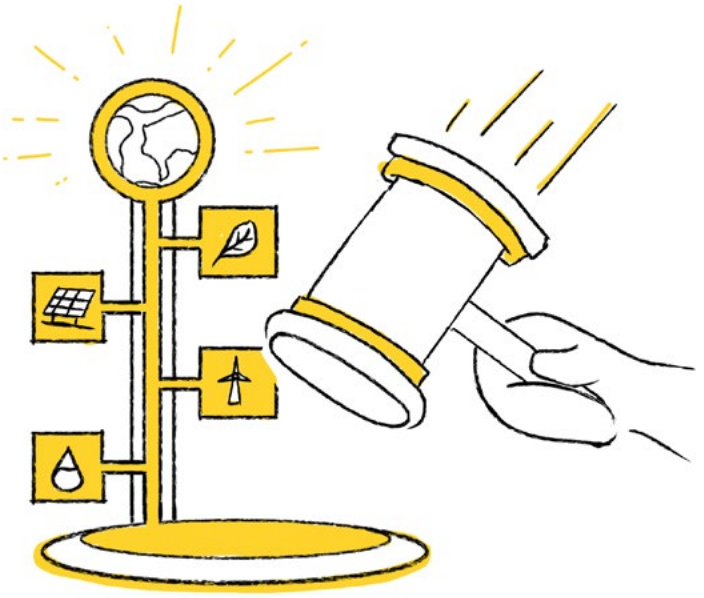
What are some of the factors creating barriers for women and girls when trying to access the science and tech fields today and how can we debug the diversity gap?

7 **Innovation Nation**

Creating innovative societies to solve humanity's greatest challenges

In collaboration with UAE Innovates

Can mission-driven approaches provide us with models address complex challenges such as climate change, pollution, well-being, and clean energy for all, lighting the way forward for the SDGs?



PARTICIPANTS

Power to Change the World

Fuelling a Sustainable World in 2030

Hosted by Australia Pavilion

Australia Pavilion
16th January 2022

Fahad Alajlan
President, King Abdullah Petroleum Studies and Research Center (KAPSARC), KSA

Sami Kamel
CEO of Dutco Cleantech (Dutco Group), UAE

Eithne Treanor (Moderator)
Managing Director, E Treanor Media Moderator

Todd Clewett
Director External Affairs, Fortescue Future Industries, Australia

Polina Lion
Head of Sustainable Development Department, ROSATOM, Russia

Irene Cañas Díaz
Executive President, Instituto Costarricense de Electricidad-ICE, Costa Rica

Ali Zerouali
Director of Cooperation and International Development, Masen, Morocco

Gender Equality, the Mother of all SDGs

Women's World Majlis:
SDG 5 as the Foundation to Sustainable Development

In collaboration with the Women's Pavilion

جناح المرأة
WOMEN'S PAVILION

Women's Pavilion
17th January 2022

HE Epsy Campbell Barr
Vice President, Costa Rica

Rt. Hon. Helen Clark
Former Prime Minister of
New Zealand;
Former Administrator of UNDP

Ms Stella Ronner-Grubačić
EEAS Ambassador for Gender
and Diversity, the Netherlands

Hind Alowais
Senior Vice President of
International Participants for
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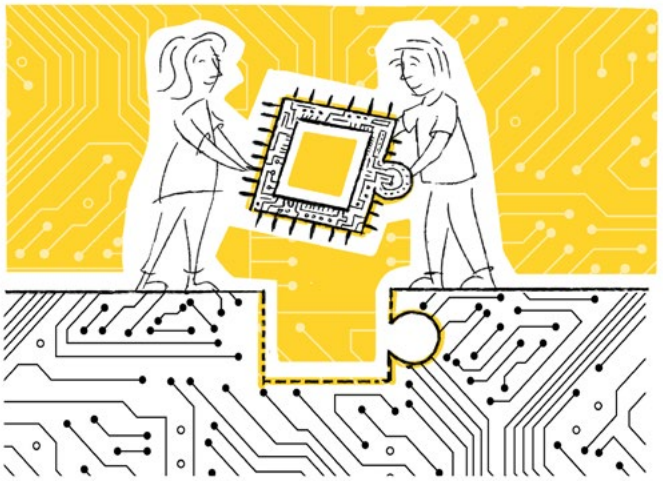
Ms Sonja Hyland
Deputy Secretary General
Global Issues, Department
of Foreign Affairs, Ireland



PARTICIPANTS

Extending the Revolution to Every Desk and Doorstep

Fourth Industrial Revolution for Everyone

In collaboration with Morocco

Terra – the Sustainability Pavilion
18th January 2022

Yousuf L. Caires
Senior Vice President of Expo Live, Expo 2020 Dubai, UAE

Wilhelm Myrer
CEO and Founder of Empower, Norway

Professor Mostapha Bousmina
President, Euro-Mediterranean University, Morocco

Ambassador David Donoghue
Former Permanent Representative to the United Nations, Ireland

Dr Patrick Noack
Executive Director: Future, Foresight and Imagination, Dubai Future Foundation, UAE

Dr Seppe Verheyen (Moderator)
Chief of Staff at the Anwar Gargash Diplomatic Academy, UAE

Oliver Kraft
Executive Vice President for the Expo 2020, Siemens

Othmane Akherraz
Serial entrepreneur (Maths/ Gamification including Edukaty, The Doorz, Box Analytics); Online Education and Virtual Classroom Expert, Morocco,

Everyday (S)Heroes

Leading the charge towards the Global Goals

In collaboration with Hungary

AQUA ROOTS of Hungary

Hungary Pavilion
20th January 2022

Ambassador Katalin Annamária Bogyay
President of UN Association-Hungary, Founder of Women4Diplomacy; Former UN&UNESCO Permanent Representative of Hungary, President of 36th UNESCO General Conference, Hungary

Lea Giménez
First Female Minister of Finance, Paraguay First Female Head of the National Economic Team, Paraguay, First Female Chief at the Institutions for Development Sector of the Interamerican-Development Bank

Samar Al Shorafa
Founding CEO, She is Arab, UAE

Rt. Hon. Helen Clark
Former Prime Minister of New Zealand; Former Administrator of UNDP

Antónia Mészáros
Managing Director of UNICEF, Hungary

Prof Dr Darija Kisic Tepavcevic
Minister of Labour, Employment, Veteran and Social Affairs, Serbia

Cristina Gallach
Former Secretary of State, Spanish Ministry for Foreign Affairs, Spain

Leena Al Olaimy
Social Innovator and author, Bahrain

Eithne Treanor (Moderator)
Managing Director, E Treanor Media

PARTICIPANTS

Innovation Nation

Creating innovative societies to solve humanity's greatest challenges

In collaboration with Spain

ESPAÑA
Expo Dubái 2020

Spain Pavilion
4th February 2022

Alya Al Mazrouei
Program Director of UAE Research Program for Rain Enhancement Science, UAE

Marc Galabert
Secretary of State for Economic Diversification and Innovation, Government of Andorra; Commissioner General, Andorra Pavilion, Expo 2020 Dubai

Arun Sundararajan
Harold Price Chair in Entrepreneurship; Professor of Technology, Operations and Statistics, Leonard N. Stern School of Business, New York University, USA

Yoav Fisher
Head of Tech Innovation, HealthIL, Israel

Professor Javier Garcia Martinez
President of the International Union of Pure and Applied Chemistry, Founder, Rive Technology Founder and president of Celera, Spain

Saeed Al Saeed (Moderator)
Science and Technology Advisor, Ministry of Foreign Affairs and International Cooperation, UAE

Amin Gafaranga
Founder, Atelier (Design-Thinking Academy), Rwanda

Oscar Di Montigny
Ideator of the Humanovability vision, Italy

ChangeMake(h)er

Advancing diversity in the tech world

In collaboration with Australia and New Zealand

NEW ZEALAND

Terra – the Sustainability Pavilion
11th February 2022

HE Sheikha Lubna Bint Khalid Al Qasimi
Former Minister in the Government of United Arab Emirates

Akshaya Dinesh
Founder and CEO, Spellbound, USA

Elise Labott (Moderator)
Founder and CEO, Zivvy Media

Eng Mariam Saeed Aljenaibi
Agriculture Engineer and Entrepreneur, UAE

Professor Dame Juliet Gerrard FRSNZ, HonFRSC
Prime Minister's Chief Science Advisor, Government of New Zealand

Anna Andersone
Chief Empowerment Officer, Riga TechGirls, Latvia

Professor Lisa Harvey-Smith
Australian Government Women in STEM Ambassador; Professor of Practice in Science Communication, University of New South Wales, Australia

PARTICIPANTS

Innovation Nation

Creating innovative societies to solve humanity's greatest challenges

In collaboration with UAE Innovates

الإمـــارات تبتكـــر
UAE INNOVATES

Terra – the Sustainability Pavilion
15th February 2022

HE Huda AlHashimi
Deputy Minister of Cabinet Affairs for Strategic Affairs, UAE

Professor Ted Fuller
UNESCO Chair on Responsible Foresight for Sustainable Development; Editor-in-Chief, Futures Journal; Lincoln International Business School, University of Lincoln, UK

Luis Martin
President at Barrabes.biz, Spain

Albert Efimov
Vice President and Director of Sber Innovation & Research; Chairman of the Department of Engineering Cybernetics, National University of Science and Technology MISiS, Russia

Nishita Henry
Principal, US Consulting Chief Innovation Officer, Deloitte, USA

Mihkel Tammo
Head of Trade and Innovation Center, Enterprise Estonia
Co-founder, Rohetiiger, Estonia

Hadyah Mohammed Fathalla
Director of Strategic Projects, Humanitarian Works and Youth Affairs, Government of Bahrain

André Marquet
Founder and CEO, Productized, Portugal

Saeed Al Saeed (Moderator)
Science and Technology Advisor, Ministry of Foreign Affairs and International Cooperation, UAE

PARTICIPANTS

SUGGESTED ACTIONS AND INITIATIVES

For Government

SDGS OVERALL	Governments can identify specific challenges that are impeding the achievement of the Global Goals by collaborating with academics and industry, and then directing R&D and talent to solve them **[p59, 103]**
	Create platforms for actors from different sectors—government, businesses, academia, civic society and individuals to post SDG initiatives—to create communities around SDGs, for peer pressure and to inspire action **[p113]**
GENDER	Take a mission-oriented all-of-systems approach to promoting gender equality across government **[p75, 76]**
	Use gender management practices such as gender budgeting, gender parity, and equitable pay **[p75]**
ENERGY	Conduct on-going assessments of renewable energy opportunities and challenges and identify areas where country can be self-sufficient or collaborate strategically to meet energy requirements **[p35, 39, 50]**
4IR	Develop a cohesive, national-level digital strategy that takes an mission-oriented approach to ensuring citizens are included and empowered for the Fourth Industrial Revolution (4IR) **[p25, 59, 60]**
INNOVATION	Foster a culture of innovation where all sectors, and individuals can participate in addressing SDG challenges—these can include business incubators, mentorship programs, incentives for innovators to benefit from IP rights and measures to track innovation **[p107, 110]**

For Businesses

SDGS OVERALL	Collaborate across sectors—government, academia and civic society— to identify opportunities where businesses can fund SDG initiatives and bring business models to scale initiatives [p113]
GENDER	Actively promote gender sensitivity and equality through workplace policies and programs [p75, 76, 79]
ENERGY	Identify opportunities for playing a leadership role, in collaboration with government to identify opportunities for investment and models for collaboration for transition to renewable energy sources [p40, 43, 50]
4IR	Develop innovative collaboration models with government and academia to fund and scale up models of technology for inclusive, ethical development [p60, 62, 66]
INNOVATION	Collaborate with governments to identify innovations that can provide a roadmap for accelerating progress to the SDGs [p105]

For Academia

SDGS OVERALL	Chanel the energy of youth towards SDG challenges, supported by the academic institution [p60, 63]
GENDER	Develop gender sensitive curricula that are gender sensitive. Use innovative methods like gamification to make STEM subjects more engaging and appealing to everyone [p89, 91]
ENERGY	Begin education on energy in the early years. Create the next generation of energy professionals with the skills to meet the rapid demands of the global energy dynamics and climate change [p48]
4IR	Align curriculum with future trends to prepare the next generation of 4IR tech experts that are also trained in the humanities [p64]
INNOVATION	Foster the next generation of innovators with the right mindset, creativity and problem-solving skills [p107]

FUTURE INQUIRIES

Connecting the ideas from 60 thought leaders from 24 countries has sparked new lines of inquiry for future conversations and research.

Will new energy sources vary hugely depending on where you are in the world?

How will the transition to renewables change global energy production and geopolitics?

What impact will climate change have on renewable energy?

How can we ensure that electrification does not lead to another sustainability crisis?

Can space be the new frontier for energy?

Is green hydrogen really green if we don't factor in the footprint of the whole supply chain?

If energy is so central to our future, why is it not being taught in primary and secondary schools?

How can we embrace clean and renewable energy quicker?

Will changing energy sources to renewables open pathways for more developing countries to be energy exporters?

Can the global digital ecosystem support shared prosperity?

How can the SDGs become the leading purpose for governments?

How do we incentivise more social innovations to support the SDGs?

How can open innovation help address our biggest challenges?

How can we encourage innovation around public participation, with smaller scale solutions where humans are in balance with the environment?

Are we doing enough to encourage youth participation in innovation?

How can we strengthen gender equality post-COVID?

How can we engage men as allies in achieving gender equality?

How can technology help to level the STEM playing field for women, from education through the workplace?

Context

What if we really achieved the Sustainable Development Goals in 2030?

Faced with our current existential challenges, amplified by the pandemic, it has become evident that our socio-economic growth models, with their undeterred focus on market incentives, are not sustainable. We need to shape a new paradigm, a new future based on values of planet and human well-being, framed by the SDGs.

The SDGs—a new paradigm for an inclusive and healthier planet

In 2015, the UN launched the Global Agenda 2030—the main part of which are the 17 Sustainable Development Goals (SDGs), also called the Global Goals. The framework of the 17 SDGs, broken down into 169 targets, addresses interconnected global challenges including eradicating poverty and hunger, providing access to quality health and education, decreasing inequality, and boosting economic growth – all while combating climate change and protecting the environment.

"What was impressive was that every country in the world decided that it wanted to be part of the same agenda, that although some countries might be contrarian on individual issues, they all felt that they had to be part of the same project."
David Donoghue

The SDGs are the outcome of all 193 UN member countries—the global community—uniting behind shared values and goals. The SDGs also established a new paradigm for integrated development and a roadmap for the international community to achieve peace, prosperity, and planetary well-being within the SDG framework. Governments agreed to focus on the most pressing issues, such as eradicating poverty, hunger, and discrimination against women and girls.

