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World Summit on the Information Society
International Telecommunication Union
WSIS Stocktaking Process

ASIA AND PACIFIC

REGIONAL WSIS STOCKTAKING REPORT 2016 - 2018
ICT PROJECTS AND WSIS ACTION LINE RELATED ACTIVITIES IN ASIA AND PACIFIC

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ITU

WSIS STOCKTAKING REPORT IN ASIA AND PACIFIC

2016 – 2018

Acknowledgement

The World Summit on the Information Society (WSIS) team would like to acknowledge the tremendous contributions of governments, international organizations, the private sector, civil society and other stakeholders in providing information on ongoing projects and initiatives to the WSIS Stocktaking Platform. The WSIS Stocktaking Report on the Asia and Pacific Region 2016- 2018 is based on the contributions provided by different stakeholders on ICT related projects within the region. The full descriptions of the activities are available on the online database accessible at www.wsis.org/stocktaking.

The Report benefited from the contributions and insights of:

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Disclaimer

The information contained in this publication is provided by the multiple stakeholders that contributed to the WSIS Stocktaking process and does not engage ITU. Denominations and classifications employed in this publication do not imply any opinion on the part of the International Telecommunication Union concerning the legal or other status of any territory or any endorsement or acceptance of any boundary. Where the designation "country" appears in this publication, it covers countries and territories. The views expressed in this report are those of the authors and do not necessarily reflect the opinions of ITU or its membership.

ISBN

978-92-61-26711-7 (Paper version)

978-92-61-26721-6 (Electronic version)

978-92-61-26731-5 (EPUB version)

978-92-61-26741-4 (Mobi version)

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Executive Summary

Following the publication of the WSIS Regional Stocktaking series for the period 2014-2016 and its popular reception within the WSIS community, we have prepared new edition of the WSIS Regional Stocktaking with the special focus on how ICTs are helping advance the Sustainable Development Goals on the ground. Our objective is to have a customized reporting by region (based on six ITU regions distribution) that will be considered as a strong reference point to good ICT practices implemented by the different stakeholders (government, private sector, civil society, academia, international organizations, others), generating social impact, partnerships, replicable examples, and advance the achievement of the SDGs.

In the period between 2016 and 2018, four hundred and twenty-two (422) entries were submitted from the Asia and Pacific Region to the WSIS Stocktaking platform while forty-three (43) entities from this region have been awarded WSIS Prizes as winners or champions since 2012. It is our pleasure to recognize the WSIS Prize 2016-2018 winners and champions from the Asia and Pacific Region, and to applaud their dedication and commitment to the implementation of the WSIS Outcomes, while also honoring and awarding outstanding projects from the international WSIS community.

It is also with pleasure that WSIS Stocktaking and ITU recognize the commitment of this region to the implementation of the WSIS Outcomes, including the commitment made to share best practices regarding the use of ICTs to help advance the achievement of the SDGs.

The United Nations Economic and Social Council resolution 2017/21 on "Assessment of the progress made in the implementation of and follow-up to the outcomes of the World Summit on the Information Society" reiterates the importance of sharing best practices at the global level and, while recognizing excellence in the implementation of the projects and initiatives that further the WSIS goals, encourages all stakeholders to submit ICT-related projects and initiatives to the WSIS Stocktaking platform.

The same resolution also reiterates the importance of recognizing excellence in the implementation of the projects and initiatives that further the goals of the WSIS process, and encourages all stakeholders to nominate their ICT-related projects for the annual WSIS Prizes contest, as an integral part of the WSIS Stocktaking process.

The WSIS Stocktaking database (www.wsis.org/stocktaking) was introduced in 2010 and currently has more than 10,000 entries and a growing community of more than 350,000 stakeholders. It is a unique global tool for collecting information and regular reporting on ICT-related initiatives and projects, carried out by governments, international organizations, the business sector, civil society, academia and other entities, in the context of 11 WSIS Action Lines. The WSIS Stocktaking process has been maintained by ITU since 2004, as requested by the WSIS Outcomes (Tunis Agenda for the Information Society, paragraph 120).

With the year-round ongoing call for updates and new entries, all stakeholders are invited to continue sharing best practices on the WSIS Stocktaking Platform and emphasize how ICT-related initiatives and projects are enabling SDGs. WSIS Prizes 2019 Call for Submissions will be launched in July 2018. Please follow up on www.wsis.org/prizes.

All WSIS-related publications, including the Reports on the WSIS Stocktaking, are available to download at the ITU Bookshop: https://www.itu.int/pub/S-POL-WSIS.

Introduction

On the occasion of the World Summit on the Information Society (WSIS) Forum 2018 – held in Geneva on 19-23 March, a special edition of the WSIS Stocktaking Report for the ITU Asia and Pacific Region for the period 2016-2018 was produced as the information document for the technological developments and innovations within the Asia and Pacific Region.