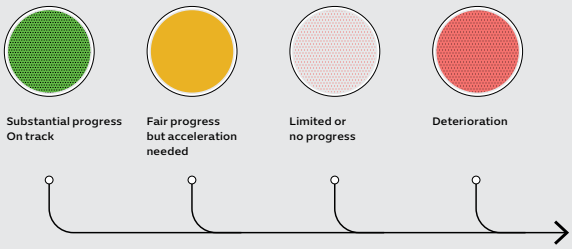
PROGRESS TOWARDS THE 17 SUSTAINABLE DEVELOPMENT GOALS (SDGs)

This is a snapshot of global progress towards selected targets under the Goals of the 2030 Agenda for Sustainable Development, based on best available data in 2021.

Data source
The information was taken from the UN SDG Progress Chart 2021

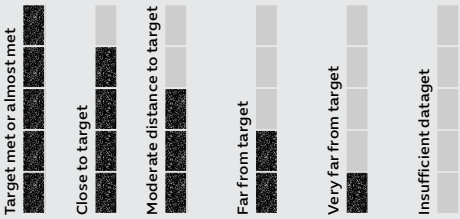
LEGEND

Speed of recent progress



Current level

How much progress made towards the 2030 target



Reimagining a new world

Since the Global Goals were established in 2015, countries made progress in a number of areas, including poverty reduction, energy access, and gender equality. However, progress is short of what is required to accomplish the Goals by 2030. Further, the turbulence of the pandemic upended some progress made, particularly in areas of health, gender equality, education and economy.

As we emerge from the pandemic, we have many reasons for optimism. Despite the social, economic and political disruptions we experienced, we also witnessed exceptional resilience and global collaboration and care for others and the environment. This can propel us forward in a new, re-energized, re-imagined, sustainable society framed by the SDGs, and captured by the UN's "Build Forward Better" slogan.

Achieving prosperity for all

As we look with fresh eyes at the challenges ahead of us, we ask is it feasible, despite setbacks, to meet the Global Goals? What if women and girls were not systematically discriminated against and could participate fully in society? How can young people become agents of change for a better tomorrow? What if innovations in renewable energies made them inexhaustible, allowing everyone access?

What if the Fourth Industrial Revolution ushered in a new sharing economy? Can innovations accelerate our path to meet the SDGs by 2030?

> I think the impact of COVID is such that now the general approach to the SDGs now is that we need them in order to 'build back better' or to 'build forward better' is the variation that they sometimes use. That's the UN slogan at the moment, and I fully agree with it.

– David Donoghue

Thinking differently about the Global Goals

We have the capacity to achieve the Global Goals by 2030 by thinking differently about how we approach them. We can build forward better, to create a brighter future for all, shaped by the Global Goals.

Gender holds the key to all other SDGs

Sustainable Development Goal 5 aims to achieve gender equality and empower all women and girls. Despite the fact that the SDGs are broken down into 17 individual goals, they are fundamentally interrelated, and progress in one can help or hinder development in others. None of them can be reached without the others, but SDG 5 is a particularly important catalytic SDG. Without addressing gender equality, we will not be able to reach the SDGs standards for health, education, or equality, to name a few.

Focus on the nexus of interrelated challenges

A systems-thinking approach that takes into account the interrelated nature of global sustainability is the cornerstone of Global Goals. Greater use of robust, digitally enriched nexus maps based on a thorough understanding of SDG interconnections would provide policymakers with new ways to visualize and think about synergies and trade-offs among them. Artificial intelligence, satellite imaging, and cloud computing for instance, can provide valuable, granular level data and help paint a better picture of disadvantage in the world and its interconnections. For instance, an energy subsidy reform may be good for the economy and the environment, but it may have unforeseen repercussions in terms of poverty and hunger reduction, especially among the most vulnerable.

Leveraging technology to deliver national goals

In the face of powerful technologies emerging in the Fourth Industrial Revolution (4IR) countries need to develop comprehensive, mission-oriented national digital strategies to ensure that everyone benefits from these developments. Enabling access to services such as e-learning, e-health, and e-government, financial services, as well as the construction of smart grids to provide electricity to underserved areas and enabling citizen empowerment for the digital era, are just a few examples of the ways in which a coordinated strategy can accelerate access to the 2030 goals.

Innovation framed by human values

The SDGs are promoting a global pivot toward more innovation with a social purpose. It is also triggering new methods, structures, governance, and market approaches to address some of our greatest concerns. Innovations framed around shared values can accelerate our path to the SDGs by 2030.

Energy pulses through all of the SDGs

Governments have committed to achieving SDGs in response to the urgency of climate change. To accomplish this, the global economy must quickly convert to renewable energy sources, moving towards low-carbon communities. To accomplish this all countries will have to make new decisions concerning energy mixes at the national level. Energy decisions will have an impact on all the SDGs from poverty eradication to breakthroughs in health, education, water supply, and industrialisation, in addition to moving toward clean and affordable energy and mitigating climate change.

Energy—powering our future

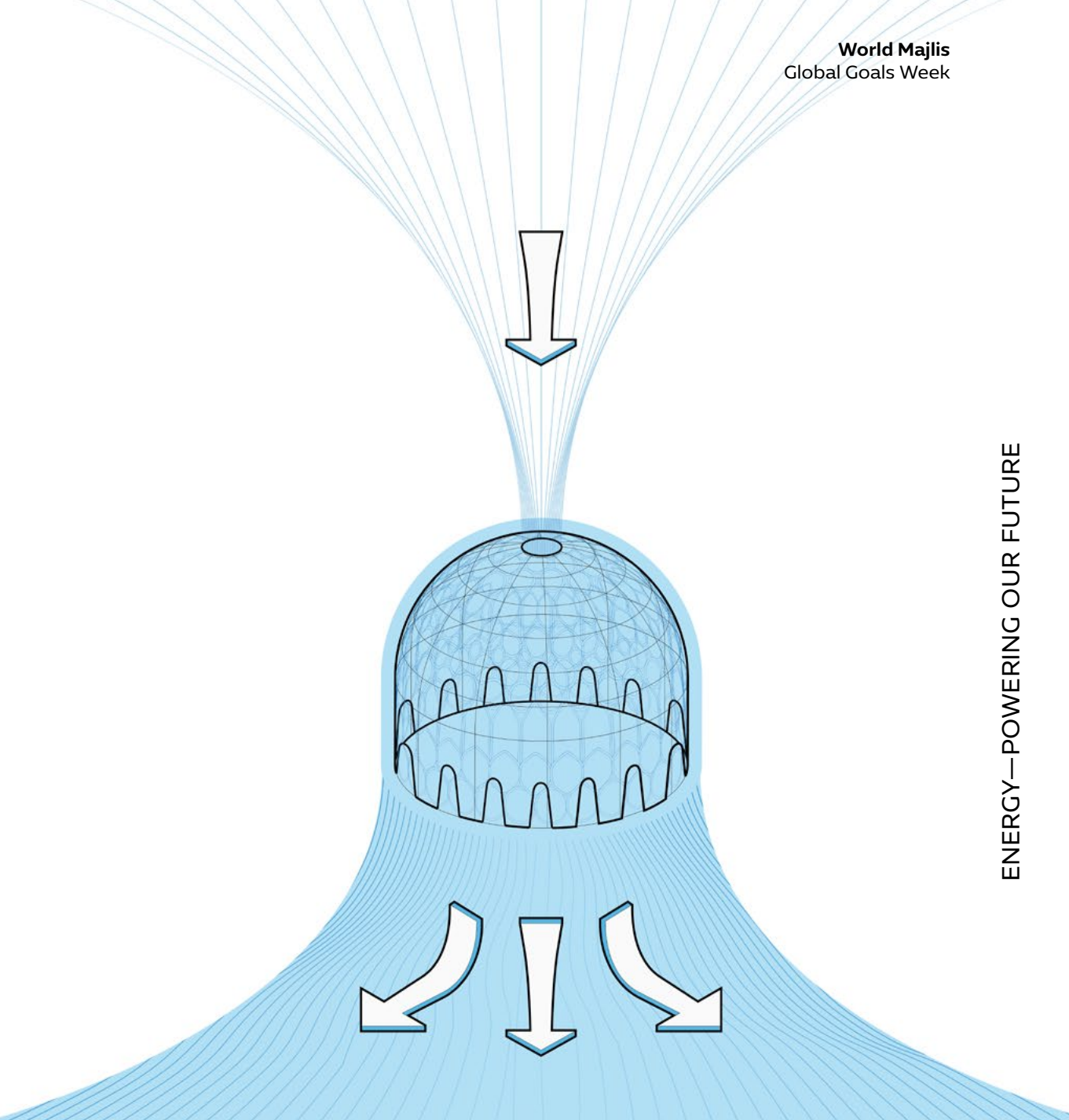
Energy production is by far the main contributor to climate change making up 73 percent of greenhouse gasses. There is an urgent need to meet the SDGs for climate action and affordable and clean energy.

SDGs—the road to net-zero economies

Governments have committed to achieving SDGs in response to the urgency of climate change. To accomplish this, the global economy must quickly convert to renewable energy sources, moving towards low-carbon communities, to sources that include solar, hydrogen, wind, hydro, geothermal and nuclear power, all while ensuring that people have access to affordable energy and equitable economic growth.

More than 130 countries aim to have net-zero emissions by 2050. Poverty reduction, economic progress, and improved living conditions all require energy. While in recent decades, we have seen significant progress towards access to energy, there are still more than 770 million people without electricity, and around 3 billion people do not have access to clean energy, relying on wood, coal, charcoal or animal waste for cooking and heating.

Many countries are falling short of the 2030 goal of universal access to low-cost and cleaner energy. As populations increase, so will the demand for cheap (fossil fuel-based) energy, further contributing to climate change.



"Climate change is upon us. It's here, it's real. It's now, and it's getting more and more urgent. So we don't have a choice."

– Todd Clewett

Targets linked to the environment:

7.1: By 2030, ensure universal access to affordable, reliable and modern energy services

7.2: By 2030, increase substantially the share of renewable energy in the global energy mix

7.3: By 2030, double the global rate of improvement in energy efficiency

7.A: By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology

7.B: By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support

Source:
United Nations Development Programme

Targets linked to the environment:

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

13.2: Integrate climate change measures into national policies, strategies and planning

13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

13.A: Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalisation as soon as possible

13.B: Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities

Source:
United Nations Development Programme

Energy production is by far the main contributor to climate change accounting for 73 percent of greenhouse gasses. Climate-related calamities cause annual economic damages in the hundreds of billions of dollars. The human toll of geophysical disasters caused by climate change accounted for the deaths of 1.3 million people and left 4.4 billion people injured between 1998 and 2017.

Source:
United Nations Development Programme (UNDP)

While the world has achieved progress in terms of new sources of renewable energy, energy cost and accessibility, there is still much to be done. The percentage of people with access to electricity, has risen from 78 percent to 90 percent, and the number of people without electricity has fallen to 789 million. However, approximately 3 billion people – one-third of the world's population – still lack access to clean cooking fuels and technologies. And, as the world's population increases so will the demand for cheap energy, fossil-fuel-based energy that is contributing to climate change.

Achieving the energy goals

Transforming governance, infrastructure and efficiency
The SDGs and net-zero targets can only be achieved through a series of transformations. Key among them are:

Governance and finance structures. Put legislation, finance, and infrastructure in place to transition away from fossil fuels and toward zero-emission economies.

Energy mixes. Determine renewable energy sources that the country will adopt based on natural endowments and context.

Energy efficiency. Improved energy efficiency as well technologies that help manage energy usage will play a critical role in achieving net-zero targets.

Reforming industries. Industries that contribute significantly to CO2 emissions, such as transportation, manufacturing, agriculture, and other industries, will need to be adapted.

"It's important that we continue to have an investment in oil and gas and coal. Otherwise, we're going to be running into challenges, into increases in volatility in energy prices. The last thing that we would like to have to achieve net-zero and achieve a sustainable world is to have a very volatile path."

– Fahad Alajlan

Navigating a dynamic, uncertain energy terrain

Governments must navigate a complicated and dynamic global energy landscape while balancing energy supply, demand, and affordability in order to achieve low-carbon economies. In emerging markets, rising consumerism and industrialisation are also key driving forces. Renewable energy sources, energy storage, and efficiency-enhancing technology are unleashing change. The energy sector's dynamics are being reinvented by new renewable energy production patterns, shifting trade links, changing geopolitics, and knowledge-sharing alliances. This rapidly transforming energy landscape presents a slew of new difficulties as well as great potential for achieving the SDGs.

Keeping the lights on while switching to renewables

Countries must be able to shift to renewable energy with as little disruption as feasible. A poorly managed transition, or one that disrupts supply, might cause energy costs to skyrocket, wreaking havoc on energy supply, access, and cost, especially in poorer countries, with a potential impact over the entire economy. To achieve a smooth transition to sustainability, governments must continue to invest in the dominant energy source while also fostering decarbonisation.

"When we're looking at projections beyond 2030, for example, 2050, and if you've seen the International Energy Agency, for example, net zero scenario that they unveiled before Glasgow, you still see that hydrocarbon would produce 30 percent of the world energy mix in 2050, even in a net-zero scenario world."

– Fahad Alajlan

There is no single ideal energy mix

"I think that this economic challenge would drive the strategists of all the countries to put more renewable energy in their energy mix. And it's good for the workers, it's good for the people. But it will be also good for the economy."
Ali Zerouali

No one-size-fits-all solution

There is no one-size-fits-all approach to decarbonisation and renewable energy since countries will determine the national energy mixes that are suited for them. Each country will select the optimal mix of solar, wind, geothermal, nuclear, and/or other energy sources that will be unique to their context. The appropriate energy mix—renewable and traditional—for the transition to decarbonisation will be critical. Natural resources, energy costs, accessibility, national vision, strategic orientations and priorities, and financial resources will all bear on the energy combination any country chooses.

"Solar and wind today being the lowest cost energy generation technologies as opposed to coal and gas. But it's a question of do you have the right set of policy instruments and environment for investments."
Sami Kamel

Solar and wind energy are cheaper than fossil fuels

Renewable energy's economics will play a central role in deciding national energy mixes. As renewable energy grows more cost-competitive against fossil fuels, it is becoming increasingly attractive. According to the International Renewable Energy Agency (IRENA), new solar photovoltaic (PV) and onshore wind power costs less than maintaining ageing, traditional coal-fired facilities. As this trend grows, it will increasingly support the case for coal-fired power plants to be phased out entirely. Renewables will become much more competitive than they are currently if fossil fuel subsidies are withdrawn. This cost competitiveness, with the proper policies in place, can hasten the adoption of renewables by 2030.

Meeting global goals through nuclear energy

Nuclear power generates vast amounts of electricity at reasonable costs while emitting very little carbon dioxide (CO_2). Nonetheless, nuclear energy is contentious, and several governments have chosen not to include it in their clean energy portfolios. This is due to the fact that nuclear power is a significant and long-term investment for any government, while carrying the burden of public perception as an unsafe source of energy.

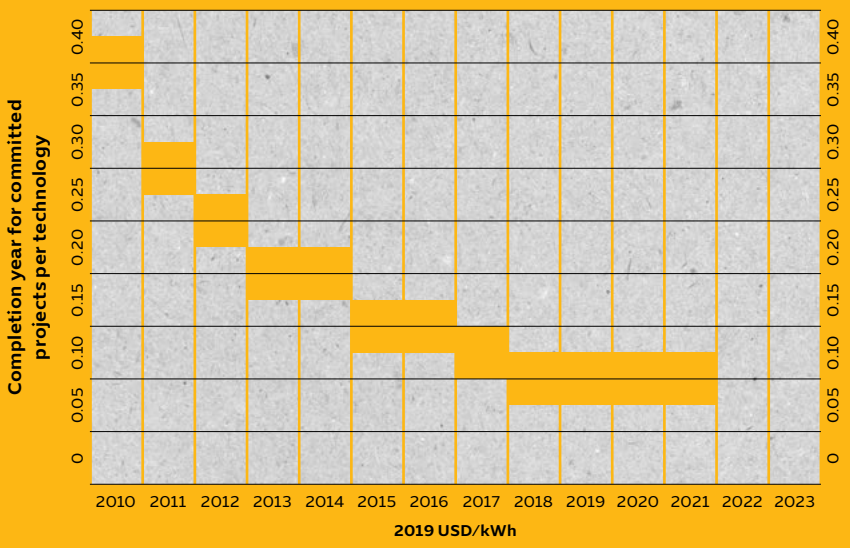
"At ROSATOM now we're absolutely sure that our technologies are safe and secure."
Polina Lion

However, for a number of countries, nuclear energy will be a critical part of the energy mix for reaching the SDGs and net-zero emissions. Russia's strategy for achieving its targets, for instance, relies heavily on nuclear power. Nuclear power plants can generate enough electricity for 60 years, and considerable advancements in nuclear safety since Fukushima have made nuclear power an essential part of Russia's energy mix. The country plans to raise nuclear energy production capacity from 20 percent to 25 percent by 2050.

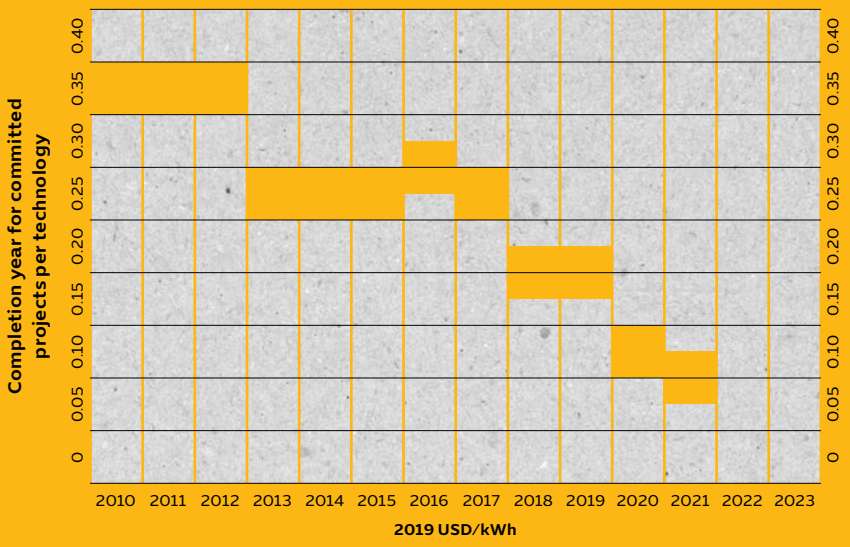
The question of safe and long-term disposal of nuclear waste, however, still needs to be fully answered as highlighted by the general public.

Renewable Power Generation Costs in 2019

Photovoltaics

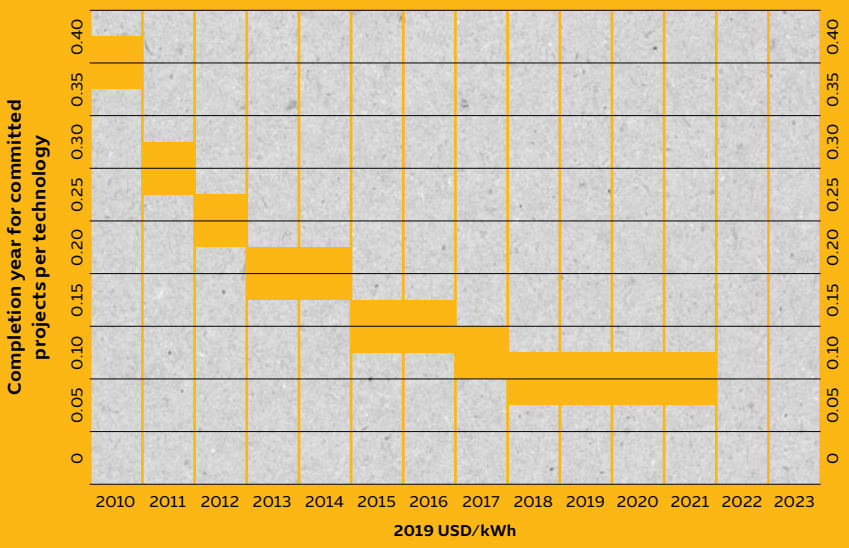


Concentrated Solar Power

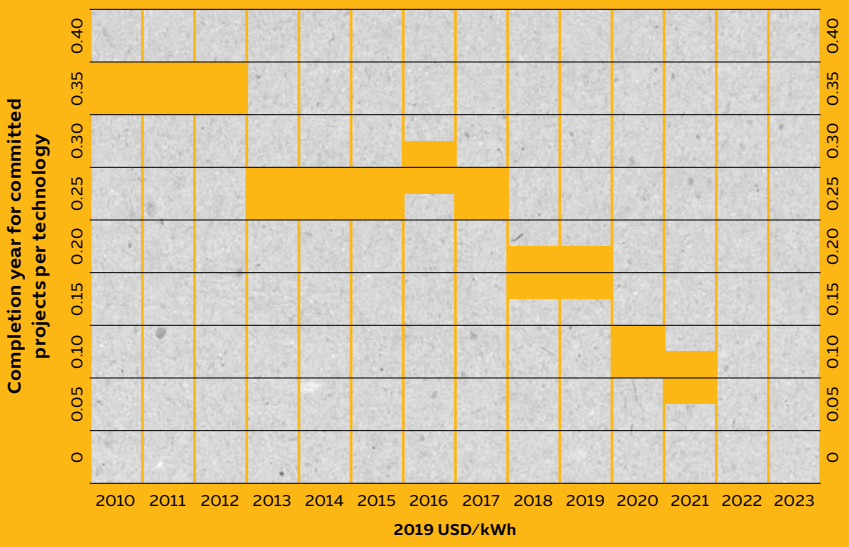


Source:
IRENA

Onshore Wind



Offshore Wind



When the wind doesn't blow

Many renewable resources are climate-dependent, and thus will be impacted by future climate change. Extreme weather conditions, such as long periods of draught and calm winds, have the potential to interrupt renewable energy output. This might have ramifications across the entire global energy cycle, including how and where renewable energy is generated.

All renewable energy systems, are highly intermittent, or will be, with climate change. A mix of energy sources is important to have as a back-up supply in case of interruptions with one source. For instance, countries that rely heavily on wind or solar are susceptible if there is insufficient wind, or the sun isn't out. An energy mix helps mitigate this, as well as large storage capacities via batteries, up-storage, and other means.

Because energy is also interconnected to food and water production, interruptions in energy can have an impact on social well-being including health, education and transportation. This means that countries need to evaluate their energy mixes on an on-going basis to maintain consistent supply.

The right balance for SDG 7

"Renewables today can stand alone as a viable investment option, even without a subsidy from governments, because the cost competitiveness of the technology itself has become very, very attractive."
Sami Kamel

Solar and wind are now profitable alternatives

The cost competitiveness in solar and wind technologies with traditional energy sources, mean that governments no longer need to pay subsidies to ensure that they remain a viable investment option in the future.

Green hydrogen: The silver bullet?

Hydrogen is shaping up to be the star of the show in the future of energy. Green hydrogen—the only form of hydrogen that doesn't affect the climate—is becoming an important part of renewable energy plans across the world. It is seen as being a significant enabler to sustainability.
In spite of its current popularity, hydrogen has been around for quite some time. There were hydrogen production plants in Finland in 1929, and General Motors built the first hydrogen car in 1960. What has changed since then? Today the costs for both making hydrogen energy and making electrolysers that turn water into hydrogen have gone down over time.

"Historically, the focus has been more on the hydrocarbon side. But as the economics of renewables have been becoming more and more competitive against conventional energy, the return on investment in renewables has proven to be more and more attractive actually for our group."
Sami Kamel

Today, the focus is specifically on green hydrogen, in line with strategies for a sustainable future. Green hydrogen can be produced in a number of low-income countries that currently lack it, creating a potential to reach clean energy targets while providing low-cost energy to citizens. There are dozens of countries where large-scale green hydrogen generation is possible, including Namibia, Papua New Guinea, Kenya, and Djibouti, but it requires significant investment to make it happen. For instance, an investment of $15 billion in green hydrogen was made in Namibia in a recent tender process—roughly equal to the country's GDP.

Hydrogen comes in various forms, including blue, green and grey. Blue and grey hydrogen are produced from natural gas, while green hydrogen is derived from renewable sources.

The possibility to produce green hydrogen opens up immense possibilities for countries to earn export income. This is already attracting new and diverse players to the energy market, with the potential to benefit developing countries and rearrange energy markets.

However, it is important to acknolwedge that green hydrogen may itself involve embedded carbon in its supply chain, for instance in the production of solar panels.

India's new hydrogen policy has the potential to transform the country from an energy importer to a green hydrogen export hub, with clean energy exports expected to soar to $500 billion over the next 20 years.

Other energy innovations

There are a number of other energy sources that we should not lose sight of. These include low enthalpy (low temperature) geothermal energy, which is attractive for countries looking into alternative sources of fuel production particularly for industrial applications.

Energy efficiency across the renewable sector

When thinking about the future of renewables, it was common to divide them into different types of energy, such as solar and wind. However, in recent years, there has been a convergence of these technologies. The Industrial Internet of Things and digital threads are propelling this convergence, allowing for the most efficient use and operation of wind turbines, solar panels, energy storage, electric vehicles, natural gas and coal-fired power plants.

These tools assist industrial IoT policymakers in maximising the efficiency of their operations. There are significant opportunities for efficiency technology optimisation on the supply side, particularly for gas turbine, coal, wind, and solar power plants, which all have large installed bases of power generation capacity.

Efficiency gains should be included in both supply and demand discussions. On the demand side, dwellings are getting more energy efficient. Now several gadgets and appliances such as dryers can be operated with an iPhone, so it can be turned off remotely if it is operating at the costliest tariff power hours.

Moving industry to cleaner energy

Clean energy to power the world's most polluting sectors
Several industries contribute significantly to global emissions. Reforming them provides a big potential to reach the SDGs and achieve net-zero emissions. The primary sources are transportation, electricity, industry, construction, buildings, agriculture, forestry and other land-use, and waste.

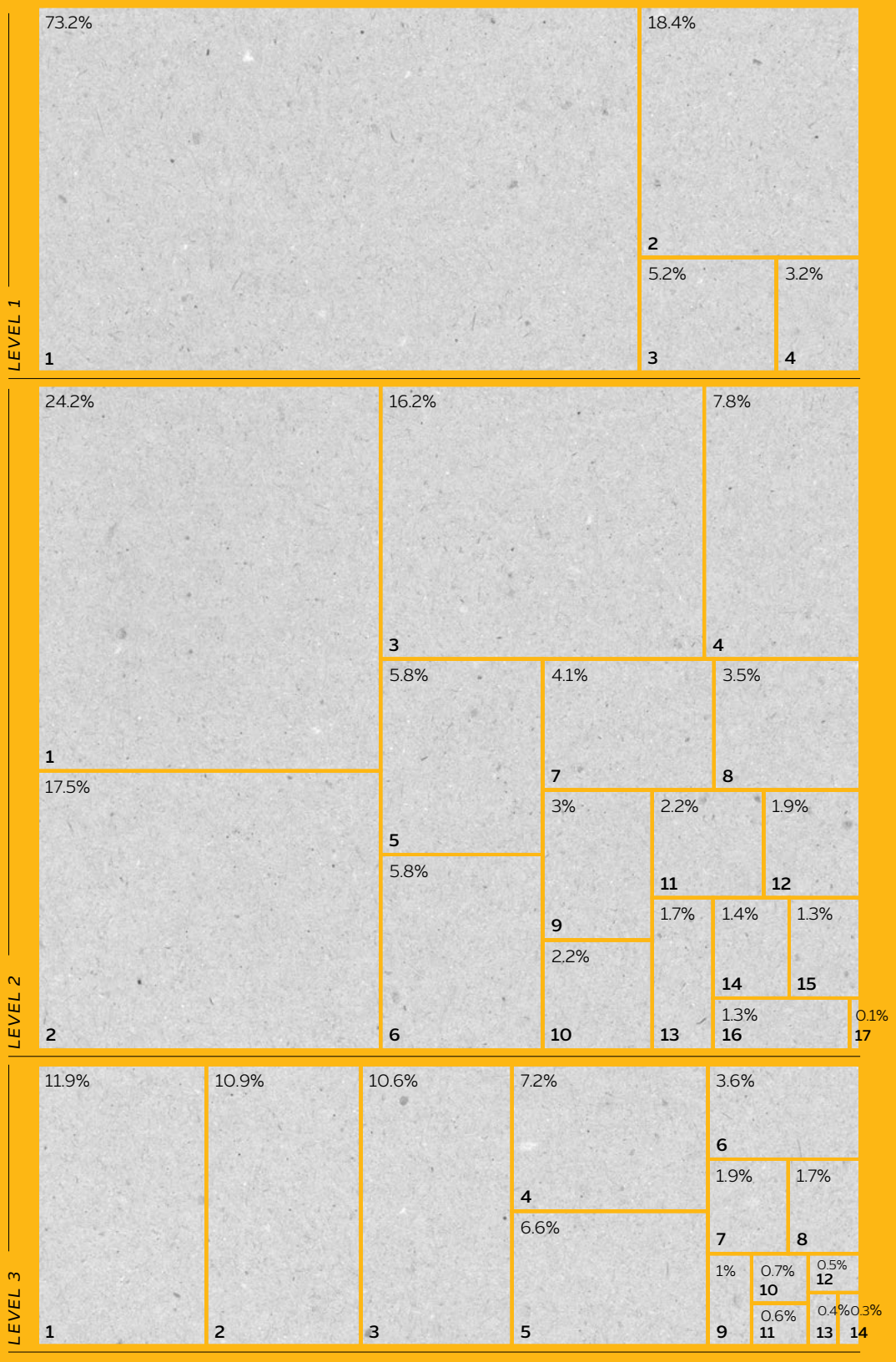
Transportation
The transportation industry consumes a vast amount of crude oil, accounting for 70 percent of all crude oil produced today. Gasoline, diesel and jet fuel, are all examples of transportation fuel, which is why crude oil is referred to as 'transportation fuel'. Electrifying the global transportation industry will dramatically reduce crude oil demand and emissions. Lithium ion will play a key role in acceleration this disruption. As that happens, we will see more and more electric vehicles such as cars, trains, ships, and planes as the cost of electrification and lithium-ion batteries fall.

Buildings
Building construction accounts for 25-40 percent of worldwide carbon emissions, in addition to their operation. Building efficiency-improving technologies are an important aspect of sustainable development.

Food Production
More than 30% of the world's greenhouse gas emissions come from food production. Food systems and indeed present global eating habits must both undergo radical transformations if we are to have a sustainable future.

Bitcoin's annual footprint is equivalent to Greece's annual footprint
The carbon emissions from mining bitcoin are significant, but largely invisible. And as the price of Bitcoin rises, so does the incentive to mine it, creating a feedback loop detrimental feedback loop for the environment. Bitcoin mining may be responsible for 65.4 megatonnes of CO2 (MtCO2) per year. The estimated global carbon footprint of Bitcoin mining, is comparable to country-level emissions in Greece (56.6 MtCO2 in 2019) and represents 0.19% of global emissions.

Source: Alex de Vries et. al 'Revisiting Bitcoin's carbon footprint', Joule, March 2022



GLOBAL GREENHOUSE GAS EMISSIONS BY SECTOR

LEVEL 1: *1.Energy, 2.Agricultue, Forestry & Land Use, 3.Industry, 4.Waste*

LEVEL 2: *1.Energy use in Industry, 2.Energy use in buildings, 3.Transport, 4.Unallocated fuel combustion, 5.Fugitive emissions from energy production, 6.Livestock & manure, 7.Agricultural soils, 8.Crop burning, 9.Cement, 10.Chemicals, 11.Deforestation, 12.Landfills, 13.Energy in Agriculture & Fishing, 14.Cropland, 15.Waste-water, 16.Rice cultivation, 17.Grassland.*

LEVEL 3: *1.Road transport, 2.Residential buildings, 3.Other industry, 4.Iron and steel, 5.Commercial, 6.Chemical & petrochemical, 7.Aviation, 8.Shipping, 9.Food & tobacco, 10.Non-ferrous metals, 11.Paper & pulp, 12.Machinery, 13.Rail, 14.Pipeline.*

"We need to work in a different mix of technologies not just electric cars, not just hydrogen cars, because we also need to give options to the people and to the different sectors transport, public transportation, industrial transportation and also heavy transport."

– Irene Cañas Diaz

Best practice

"The experience we have in Costa Rica, and I think the key was the vision when the Costa Rican institute was created for electricity. It was 73 years ago when it was created. The law was very clear. Access to everyone of electricity and develop natural sources."
Irene Cañas Diaz

The importance of a clear vision—Costa Rica

For sustainability to be achieved, having a clear vision is vital, and Costa Rica—a global forerunner in sustainable energy, is a case in point. Seventy-three years ago the government wanted to ensure that every Costa Rican had access to renewable electricity, and founded the Costa Rican Institute for Electricity to fulfil that goal. While the term 'sustainability' was not in vogue at the time, it was clearly the spirit of the mandate, which it stipulated that the energy should be generated from local sources, not imported.

Integrating markets for renewables

An innovative approach to dealing with fluctuating energy supplies, is to connect electricity grids across countries. Five countries, Morocco, Portugal, Spain, France, and Germany, have joined hands to create a combined renewable energy-based power market. Following much research, discussions, and negotiation. This integrated market means, for example, that Morocco's energy can be supplied by its French or Spanish counterpart. Similarly, Moroccan green energy producers will be able to sell their products in the European market to one of the four European countries. This novel arrangement contributes to an enhanced and more consistent global renewable energy market.

Each country will chart its own path

Saudi Arabia is abundant in natural resources— both large oil and gas reserves, and plentiful sunshine for renewable energy. Nonetheless, in Saudi Arabia there is a focus on nuclear energy. The challenge of resource diversification is about ensuring that there is a clear, long-term path to net-zero emissions. Saudi Arabia has articulated in its vision and ambitions in its Vision 2030, which foresee widespread reform the opening of new sectors as well as a pledge for renewable energy to account for 50% of the grid by 2030. Despite this, the country remains one of the world's largest petrochemical players.

Fostering future energy experts to tackle energy and environment SDGs

The Masdar Institute (MI), in Abu Dhabi, is Khalifa University's sustainability-focused research institute. As the UAE's foremost cross-disciplinary institution for clean energy, water, and the environment, MI is training the next generation of global clean energy specialists, who will help the UAE achieve its SDGs by bringing a knowledge-based approach to solving clean energy and environmental challenges. The graduate-level academic institution cross-fertilizes students and faculty's fundamental research with applications in world-leading industry and sustainability organisations collaborations, including at Masdar, a global leader in renewable energy and sustainable urban development. Masdar Institute will lead a new decade of innovative projects in the UAE and around the world, driven by new ways of producing, storing, and utilizing energy.

Enabling environments for renewables

Energy transition to the SDGs requires new systems, policies, regulatory structures, and fiscal instruments to ensure the shift can be accomplished in a way that no one is left behind.

New models of cooperation for the new energy world

Several integrated, mission-oriented approaches to attaining the SDGs are helping to develop an enabling environment for net-zero economies in a number of countries through programs and support initiatives geared at governments, the regulatory sector, and the financial industry.

Institutions such as the World Bank and the United Nations Climate Programs have collaborated and directed numerous projects to assist developing countries in creating an environment that encourages the private sector to invest in renewable energy. This now includes green hydrogen projects through capacity building programs for government agencies and energy ministries on utility planning and how to incorporate increasing amounts of renewable energy into this generation mix in the future.

Systems, instruments and tools needed

Policymakers are leading the charge and setting the stage for a sustainable energy future. Creating these enabling environments calls for the right policy instruments and investments. In less developed countries it also means substantial financial and technical assistance. Already, in a number of countries, multi-lateral organisations, governments, regulators, the private sector and the financial sector industry are working together to achieving universal energy.

Financing is a lynchpin in the renewable energy equation

There is significant investment required in the infrastructure and know-how to implement new energies in countries. The United Nations Framework Convention on Climate Change (UNFCCC) estimates that achieving net-zero on a global scale by 2050 will require an investment of $125 trillion.

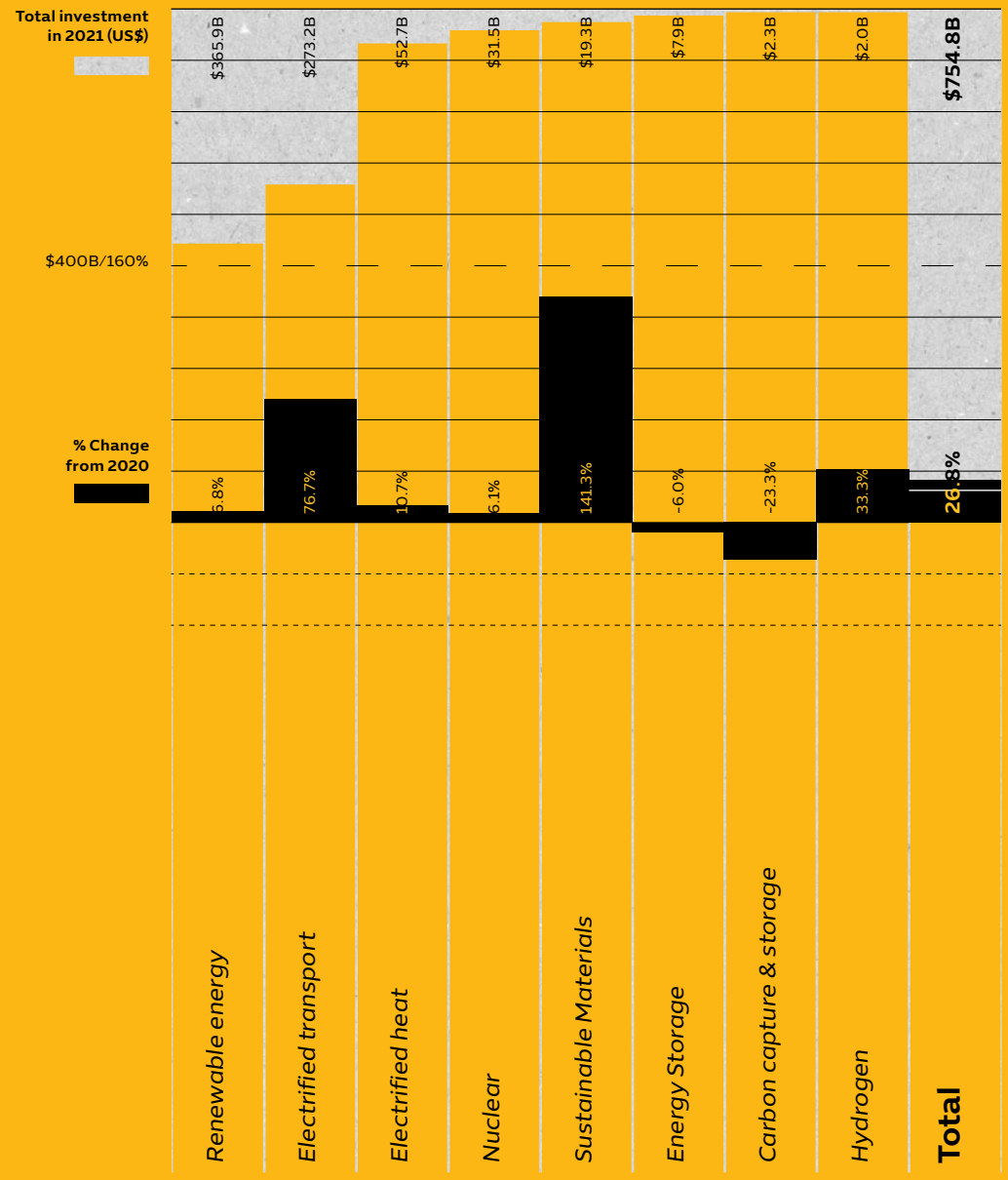
Developing and less developed countries, may not be able to fund the transition to clean energy and will require greater investment. They may also require energy subsidy reform. There are very good examples of subsidy programmes that advance technology, as long as their goals are explicit: For instance, what is the goal of each policy taken individually? Is it to speed up technology development and reduce costs? Is it to encourage mass adoption?

Transition-friendly policies

The policies of each country will be customized to their specific contexts as they transition to new energy demands. For policymaking, two principles are essential: First and foremost, what is the goal of each policy? The second is the need for transparency: What is the policy? How will it be executed? And why is it being implemented this way? Investors and businesses should be motivated to pursue sustainable solutions by the prospect of stability over the next 10, 20, and 25 years.

ENABLING ENVIRONMENTS FOR RENEWABLES

Technology/Sector



Increasing investment in clean energy—a gauge of the global enthusiasm for transition

Source: Visualcapitatlist.com; data from BloombergNEF

De-risking the risk

Currently, investments are being directed to Asia Pacific or Latin America, where political risks are lower than in Sub-Saharan Africa. In this context, programs like the World Bank's Multilateral Investment Guarantee Agency (MIGA) are vital. They ensure that investments are protected from certain types of risk allowing investors to feel secure about their investments in Sub-Saharan African countries, and it allows funding in countries that would otherwise miss out on some of this investment in renewables. Such mechanisms are in line with the Addis Ababa Action Agenda, which pushes for measures to help developing nations finance critical technology for sustainable development.

Shared knowledge powering energy

In order to achieve SDGs the Agenda 2030 advocates for increased information sharing among countries. Indeed, in order to transition to sustainable economies, a significant amount of knowledge exchange will be required. Financing capacity, technical know-how, and understanding of renewables, their economics, and engineering aspects are the primary hurdles to broad deployment of renewables and clean energy, particularly in developing nations. Several countries, like Morocco and Germany, have knowledge-sharing and technical development projects as well as partnerships in place to assist developing countries in overcoming such hurdles and achieving their renewable energy goals.

"There's a policy piece that is about how you make sure that the investment can proceed or that we've got the characteristics for a proper investment, but that over time the countries continue to benefit not just in terms of power to the people, but the ongoing benefits."

– Todd Clewett

Best practice

Accelerating the energy revolution with knowledge

Morocco's vision is to inspire a global dynamic around energy transition in specific countries, and to use this energy transition to make renewable energy the foundation of industrial and economic development in specific countries. Morocco is very committed at the UN level, having launched the Coalition for Sustainable Energy Access in collaboration with Ethiopia, to the goal of assisting and transferring knowledge from the most advanced countries to the least advanced in terms of energy for the production and management of the electricity sector.

Morocco has innovated in terms of project technical, legal, and financial structuring. In the case of many of the partner countries it is less a case of energy transition but more a case of the 'energy revolution'—going from no access to electricity to having access to electricity for industries and households.

Over 20 bilateral cooperation agreements with African countries are in place to assist them in developing the renewable energy and electricity sectors. The country is also in collaboration with the Islamic Development Bank (IDB), for a power initiative to reach 250 million people in 11 Sahel region countries and develop more than 10 gigatonnes of solar electricity in the Sahel to accelerate renewable energy development. And there are projects underway Niger and Djibouti, as well as other countries to assist them in accelerating this trend.

Taking a nascent industry off the ground with innovative policies

As part of its hydrogen strategy Germany just recently launched the H2 Global initiative, which offers a $1 billion funding plan to encourage green hydrogen production in emerging countries and to boost climate protection.

Using a "double auction," the H2Global project aims to accelerate the worldwide market ramp-up of green hydrogen. Hydrogen or hydrogen derivatives are purchased cheaply on the global market and sold to the EU's highest bidder under the plan. This is the type of subsidy that is required at the outset to establish the hydrogen industry—similar to what was done with solar and wind to make them competitive. In Japan, South Korea, and the EU similar government policy instruments and end-user incentives will help the global hydrogen industry become more commercially viable in the coming years.

"The governments are sending the right set of policy incentives to the private sector to make the investments into the green tech sector, the private sector and the financial sector. The project lending side is responding very positively to these market signals."
Sami Kamel

An international consortium for a green hydrogen

Oman's Salalah region has abundant solar and wind resources, and a world-class shipping infrastructure, which positions it to be a hub for production and export of green hydrogen and green ammonia. Oman's state energy firm, OQ, signed a joint development agreement (JDA) with Japan's Marubeni, Germany's Linde, and the UAE's Dutco Group to conduct technical and commercial feasibility studies for the establishment of a green hydrogen and green ammonia production facility in the Salalah Free Zone.

The proposed 'SalalaH2,' aims to produce up to 1,000 tonnes of green ammonia per day. And to generate green hydrogen, an electrolysis facility with a capacity of up to 400MW will be built. The electrolyser will be powered by approximately 1GW of solar and wind energy.

Renewables ushering new levels of socio-economic development

Morocco's economic, industrial, and social development have climbed sharply, fuelled by the country's 2009 renewable energy goals. By 2025, the government expects to meet 52% of its energy needs from renewables. Multiple green hydrogen production projects are already under way in the country. And geothermal energy is being added to the country's renewable energy portfolio, along with hydro, wind, and solar power.

Emerging questions for future conversations

Will new energy sources vary hugely depending on where you are in the world?

How will the transition to renewables change global energy production and geopolitics?

What impact will climate change have on renewable energy?

How can we ensure that electrification does not lead to another sustainability crisis?

Can space be the new frontier for energy?

Is green hydrogen really green if we don't factor in the footprint of the whole supply chain?

If energy is so central to our future, why is not being taught in primary and secondary schools?

How can we embrace clean and renewable energy quicker?

Will changing energy sources to renewables open pathways for more developing countries to be energy exporter?

Harnessing the 4IR for SDGs

The digital revolution can transform society, accelerate human progress and help us achieve the SDGs.

The Fourth Industrial Revolution (4IR) is transforming the way we live through technologies like artificial intelligence (AI), robotics, virtual reality (VR), blockchain, the Internet of Things (IoT). For the billions of people who lack digital access, however, the 4IR drives an even greater wedge in global digital gap.

Transformative power of 4IR

We are in the midst of the 4IR, with new technologies offering exciting new opportunities, and opening new worlds to benefit our lives. During the COVID-19 pandemic, such technologies allowed us to combine physical and digital worlds, to quickly replicate many of our most important services including accessing telehealth, online classrooms and work online.

Artificial Intelligence (AI) enabled scientists to quickly analyse research and vast data sets and collaborate across the globe. 4IR technologies enable surgeons from anywhere in the world to 'scrub in' to surgeries and assist doctors in the most remote locations in the world. Brain-human interface machines merge our thoughts with machines to break mobility barriers, empowering people to transcend physical limitations. Driverless vehicles, genomics and the next generation of medicines have also been born in the 4IR.

Entire new sectors and markets have been created offering jobs and income generation. The 4IR is revolutionizing global business paradigms and industries, including healthcare, agriculture, energy, education, and transportation.

4IR technologies have immense potential to address Global Goals such as poverty, climate change, and inequality, yet these technologies have not fully delivered on their promises. Billions of people around the globe lack access to digital infrastructure.

Many countries are grappling with the earliest stages of technological experiences, and as we progress as a global society through that experience, an increasing number of people will be drawn into the latter stages of the technological revolution. Any discussion of a 4IR digital transformation cannot escape the question of how communities that currently lack access to digital systems can benefit from emerging technologies.

"One of the big issues when we were negotiating at the SDGs was the role which technology could— and must— play in accelerating human progress and enabling us to achieve the SDGs."

– David Donoghue

Asking the pressing questions to re-imagine the world

Today's global challenges call on us to apply our collective intelligence and imagination—to reframe how we harness the potential of the 4IR to meet the SDGs? How do we ensure that the 4IR does not exacerbate the digital gap? Previous revolutions have benefited some and left other behind—how can we ensure that the digital revolution leaves no one behind?

But we need to understand this first, because this technology is contributing to make the world an increasingly complex place.

4IR for education, exports and digital business

Thoughtful, national level digital strategies and public policy can help countries leverage 4IR technologies tackle a wide range of social and economic concerns. Citizens can have easier access to online education elevating national skill levels; farmers, manufacturers, and entrepreneurs can be connected to global markets and value chains; mobile phone financial services, with their widespread reach, particularly among women, can help households build asset bases and break out of poverty.

Government working closely with the tech industry and academia in a coordinated, mission-oriented way to identify opportunities and obstacles related to the 4IR Mission-oriented public policy can help achieve these aims.

Leveraging data and painting a picture of marginalized communities
An important way to harness data is to draw out a better understanding of communities that are disadvantaged. There are numerous gaps in our knowledge of communities at risk of being forgotten. More granular disaggregated data on gender, ethnicity, and socio-economic status is critical for designing effective policies and interventions that reach the most vulnerable.

Artificial intelligence (AI), the internet of things (IoT), geolocation, and block chain technologies can assist in eliminating poverty by providing more comprehensive visualisations of disadvantaged populations, that drive more targeted interventions in these communities.

How can 4IR reach everyone's desk and doorstep?

Global equality of opportunity
Significant challenges must be solved in order for 4IR technologies to reach everyone's desk and doorstep. Ensuring basic infrastructure is key among these, and this should be accompanied by governance and regulations, business models and financial incentives for scaling. People will also need to be provided with opportunities for reskilling and upskilling to prepare for the digital age.

"That's what we always intended when we wrote SDG 17 partnerships of all kinds, so it can be partnerships involving Google and Microsoft. But it can also be partnerships involving hundreds of thousands of tiny tech start-ups."

– David Donoghue

"If you have SDGs in mind as an outcome, if you keep that as your kind of your focus, then and keep yourself open and flexible for different ways of partnering."
Yousuf Caires

Massive investment by tech giants

To connect the world requires massive investment on the part of the tech giants. The challenge with many of the digital technologies is that many companies will seek profit maximisation and the development of their own technologies.

Regulators will have a difficult time predicting how far and deep technologies will spread. What unintended repercussions might there be if the global network is dominated solely by economic interests?

Scaling up these technologies may lead to new and unpredictable risks, ranging from security to socio-economic concerns like job displacement and even unexpected environmental consequences. Adoption and scale up of technologies should be balanced with a commitment to sustainability and the Global Goals.

Partnerships for equity and inclusivity

To align social values of equity and inclusivity with market forces calls for collaborations with government and digital companies to build technology responsibly. It also calls for establishing industry standards to address issues of data privacy, ethics and ensure trust among users.

"I fully agree partnerships are absolutely critical to display all of that regulation has an important role to play."
Patrick Noack

In order to create ecosystems that promote inclusive development, partnerships and collaboration are vital. This can only be accomplished through collaboration and collective action partnerships—cross-sector and within-sector collaboration and coalitions to generate systemic change on a large scale.

Flying cars that don't fall out of the sky

As technology develops and produces prototypes and as emerging technologies evolve, we must ensure that the right regulatory and ethical frameworks and legislation are in place to allow new technologies to be used to their full potential with sustainable and inclusive development serving as a blueprint. Partnerships are important for this, but it's also critical to strike a balance between unbridled growth of companies and the SDGs.

Skilling people to close the digital gap in the 4IR

Amidst the rapidly changing world, the very concept of work is being redefined. Job displacement is inevitable. Many current jobs will be lost and replaced by others with different profiles. Countries will need to intensify their efforts to accelerate workforce reskilling in order to bring people into the 4IR and transition to a future world of work. This has implications particularly for the SDGs related to inclusive and equitable quality education (SDG4), decent work and economic growth (SDG 8) and increasing industry, innovation and infrastructure (SDG 9). To be a part of this industrial revolution, people need digital skills and competencies.

Skilling the next generation for the 4IR provides enormous opportunities for developing and developed countries to compete on an equal footing. Tech experts, data scientists, design thinkers, co-creators, and tech translators—people who can explain the benefits and risks of various technologies—will be critical for countries to join the 4IR.

People entering the workforce today, will need to continuously educate themselves.

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As highlighted during World Majlis' Knowledge and Learning week, on-going education could include micro-accreditation in areas such as blockchain or AI, for instance, to make the technology transition of our revolution a reality. There is also the need for empathy and emotional intelligence and a values-based education for the 21st century, because only then can we connect with others and the planet for a more sustainable inclusive future.

Looking ahead to 5IR, 6IR and so on

The clock is ticking for many of the concerns we face, such as climate change and environmental deterioration, no longer have time to be addressed, and the clock is ticking. Although technological developments are not a panacea, if leveraged wisely and responsibly with sustainability in mind, they could be significant in propelling us forward to the Global Goals by 2030.

The 4IR technology is fronting a time in history when the potential for opportunities and challenges are high. Yet to ensure that the digital revolution is responsible and reaches everyone's corner, policymakers will need new ways of thinking, and new collaborative approaches to take a system-level approach to ensuring technologies are responsibly in the service of the SDGs to shape our future.

As a global community we need to think more about a technological transition because after the fourth industrial revolution we will experience the fifth, sixth and seventh. The challenge is to anticipate what that might be, and feel the contours of it. Beyond the 41R, we can forecast higher productivity, with each new revolution empowering us to leapfrog, to be accelerated by several orders of magnitude. Are we putting in place the right foundations for equitable, inclusive and sustainable development in the 4IR to help us be on solid footing for our subsequent industrial revolutions?

Best practice

4IR technologies that provide a roadmap to achieving SDGs by 2030

The World Economic Forum's (WEF) Centre for Global Public Goods is proactively engaging stakeholders to exploit the immense potential of 4IR technologies to address poverty, climate change, nature loss, and inequality. Its 2030 Vision platform - a 4IR for Global Goals Platform – serves as a focal point for coordinated efforts to leverage advanced technologies to achieve the Global Goals by 2030. It collaborates with technology suppliers and forges collaborations with governments in the areas of technology, capacity development and finance in order to accelerate the new technology solutions for the Global Goals. It is in line with the United Nations (UN) High-Level Panel on Digital Cooperation, which has called for a multistakeholder approach that brings together technology companies, government, civil society, and international organisations to break down barriers to responsible deployment of new technologies and deliver positive societal and environmental impact.

Ensuring the widest possible benefit from 4IR technologies

The Dubai Future Foundation (DFF) is a government entity, and one of its key areas of focus is to think about policy and regulation and ensure that some of the technologies or any development that will have socioeconomic impact in Dubai is brought to bear in the best possible way. The DFF's original location in 2016 was an innovative 3D printed office, marking 3D printing as one of it's first technology revolution technologies. Other technologies that the DFF specifically focuses on are blockchain, artificial intelligence (AI) and precision medicine. Other areas that the DFF looks more broadly at include robotics, last mile deliveries, drones.

"And one of the key advantages of those technologies is that they're non-location specific and that they're also limitless. That can be augmented, that can be deployed, they can be disseminated almost infinitely. And it's really incumbent on us to ensure that it is done in the best possible, best possible way and to the widest possible benefit."
Patrick Noack

Bringing world-class meteorological expertise to tropical farmers

Expo Live funded Ignitia, a weather forecasting firm. Instead of profiting from its technology, they decided to give it to farmers in the tropics, providing them with greater weather predictability. Knowing if it will rain or not can make or break the farmer's crop. The farmer can prepare the soil for planting, protect it from rain or sun, and prevent seedlings from being washed away in runoff..

"And our plan is hopefully to share our experience with some African sub-Saharan countries."
Mostapha Bousmina

Innovation ecosystem for 4IR technologies in service of SDGs

Morocco is creating a 20 million Euro innovation ecosystem that positions it among high value technology-producing nations. The ecosystem will bring national industries on board with the 4IR, making them more globally competitive. It also houses Africa's largest additive manufacturing plant. The ecosystem has an emphasis on industry, entrepreneurship and research in 4IR technologies such as big data, AI, the Internet of Things, cloud computing, 3D printing, block chain, robotics, and cobotics (human-machine collaboration). The life blood of the ecosystem are its's collaborations with universities, engineers, and start-ups, as well as international organisations such as the Millennium Challenge Corporation (MCC), a US agency that provides grants to countries determined to have good economic policies and potential for economic growth.

"Every company which can optimize building performance in terms of energy consumption, water consumption has a key for sustainability with impact."
Oliver Kraft

Leveraging Mindsphere technology to create sustainable buildings

Siemens at Expo 2020 showcases 4IR technologies to improve sustainability. Buildings consume between 30-80% of the world's energy. At Expo 2020 Siemens they introduced the infrastructure to the Internet of Things by focusing on five areas related to sustainability. Smart monitoring enables them to regulate air quality—indoors and outdoors, energy and water consumption via smart meters, as well as waste management. Such technologies, if used on a global scale could greatly reduce energy consumption and greenhouse gas emissions.

Emerging questions for future conversations

Can the global digital ecosystem support shared prosperity?

How can the SDG's become the leading purpose for governments?

Gender is everybody's business

Every issue the global community is dealing with involves gender. Poverty, climate change, education, partnerships, peace, and security all have a gender component, and without the full and equal participation of women and girls, all SDGs will remain out of reach.

Targets linked to gender equality:

5.1: End all forms of discrimination against all women and girls everywhere

5.2: Eliminate all forms of violence against all women and girls in the public and private spheres, including trafficking and sexual and other types of exploitation

5.3: Eliminate all harmful practices, such as child, early and forced marriage and female genital mutilation

5.4: Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate

5.5: Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life

5.6: Ensure universal access to sexual and reproductive health and reproductive rights as agreed in accordance with the Programme of Action of the International Conference on Population and Development and the Beijing Platform for Action and the outcome documents of their review conferences

5.A: Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance and natural resources, in accordance with national laws

5.B: Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women

5.C: Adopt and strengthen sound policies and enforceable legislation for the promotion of gender equality and the empowerment of all women and girls at all levels

Source:
United Nations Development Programme

SDG 5—a catalyst for achieving the other SDGs

The 17 Sustainable Development Goals are intricately linked. None of them can be achieved without the achievement of the others, but SDG 5—the mother of all SDGs— is a very significant catalytic SDG.

"You can't achieve the SDGs unless women and girls are fully part of the picture. We have very absolute targets of the SDGs. Eradicate poverty - women make up 70 percent of the world's poor. Unless we deal with that, we can't achieve that SDG. A similar story with the absolute goal of eradicating hunger. We can't leave women and girls behind in areas like education. We want to see girls able to reach that target to of everyone being able to have the 12 years basic education and equal opportunity. There's a long list of things that have to happen now."
Helen Clark

"We're not supposed to say that one goal is more important than the other. But having said that, of Goal 5 I would say it opens up space for many of the other goals to be achieved. If we are serious, if we can make progress on goal five, it will make it easier to make progress on the others."
David Donoghue

The COVID-19 effect

Despite the fact that the global community is far from where it needs to be, there were some positive strides being made along SDG 5. According to the World Economic Forum, over the two years of the pandemic, the world has regressed 36 years on achievements in gender equality.

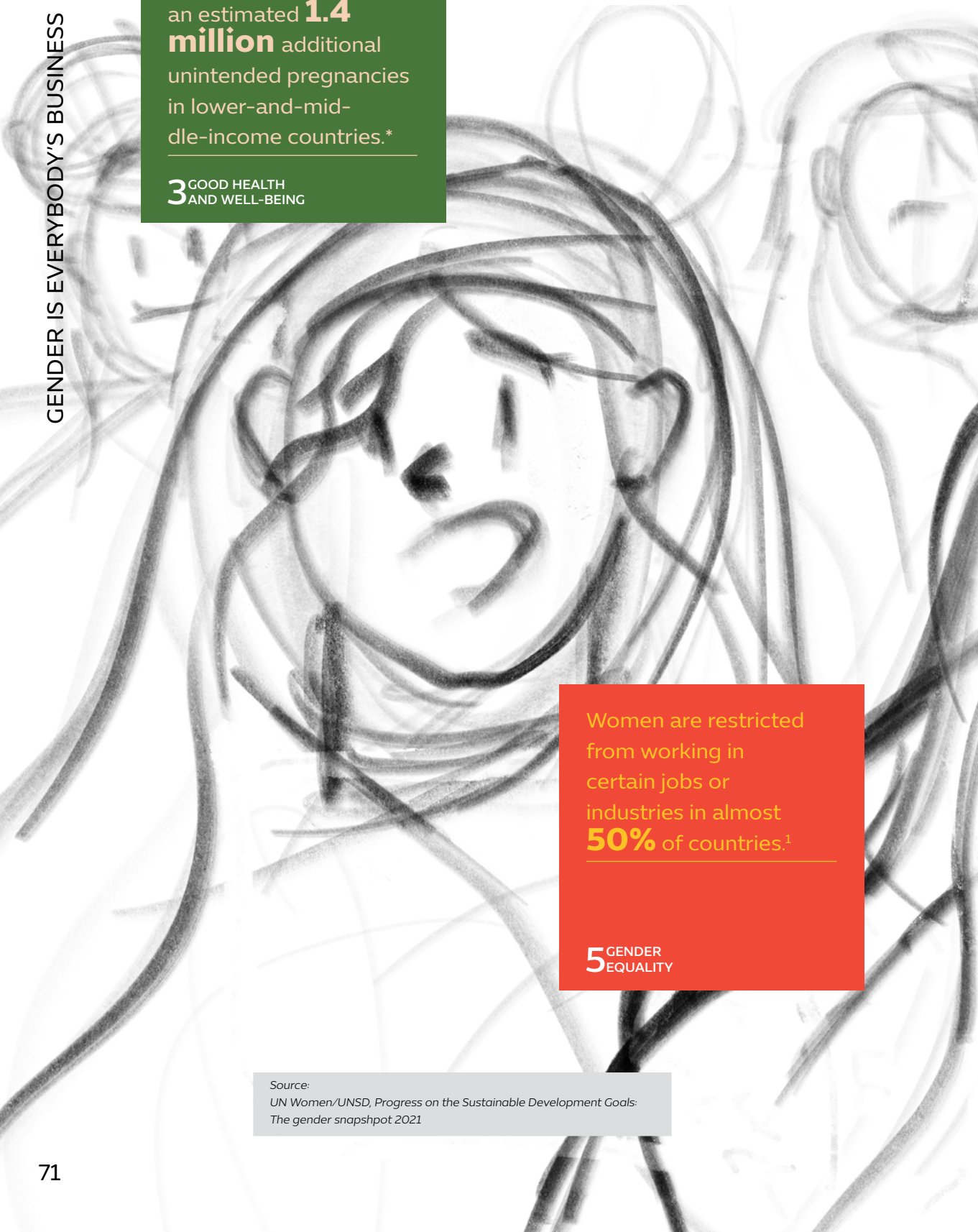
While people from all walks of life have been adversely affected by this pandemic, women have suffered particularly in the areas of education, social and economic growth, conflict, and security. Domestic violence against women also increased during the lockdown.

The United Nations' Common Agenda report, released last year, proposed a social development summit in 2025. This would enable the international community to concentrate on the SDGs' human development goals in particular. Poverty, starvation, education, gender equality, universal health care, and reproductive health rights are just a few of the issues that need to be re-focused and re-energised.

GENDER IS EVERYBODY'S BUSINESS

In the first year of the pandemic, there were an estimated **1.4 million** additional unintended pregnancies in lower-and-middle-income countries.*

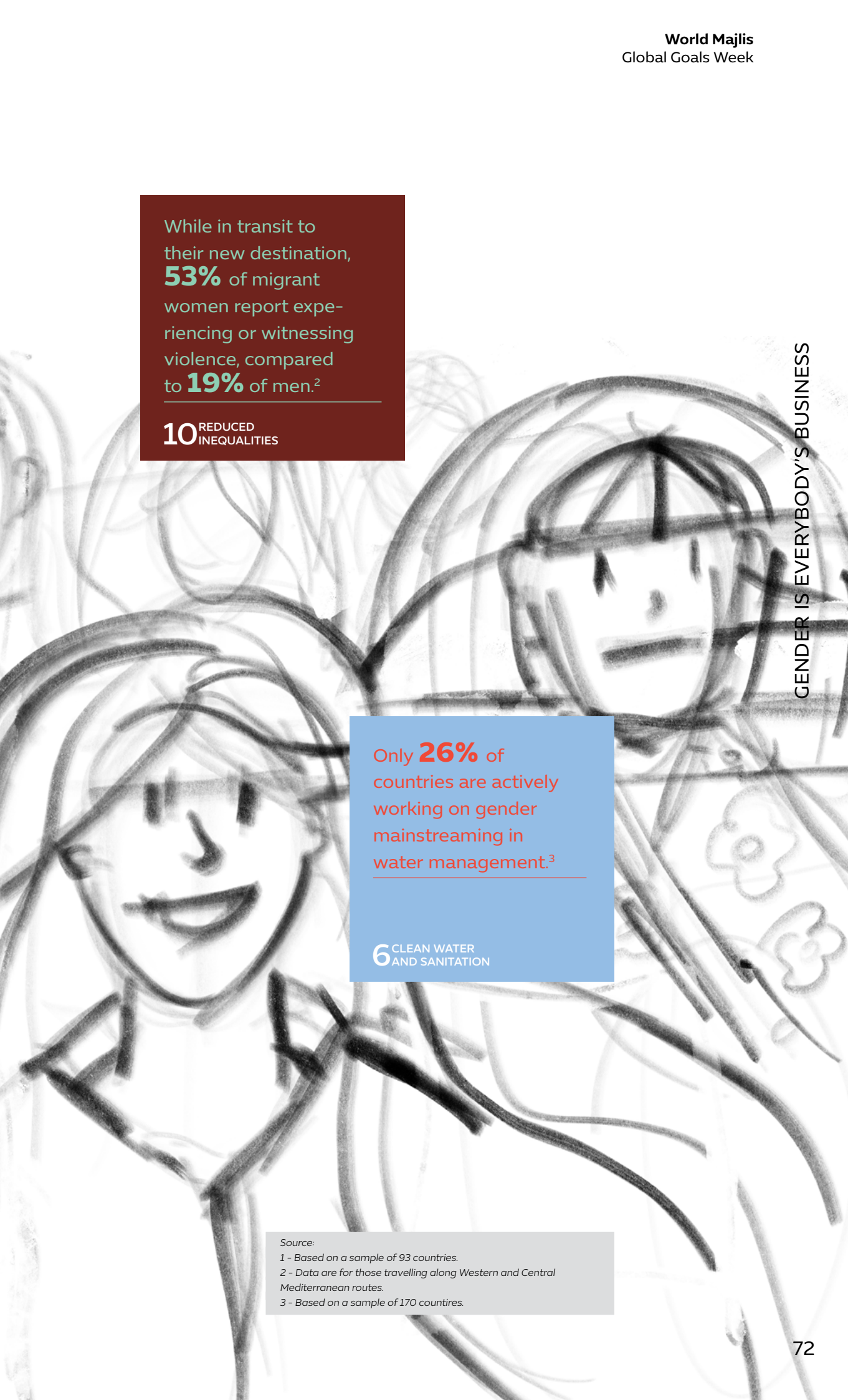
3 GOOD HEALTH AND WELL-BEING



Women are restricted from working in certain jobs or industries in almost **50%** of countries.[1]

5 GENDER EQUALITY

Source:
UN Women/UNSD, Progress on the Sustainable Development Goals: The gender snapshpot 2021



While in transit to their new destination, **53%** of migrant women report experiencing or witnessing violence, compared to **19%** of men.[2]

10 REDUCED INEQUALITIES

Only **26%** of countries are actively working on gender mainstreaming in water management.[3]

6 CLEAN WATER AND SANITATION

Source:
1 - Based on a sample of 93 countries.
2 - Data are for those travelling along Western and Central Mediterranean routes.
3 - Based on a sample of 170 countires.

"We have to work extra hard to get to where we want to be in 2030. I totally agree that we can get there, but we can't get there without an enormous effort and really doubling down on the efforts that we've made so far."
Sonja Hyland

"The majority of our working force in the health sectors are women. For example, more than 85 percent of all nurses are women. More than 90 percent of all long-term caregivers are also women, meaning that the women had—or unfortunately still have— a greater chance to get corona virus. And also, unfortunately, more recent investigations show that more women compared to men lost their job during the pandemic. And finally, at least at some point during this pandemic, the schools and kindergartens are closed, meaning that unpaid work in the home increased and the statistics showed that all that work at home was on the women, meaning that they had less time for individual and professional development."
Darija Kisic Tepavcevic

"I think we have to ask ourselves with all of these efforts, why is it still going to take another 135 years, according to the World Economic Forum gender gap report, to achieve gender equality. Who has time to wait an entire century for gender equality? One way to think of it is that perhaps while policies and programmes and interventions are very important, maybe we have concentrated a disproportionate effort on these programs and not enough on actually transforming the various systems and structures that lead to pervasive gender and any other inequality in the first place."

– Leena Al Olaimy

"It is really important to say that if we have one major achievement, it is really that we have to be a very strong, normative and conceptual framework in place."
Stella Ronner-Grubačić

Catalysing change through robust frameworks and policies
Systemic changes and strong resolutions and frameworks serve as the "infrastructure" to achieve SDG 5. They govern exterior actions and define internal goals.

Important agendas laid out in the Beijing Declaration, the Istanbul Convention, the EU's Gender Action Plan III and several other important instruments and human rights charters, should help us ensure that gender is not an afterthought in our actions, but rather a fundamental part of them.

Leadership and strong, consistent policies are needed to action solutions towards gender equality and women's empowerment. Gender budgeting, gender parity, and equitable pay are all examples of gender management tools that help organisations perform better.

"There are many countries in the world where women don't have even the basic legislative rights that they need. For instance, they don't have the same access to inheriting land or assets, to equal pay or even access to the workforce. We can't stop focusing on structural legislative issues of hard power and access to money and power."

– Sonja Hyland

Men for gender equality

Ending gender inequality will need everyone to be involved. Men and boys should also advocate for equality because stereotypes and biases affect them too. In the UK suicide is the biggest killer of men between 20-49 years of age likely as a result of men made insecure by a distorted sense of what constitutes male success.

Economic empowerment of women, which is one of the key enabling factors for achieving many of the other goals, depends on the opportunity for women to work and requires women to balance domestic responsibilities with a career. As long as the burden of childcare and domestic work primarily falls to women, their perceived value in the workplace and subsequently opportunities for career progression remain limited. Unless men take on more of these responsibilities women's economic opportunities will continue to be limited.

"And that's why legislation in every country is fundamental that pushes quotas and the right numbers—we want to bring women in different spaces— that pushes the right legislation to make health more inclusive, to ensure that women have opportunities, education. So, the role of the public policies is fundamental."

– Cristina Gallach

GENDER IS EVERYBODY'S BUSINESS

"What we've done with UNICEF Hungary is a survey about career opportunities and employment opportunities for women with young children. What we found is that there are incredibly contradictory expectations from society. When we asked people if they thought both parents should work, 92 percent said that they thought that both women and men should contribute to the household by bringing home a salary. But when we asked whether women with young children should work, 85 percent said ideally no. When we asked whether women with young children were full value as employees, 73 percent of the population said that they didn't think a woman with a young child would provide full value as an employee, and 75 percent of Hungarians thought that children under three actually suffer if the mother is going back to employment... Nothing will really change until the men do. Until they help their wives and their daughters, and they play a more active role at home and in the household, and they share the burdens equally."

– Antónia Mészáros

Making the case for women leaders

Women in leadership, whether in business or politics, are more likely to make decisions that consider social and environmental outcomes, as well as the "bottom line".

The world needs women leaders

The state of the world and our global systems today can be attributed in large part to a style of leadership that could be characterised as "masculine" – one that often takes a zero-sum view of growth and foreign policy. Solving some of the world's biggest challenges will require collaboration, the ability to be empathetic and take a long-term view on various issues. We need diverse leadership that can represent the complex world we live in.

It is of course questionable why there needs to be a business case for women leaders, when one isn't needed for male leaders.


20-30%
Increasing access to resources and WOMEN'S LEADERSHIP IN AGRICULTURE could increase agricultural yield by 20-30%.
Countries with a greater share of WOMEN CABINET MINISTERS exhibit greater levels of confidence in their national governments.
WOMEN IN LEADERSHIP
35%
Peace agreements are 35% more likely to last at least 15 years if WOMEN LEADERS are engaged in their creation and execution.
Countries with a greater proportion of WOMEN AMONG TOP DECISION-MAKERS in legislatures have lower levels of income inequality.
WOMEN'S DECISION-MAKING OVER LAND and household income improves access to education and healthcare for their families.
21%
When women hold more executive leadership positions, their companies are more profitable. Companies in the top-quartile for GENDER DIVERSITY ON EXECUTIVE TEAMS are 21% more likely to outperform the national average.
Source:
Womendeliver.org/Women's Leadership

"The proportion of women parliamentarians, for example, around the world is pathetically low. It reminds me of my relatively early days in New Zealand politics. I was one of nine percent women in the parliament. These days, it's almost 50 percent. But we have to keep pushing because out of sight is out of mind. You know, decisions shouldn't be made without women being a part of them. Getting a focus on the things that are most important to women does mean getting women's voices at the top tables."

– Rt. Hon. Helen Clark

Source:
Womendeliver.org/Women's Leadership

"Every time I have to make the business case for diversity and inclusion, I feel very conflicted because on the one hand, diversity and inclusion do add trillions to the economy. It does increase shareholder value, it does increase innovation. But it's also a moral imperative. And we're not making the business case for men. So why should we be having to make the business case for gender or any kind of equality."

– Leena Al Olaimy

"What happens, I think in general when it comes to women is after a while, it becomes obvious to them that the priority of their family becomes a challenge. Looking at high level CEOs, women CEOs in the US where after a certain level of senior post, they've stepped down, taking a choice to spend more time with their families. It's not that the side is pushing them toward a choice of taking home as priority, but most women carry that as a responsibility regardless."

– HE Sheikha Lubna Bint Khalid Al Qasimi

"We need a clear set-up in every country - a sort of engagement from the different governments that regularly check what advancements are being made and in front of the public opinion it becomes a transparency exercise so that we know what is being done."
Cristina Gallach

"Christine Lagarde in her time at the IMF showed the world that women can lead the most important financial institution in the world, and do it better than men. She also opened the door to four other women leaders who are also the first females to hold these positions. So this is sort of permeating a very important institution ."
Lea Giménez

Why are there so few women in leadership?
From societal expectations to family responsibilities, the "leaky pipeline" metaphor is often used to describe women's careers where the number of women who progress to the next level tail off at a certain stage.

Champions for Equity – in the workplace and at home
Legislation is fundamental to ensure greater inclusion, but it must be supported by the private sector.

To address systemic issues we need a concerted effort which includes companies making the conscious choice to prioritise diversity, as well as men individually taking on a more equal domestic role than they often have in the past.

The importance of role models
Women today hold just 4% of the leadership positions in Fortune 500 companies, and only a quarter of the world's parliamentarians are women. Seeing women in positions of leadership is crucial to inspire as well as open the door for other women.

Visible women leaders, such as those leading nations and influential organisations, are paving the way for a new generation of girls to believe in their own abilities to do and be more.

Specifically, role models have a dramatic influence on whether or not young women pursue STEM subjects in school and STEM related careers. In fact, research shows the number of girls interested in STEM almost doubles when they have role models (41%) compared to those who do not (26%). Girls with role models are also more passionate about STEM subjects and are 15% more likely able to imagine themselves working in one of the STEM disciplines.

"Companies sign up as champions for gender equity in STEM, and they make a public commitment to actions that they're going to take within their own business and report back on what they've done and the results of that, like measure the gender pay gap within the company. Gender pay gap is fairly large across the board, but in some STEM industries they are larger than the average. So if somebody male or female wants to spend more time on their family, then there is flexibility to do so without losing your career and the ability to go back to a career after a break."

– Lisa Harvey-Smith

"If we look at the science of the brain, men and women think differently, we act differently. So the structure of your brain, the connectivity between the two sides, gives women certain skills that maybe the men would lack or vice versa. You can put a problem in front of a man or a woman - they may look at it differently, may solve it differently. So therefore, when we talk about culture, the culture that both male and female bring to the table to scientists is very crucial. When it comes to the problem-solving and the contribution, it is crucial to find the right combination of both."

– HE Sheikha Lubna Bint Khalid Al Qasimi

Importance of education

Girls' education strengthens economies, reduces inequality and is crucial to creating more stable, resilient societies.

Only 49 percent of countries have achieved gender parity in primary education. At the secondary level, the gap widens: 42 percent of countries have achieved gender parity in lower secondary education, and 24 percent in upper secondary education.

Removing the barriers to girls receiving education will be key to achieving any of the other SDGs.

"There has been progress in this area, actually - two thirds of the world's countries now have equal opportunities in education for boys and girls, and this is great. But still, 29 million children of secondary school age are out of school across the world. In conflict areas girls are two and a half times less likely to have access to education than boys, and 20 to22 percent of the girls across the world between the ages of 15 and 19 are neither in education or in work across the world still, which is clearly an issue and an issue that is linked to other ones like child marriage, which is still affecting 650 million women and girls living in our world today. And an issue that has actually been quite severely impacted by the COVID crisis as well. This is also linked to the fact that complications during pregnancy is the second leading cause of death for young women because of the fact that they have their children too early as a result of child marriage."

– Antónia Mészáros

Making the case for women in STEM

Globally only 35% of STEM students in higher education are women, and the representation gap grows wider in the workplace. With STEM careers being the jobs of the future, driving innovation across new realities, it becomes crucial to address this gender inequality.

Many women STEM superstars have certainly made headlines through history. We owe the world's first computer program to Ada Lovelace, in Great Britain, in 1843. Marie Curie was the first person – from a total of four so far in 120 years - to be awarded two Nobel Prizes, one in Physics and one in Chemistry. During World War II, women operated some of the first computational machines used for code-breaking at Bletchley Park in Britain. In the United States, by 1960, according to government statistics, more than one in four programmers were women. Traits such as being considered logical, good at math and meticulous were all gender stereotypes that worked in women's favour.

The number of women in science and engineering is growing, yet men continue to outnumber women, especially at the upper levels of these professions. Today, while girls and boys take math and science courses in roughly equal numbers in school, only 35% of STEM students in higher education globally are women, with that number being under 10% for subjects like ICT and engineering.

The gap is more acute in workplaces with less than 40% of the STEM workforce being women, with the number being significantly lower for engineering and technology jobs.

Why does it matter?

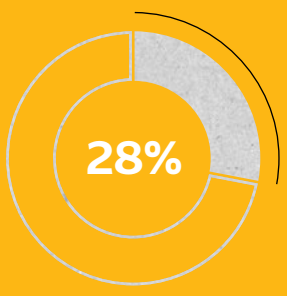
If the people working in technology-related fields are not representative of the people in our communities, the solutions they develop will not be representative either. As we will depend more on advanced technology to solve some of the world's most complex problems, it is important that we are able to engage our best and brightest minds in this pursuit, and not be leaving half of them out of the picture.

"It is exceptionally important that we change the structure of the workforce so that these new worlds that we're building - the virtual worlds, the AI algorithms, the artificial intelligence – don't look like a white man but look like a more diverse section of society. And there's lots of examples that come up all the time about image recognition and all sorts of things that really emphasise that the unconscious biases and very innocent assumptions, made by the people writing lots of the code, could actually be shaping a world in a way that's not friendly to people that aren't quite like them."

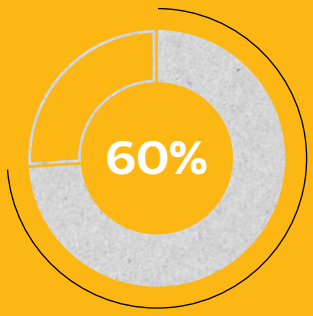
– Dame Juliet Gerrard

Women in the STEM workforce

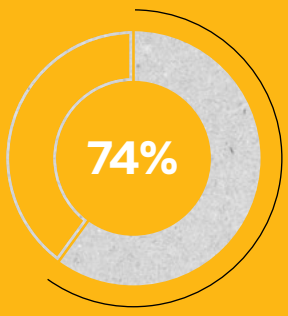
Science and engineering



Social sciences



74% of girls show interest in STEM



By middle school they tend to lose interest

Source:
U.S Bureau of Labor Statistics; Girl Scouts Generation STEM Reports

"We have a new program called male champions - so male participants who are supporting females in their path. Male champions are the husbands who support their wives who want to learn new skills, who want to network and build connections, the husbands who take care of the kids equally in the evenings and let the women also have their social plans, I think that's a crucial part in supporting women achieving their goals."

– Anna Andersone

"Anonymising applications for funding for scientists, for example, so that when scientists apply to use a giant telescope facility or a super-computer facility, that the applications are anonymised so the names are removed. And what is judged is not the person's name, but the science itself – is one of many ways to away at those many different barriers to full participation."
Lisa Harvey-Smith

Getting women into STEM and keeping them there

There are many systemic factors that are creating barriers for women in STEM and solving them will require approaching the issue from multiple angles.

Making STEM great again

Research shows that girls as young as six years old believe that STEM subjects are not for them due to the stereotypes they've been exposed to. Programmes and initiatives that work at this early stage to engage children and help them see STEM subjects as cool and important in solving the great challenges of the future will play a large part in keeping girls interested in education in STEM subjects.

"There's initiatives like code.org in the U.S., where everybody in all elementary schools learn how to code. But they do it in a way that shows how it's applied to fashion design or medicine or their other passions and interests - seeing that computer science is not just something that software engineers do. With young people there's this larger culture of activism and of wanting to promote positive social change. So seeing that computer science is just another tool to be able to build products or solutions to solve those same problems that young people care about."

– Akshaya Dinesh

"The percentage of venture capital funding that goes towards women led companies is just like horribly smaller. And I don't even think it's just because there's not enough female investors, but even across female investors, a lot of them are afraid to invest in female-led companies because they don't want to be seen as the diversity pick."
Akshaya Dinesh

Biases and the myth of the "math/science brain"
Research shows no cognitive biological differences between men and women in math, so the idea of a male "math/ science brain" is not true. Despite equal levels of ability among boys and girls, a math/science gap grows over time as girls are discouraged and tracked away from STEM subjects. Some studies indicate that lower expectations and biases contribute to around half of the gender achievement gap in math.

This is also evident in for example the significantly lower level of funding women-led startups receive.

The STEM Boys Club

Across the board, women are underrepresented in STEM fields. The significant role of social interactions in the progression of STEM careers as well as in the gender pay gap has been well-documented, and the STEM Boys' club has become something of a self-perpetuating situation.

Creating a supportive STEM culture

STEM fields idealise this culture of working as many hours as you can and focusing on quantity of work as well as quality of work. A shift in culture to judge people not on the number of hours they put in and creating a friendlier environment would really help the cause of diversity.

"We were two female founders in the in Riga, in our capital. I knew that there was a founder weekly dinner. It was all guys going out to get beer and they were not inviting us and they frankly said, 'Oh, I'm sorry, we just will not feel as comfortable if you are there because we can't make funny jokes and stuff like that'. So Riga TechGirls was actually was born from the idea that I thought, I want more women start-up founders so they can build this club and support each other and not just be role models for others, but also support each other."

Anna Andersone

"The very way we do science, the way we throw up ideas and ask people to tell us what's wrong creates in some ways a negative, combative culture. And if we can shift the culture so that we judge people on the quality of their output, and role model a more positive culture that still encourages robust presentation of data and rigour but that creates a safer, kinder environment in which we can make progress."

– Dame Juliet

"In Silicon Valley, there's definitely this term hustle culture where a lot of the role models that we idolise are people that work 24-7. They're first in the office, last out of the office, and that's not just at the engineering level, but also just in the executive level. And oftentimes that's measured by the number of hours. Across tech founders, it's definitely even more common where they just have no work-life balance."

– Akshaya Dinesh

Best practice

The Women's Pavilion Expo 2020 Dubai

The Women's pavilion at Expo 2020 is collaboration with Cartier is a tribute to the approach of creating multi-stakeholder spaces and demonstrating that everyone, including premium brands have a role in participating in women's issues. The pavilion is based on the principle of gender equality and that when women thrive, humanity thrives.

HeForShe

HeForShe is a solidarity movement for the advancement of gender equality, initiated by the United Nations. Since its launch in 2014, by UN Secretary-General Ban Ki-moon and UN Women Global Goodwill Ambassador Emma Watson, millions of men from around the world including Heads of State, CEOs, and global luminaries have committed to gender equality. On the HeForShe website, a geo-locating map records the global engagement of the movement through counting the number of men and women around the world who have taken a pledge for the HeForShe initiative, registering over 3.3 million online commitments worldwide as of 1st March 2022.

Social enterprise addressing gap in Arab women's participation in workforce

She is Arab is working on SDG 5 concerns gender equality, namely to 'Achieve gender equality and empower all women and girls', driving this focus on workforce participation. The Arab world fares worse when it comes to female workforce participation, with rates lower than 20 percent. When it comes to seeing women in leadership, there aren't many women as role models.

"In Costa Rica we have a general law in terms of parity, women participation and in position political position, especially in the Parliament. Now we have the 46 percent of women seats in the Parliament, but also we have a parity government."
HE Epsy Campbell Barr

Women's representation in parliament

Costa Rica stands out for having a high percentage of female public leaders. The Central American country is an interesting case given its long democratic history, higher gender equality ratings than other Latin American countries and unique political gender quota system.

20 for 2020, UAE

The UAE launched this initiative In order to champion gender balance at board level. Under this programme, twenty women will take part in a year-long professional development course while they gain board-level experience. The aim is to increase female representation on corporate boards to 20 percent within 2020.

Future You, Australia

Future You is a play-based digital awareness raising initiative to excite young kids from the age of 8 to 12 about STEM careers. Funded by the Australian Government, it shows people from different cultural backgrounds, different genders, people with disabilities being successful in STEM careers. The Future You website offers a fun environment with animated characters, skill-based games, songs, quizzes and loads of inspiring, diverse careers depicted for kids and their parents.

Women in STEM Ambassador Programme, Australia

The Women in STEM Ambassador is an Australian Government initiative to address gender inequities in science, technology, engineering and mathematics (STEM). The Women in STEM Ambassador provides high-level independent advice to Ministers on matters relating to gender equity in STEM. The Office builds and hosts free resources to ensure Australian parents, educators, students, workplaces and people running equity programs create a sustainable and equitable future.

Emerging questions for future conversations

How can we strengthen gender equality post-COVID?

How can we engage men as allies in achieving gender equality?

How can technology help to level the STEM playing field for women—from education through the workplace?

Innovation at the service of the SDGs

As innovation ecosystems mature, new opportunities enable all sectors—governments, corporations, NGOs, academia, entrepreneurs and individuals—to participate in solving complex challenges, creating the future we want and ensuring no one is left behind.

Existential crises and the SDGs call to action

COVID-19 changed our lives overnight, forcing billions to stay home for months and disrupting lives, work, and education. With existential crises looming, we catapulted forward on technological innovations like mRNA vaccines, online learning, telehealth, and online shopping. To meet the demands of a sudden rupture in our lives, we needed tech-driven innovations immediately, not later.

For many, however, the innovations were out of reach and could not be availed in time to safeguard their lives—for instance, as a result of school closure and the digital gap, almost 10 million children may never return to school.

How can we use the SDGs as a call to action to ensure we use different models of innovation to accelerate our path to the SDGs and reach every corner of the globe? Can we use the SDGs to pivot innovation towards social purpose for the greater good.

"Letting go of the old ways. That, to me, seems to be more difficult than discovering what is the new things that you need to achieve."

– Mihkel Tammo

"I think the beauty of the word innovation is that it's constantly innovating as well. We are in one of the most innovative locations in the world today. We are at the World Expo in Dubai, where countries all over the world are actually showcasing their innovations. So, what does it mean to them from different countries. And I think the commonality between all of these nations and us, as well as the UAE government, is that it needs to bring impact. It needs to bring value. It needs to bring change. Innovation for the sake of innovation is just a nice word and it's a fad."
HE Huda AlHashimi

Definitions for innovation

We often think of innovation as ground-breaking, 'white lab-coat' scientific or technological advancements. This, however, is not the case. Innovation takes many forms and occurs across all sectors, particularly social innovation.

Social innovation—innovation with a strong focus on common values and shared goals— is gaining traction at a time when our present models, structures, governance, and markets are failing to address pressing issues such as climate change, poverty, hunger, and other inequities.

Definitions of technology abound but what is generally agreed upon is that innovations should solve a problem, it must be applied and it should result in value—social or economic.

Today there is increased openness to use social innovation as a driver of growth and prosperity. Whether it's innovations in health, education, technology, finance, or policy, governments are increasingly realising they need to invest in social innovation to create new approaches if we are to meet the SDGs. As new ideas from innovations are increasingly adopted, we see changes and the impact of these ideas on society.

Innovation is a product of our values and frames the future

Innovation can be considered at the systemic, cultural and national level. Or it can be considered at the micro individual level. Innovation is future-making, as it alters the future. The dominant narratives of the future and what innovation means is a very contested space—whose future is most important? Although there are many conflicting anticipatory models to design the future, innovation for good yields a product that we value as a society. How we frame innovation in relation to these values will shape our future.

> If the anticipation of value produces innovation and what we value as governments, as citizens, as individuals, as companies shapes our innovations and therefore shapes our future.
> So, innovation can change our sense of value, too. There's an interaction between it. So, my point is if you wish to encourage innovation as change for the better, changes to create value then the way we frame innovation for good and how we express our values in relation to that is an important step for our future.
>
> **– Ted Fuller**

"If society doesn't think an innovation is valuable enough, then that innovation is unlikely to happen to grow, to develop. And the value might be measured in terms of commercial profit, but it might be valued in other ways. If it's just purely in the pursuit of money, one does wonder how that will deal with the existential threat of the nation, but actually also the existential crisis facing humanity at the moment, particularly with climate change. I think it's important that we are able to espouse values that we seek and the example of the shared narrative between governments and stakeholders where the future is framed to some extent and the meaning of innovation is framed in a particular way. I think that's a really important activity that needs to be continuously considered and developed."

– Ted Fuller

Common misconceptions of innovation

1 All innovation must be breakthrough innovation. This is not the case. Most innovations are in fact incremental changes.

2 Innovation is the white lab coat kind, namely scientific or technical. This is also not the case. Numerous innovations are social innovations.

3 Innovations happen in specific sectors. The reality is that innovations can be incubated in all sectors– private, public and non-profit.

"There's this kind of inherent default in our day and age when we think about innovation that we think about technology, which I don't think is necessarily true."

– Yoav Fisher

"The Apollo space programme and other government led programmes in the past that were able to provide this big vision, bold missions that really put us forward. So either financial non-financial, I think for me, what makes sense is having governments play in consortium with private players and having an ecosystem of start-ups and corporates towards end goals."
André Marquet

A bold vision for national innovation advancing SDGs

Governments as amplifiers of innovation may greatly advance society and the SDGs. Countries like the United Arab Emirates and Estonia, among others, have demonstrated in recent years that governments that provide a bold vision and mission-oriented approaches to innovation, can greatly advance innovation ecosystems to address national and global challenges. A strong vision and a system-wide approach will help innovation bridge the gap between inspiration and solution, while also addressing the complexity of integration.

Crowdsourcing ideas

Are crowd sourcing ideas and open innovation the new paradigms? Crowdsourcing or crowd engaging ecosystems allow people to come together to create something unique for humanity. When innovation is surrounded with purpose—what is it going to do for humankind? — the result can be truly transformative. This can be the basis of successful innovation towards the SDGs.

Participatory economy

How do we involve people in advising what policies work better? How can we leverage local knowledge and indigenous knowledge to bring about effective solutions, because these tend to be the most sustainable solutions? The idea of a participatory economy, this collaborative process for innovation, it's something that needs to be encouraged not just by the tech companies, but also by governments. In this way, robust ecosystems in which there is wide participation by individuals, can help shape solutions to the SDG challenges.

"Now, any society has the potential to innovate and create. And the key here of unlocking this potential is the conditions that are created by its leaders. Here in the UAE, we are very lucky and we are blessed to have these visionary leaders who strongly believe in embracing and investing in emerging technologies and novel solutions that at the end you reach a point where you solve global challenges here."
Alya Al Mazrouei

"It's allowing people to create their own services and experiences. I think there's something about that when you involve people in shaping their services. Few governments are crowdsourcing policies. But there should be the names somewhere in the world of a local farmer, taxi driver, or grocer, for example, that contributed to crowdsourced ideas—almost like a like a policy suggestion box. I think that's the way to go in terms of involving people and creating social infrastructure."

– Amin Gafaranga

"How do we change the business model to de-risk it for multiple players?"
Nishita Henry

Scalable innovations that help us tackle the big issues

A key element of innovation is the ability to solve problems in new ways that can be scaled up from one to many. There are many ingredients that help create this ecosystem for scaling innovations: technology that solves a real problem; a robust business model that challenges conventional thinking; and different financial services from one sector to invest and boost another.

**An international reference for innovation is the OECD Oslo Manual. It establishes a standard vocabulary for talking about innovation:
A product, process, service, or model must address a problem; it must be applied (not simply a theoretical idea); and it must result in some type of value—social or economic—to be considered an innovation**

"As I think about the future and UNESCO and the SDGs, we're forgetting an important piece as the youth piece and I I'm wearing my youth hat right now. It's more than 1.8 billion. Whether we like it or not, they are going to be solving tomorrow's problems"
Hadyah Mohammed Fathalla

Moving Forward

It's more about innovators not innovations

While much of the focus is on innovations, what we really should be thinking about is innovators, the people who will be carrying out the innovations. How best can we foster a new generation of innovators who will shape our futures? What are the mindsets and skills for individuals to participate in innovating to address societal challenges?

It is vital to provide role models for the new generation of innovators, and demonstrate to students what can be accomplished via innovation, science, technology, and mentors. How do we develop the next generation of innovators with a sense of urgency, a sense of identity that encourages them to build skills in the service of the SDGs? What is the appetite for risk we need to harness?

> *"If the youth can think of themselves as one nation solving bigger problems like global warming, famine, disease, you know, degradation of the planet, then there might be a way for us to scale our solutions, whether they're in the UAE or in universities in Russia."*
>
> – Hadyah Mohammed Fathalla

Open knowledge

We need a new generation of scientists who are committed to discovering solutions to the existential threats that we currently face.

In parallel, ways of sharing information freely and quickly can support the growth of scientific knowledge in places where ideas sitting behind paywalls can impede the flow of knowledge. At the heart of science and innovation is the spirit of sharing information and disseminating concepts for the advancement of research. Without these currents of knowledge moving freely across sectors and disciplines, innovation can be hampered.

"When we are talking about fundamental research it inspires human use and has value. For example, space research or even astrophysics has got some meaning for humanity. Because if we don't understand how the sun produces so much energy, we will not have thermonuclear energy."

– Albert Efimov

"This year is the international year of Science for Sustainable Development. All the international unions, the main academies, all the scientific societies are working together not only to create the solutions we need, but also to be in these kinds of settings, so we can listen to the scientists and have a more inspiring future to our next generation of young scientists. We need brilliant minds not to create more apps for our phone. We need brilliant minds to create solutions for our world."

– Javier Garcia Martinez

"I believe in innovation when that innovation is led by principles, values and humanity?"

Oscar Di Montigny

Humanovabilty is the notion that combines three interlinked concepts-- that sustainability must be energized by innovation, and that this in turn they should have positive impact for humans. When applied to the SDGs, the framework recognizes that innovations are key to the long-term success of solutions, and that they must result in the well-being of people.

Scientific research - a matter of national security
Scientific research and development contribute to national resilience by building solid foundations for shaping countries' futures and providing the means to avert potential risks. The recent epidemic, for example, laid bare the importance of national scientific development, particularly vaccine production. Several countries, including developed ones, were forced to buy vaccines on the international market, putting them at the mercy of other countries and the international market.

At the same time, there should be systems in place to ensure that for those countries not able to conduct their own fundamental research can still benefit from significant discoveries and innovations.

"Today doing research is not a luxury. It's a matter of national security because if you don't create your own vaccines, you need to go to the market to see who wants to sell them to you. And if nobody wants to send them solutions, what's going to happen."

– Javier Garcia Martinez

"But also, the ability to not define innovation just as, you know, sustainable development goals or meeting 2030, but the ability to actually solve problems and use specific metrics to say, OK, this is what we sought to do 10 years ago and one, two, three, four or five, these are the tactics we use, and here are actual problems solved. So to me, that's the definition of innovation, one that's more practical and one that's more sort of policy oriented."

Hadyah Mohammed Fathalla

Using tangible goals and metrics to measure progress

Advancing progress on innovation towards the SDGs requires a fundamental shift in the way we think. Inspiring SDG case studies are important and have their place, but these should be accompanied by key performance indicators (KPIs). KPIs for innovation can be threaded into new ways of addressing the SDGs and cascaded throughout government, the private and academic sectors. An emphasis on the SDG targets and fit-for-purpose innovation metrics that track impact of innovation in advancing the SDGs are an important step forward.

Indigenous epistemologies advancing innovation

Diversity is a major driving force for innovation. Historically and in the contemporary world, the most innovative societies have been the most diverse. Emerging technologies compel us to tap into diverse ways thinking to generate solutions that are sustainable.

Traditional and indigenous epistemologies and worldviews cannot be ignored in contemporary approaches to innovation. Different perspectives on nature and human nature should be blended into a contemporary language that helps us communicate our progress, well-being and environmental stewardship.

"And as you were saying specifically to answer the question about leaving no one behind. I mean, it's a wonderful slogan, if I may say so, but of course, it really means those who under different categories, different headings are disadvantaged, so you need to have data which is disaggregated across gender, ethnic background, socioeconomic status. I mean, there are many different criteria. And for that, we need all the advantages of the new technologies, which instantly I mean, both new and in some ways, old technologies. There's a fantastic amount of knowledge which comes from indigenous peoples."

David Donoghue

Aligning our innovations with the SDGs

The existential crisis facing humanity at the moment, particularly climate change, place new demands on innovation. It becomes increasingly important that we align stakeholders along common values, where shared narratives frame the future and the meaning of innovation in a way that moves us forward and closer to the SDGs. These shared narratives need to be continuously re-evaluated, re-shaped and re-developed to address the challenges effectively and collaboratively.

"Innovation shouldn't just focus on the ideation and R&D phase should also sort of give equal importance to the execution and then to the scaling phases, because that's how the world can, derive value from innovation."

– Arun Sundararajan

Best practice

"As government is that we are the enablers of innovation to provide the right ecosystem so everybody can flourish and innovate from the children to the professors, to private sector, to mothers at home. So it's I think that's our role in government innovation, and we are here today celebrating every year, the month of February. UAE innovates it's to actually bring this to a life and show everybody, what does innovation mean to them."
HE Huda AlHashimi

UAE Innovates--Government enabling innovative societies

Fostering innovative societies can help us address global challenges and meet the Global Goals. As innovation ecosystems mature, there are exciting opportunities to create innovative societies where all sectors—governments, corporations, NGOs, academia, entrepreneurs and individuals collaborate to solve complex societal challenges, helping us create the future we want and accelerating our path to meet the SDGs by 2030. The UAE government sees itself as enablers of innovation, and has launched UAE Innovates to commemorate the innovation nation every year.

SDG Storytelling and a data commons approach to the SDGs

There is some question over whether stories are an effective tool for motivating action toward the SDGs. While stories and narratives are vital for inspiring, they must be accompanied by effective action plans if they are to be used to achieve the SDGs.

Creating national, centralised geospatial databases that allow actors from all sectors, including as government, corporations, academia, and civic society, to publish their SDG initiatives, stories and progress via an interactive portal might be a powerful way to motivate others to participate. Such portals should be able to provide precise statistics on geographic dashboards, insights, and story maps, making it easy to comprehend and analyse SDG progress. The UAE's SDG data hub (UAE SDGs Data Hub (arcgis.com) is an example of such a one-stop-shop platform for SDG progress and has been cited by the UN as a best practice.

Expo Live and the SDGs

Innovations are a big part of world Expos. When Expo 2020 was conceptualized, the leadership were keen that the event would be very inclusive of the global community and be very innovative. This is the spirit that kicked off Expo Live. An investment fund of $100 million was allocated start-ups and entrepreneurs with innovations that would have social or environmental impact—rather than disruptive technologies.

Be My Eyes is an app developed by a Danish entrepreneur awarded an Expo Live grant. People who are blind or visually challenged can use the app to communicate with others around the world to help them "see" via the camera on their phone. When a person needs help, the app connects them with someone who can be their eyes for tasks like verifying if the medicine or the milk is past its due date, or if the person is in the correct place for an appointment.

Crowd-engagement for SDGs

UpLink, a new open-source digital platform developed by the World Economic Forum, aims to encourage mass participation from companies, community groups, and other interested parties or individuals in order to achieve the UN's Sustainable Development Goals. It's being developed as a crowd-engagement tool, allowing entrepreneurs, professionals, and other people – including Generation Z and Millennials – to participate in policy for sustainable development. A fund is also planned to finance the finest ideas and inventions, in addition to offering a forum for crowdsourcing ideas and innovations to achieve the Goals.

The importance of R&D and scientific and technical innovation

The International Union of Pure and Applied Chemistry (IUPAC) is bringing scientific and technical know-how and research and development (R&D) bear on to some of humanity's most urgent issues. It accomplishes this by convening scientists to identify the technologies that scientists believe are critical to resolving some of the world's most pressing challenges; it is nurturing a new generation of scientists, including young girls and boys, who will trained and empowered to participating in innovating to address challenges of their time; and promoting global cooperation and engagement of scientists at public forums.

"But the key thing is that the difference for me or the promise that I would say, are in start-ups particularly those that make this commitment, would see that they have a technology, they have something that works and they make a choice to deploy it in some activity that eventually is very, very well defined within the SDGs."

Yousuf Caires

Emerging questions for future conversations

How do we incentivise more social innovations to support the SDGs?

How can open innovation help address our biggest challenges?

How can we encourage innovation around public participation—with smaller scale solutions where humans are in balance with the environment?

Are we doing enough to encourage youth participation in innovation?