The principal role of the WSIS Stocktaking exercise is to leverage the activities of stakeholders working on the implementation of WSIS outcomes and share knowledge and experience of projects by replicating successful models designed to achieve the Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development. The WSIS Stocktaking process was initiated in October 2004 during the Tunis phase of WSIS, and in the years since has come to comprise the database of:

- Exchanges of information on projects
- Sharing of best practices of certain regions
- Initiatives related to the implementation of the 11 WSIS Action Lines
- Linkages between the 11 Action Lines and the SDGs – a linkage that becomes more and more important over the years.

In addition to the United Nations Economic and Social Council resolution 2017/21 on "Assessment of the progress made in the implementation of and follow-up to the outcomes of the World Summit on the Information Society", the WSIS Overall Review called for close alignment between the WSIS process and the 2030 Agenda for Sustainable Development, highlighting the cross-cutting contribution of ICTs to the Sustainable Development Goals. In this context also the WSIS Stocktaking evolves into the unique global process for collection of information on actions carried out in context of WSIS, while underlining their contribution to the implementation of the 2030 Agenda for Sustainable Development.

There are four hundred and twenty-two (422) projects listed in this Report and most of them were also nominated for the WSIS Prizes contests in the period 2016-2018. WSIS Prize, as an integral part of the WSIS stocktaking process, is a unique global recognition for excellence in the implementation of WSIS outcomes. The contest was held for the first time in 2012, and rapidly gained attention and popularity within the ICT for Development (ICT4D) community.

ICTs are enablers for sustainable development, and reporting on ICT success stories to best showcase the possible achievement of SDGs is the major objective of WSIS Stocktaking process, including WSIS Prizes, as already recognized and anticipated by the WSIS stakeholders community. All stakeholders are urged to encourage their networks to join the WSIS Prizes process, including the multistakeholder open consultation process for the WSIS Forum 2019, in order to ensure that all features correspond to the real needs of the WSIS implementation process towards 2025.

The WSIS Stocktaking community comprises of more than 350,000 stakeholders who are eager to contribute to the WSIS Process year after year. By identifying trends in implementing WSIS Outcomes, the WSIS Stocktaking Process makes a significant contribution towards building an inclusive Information Society.

The WSIS Action Lines break down into 18 categories:

1) The role of governments and all stakeholders in the promotion of ICTs for development
2) Information and communication infrastructure
3) Access to knowledge and information
4) Capacity building

5) Building confidence and security in the use of ICTs
6) Enabling environment
7) E-government
8) E-business
9) E-learning
10) E-health
11) E-employment
12) E-environment
13) E-agriculture
14) E-science
15) Cultural diversity and identity, linguistic diversity and local content
16) Media
17) Ethical dimension of the information society
18) International and regional cooperation

17 Sustainable development goals (SDGs):

Goal 1. End poverty in all its forms everywhere

Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture Goal 3. Ensure healthy lives and promote well-being for all at all ages

Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Goal 5. Achieve gender equality and empower all women and girls

Goal 6. Ensure availability and sustainable management of water and sanitation for all Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all

Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Goal 10. Reduce inequality within and among countries

Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable

Goal 12. Ensure sustainable consumption and production patterns

Goal 13. Take urgent action to combat climate change and its impacts

Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Goal 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development

We take this opportunity to extend sincere gratitude to all of the stakeholders from the CIS region who have been engaged in the WSIS Process, sharing their national advances on implementation of the WSIS outcomes since 2004. We would also like to invite all ITU Member States and Sector Members of the CIS region to continue engaging with the WSIS Stocktaking process by submitting projects relevant to WSIS Action Lines and the newly established SDGs, promote the WSIS Stocktaking process within their communities, and follow new developments of the WSIS Prizes 2017 contest.

The role of ITU in WSIS implementation

It is important to stress here that ITU has been contributing enormously to WSIS implementation and follow-up from 2005 to the present. The tasks carried out by ITU at the operational and policy level cover all mandates assigned to it relating to the WSIS process, in particular:

- in its capacity as lead facilitator in coordinating the multistakeholder implementation of the Geneva Plan of Action (§ 109 of TAIS) and primary organizer and host of the annual event in May, the WSIS Forum;
- as facilitator for Action Lines C2 (Information and communication infrastructure) and C5 (Building confidence and security in the use of ICTs), as well as C6 (Enabling environment);
- as co-facilitator for Action Lines C1, C3, C4, C7 and C11
- as partner in Action Lines C8 and C9;
- as rotating chair and vice-chair of the United Nations Group on the Information Society (UNGIS) (§ 103 of TAIS);
- as lead partner on Measuring ICT for Development (§ 114 of TAIS);
- as facilitator of the WSIS Stocktaking process (§ 120 of TAIS);
- as organizer of World Telecommunication and Information Society Day (§ 121 of TAIS);
- as lead of the Connect the World Initiative (§ 98 of TAIS).

Countries in Asia and Pacific Region

- Afghanistan
- Australia
- Bangladesh
- Bhutan
- Brunei
- Myanmar (Burma)
- Cambodia
- China
- Fiji
- India
- Marshall Islands
- FS Micronesia
- Mongolia
- Nauru
- Nepal
- New Zealand
- Pakistan
- Palau
- Papua New Guinea
- Philippines

- Indonesia
- Iran
- Japan
- North Korea
- South Korea
- Laos
- Malaysia
- Kiribati
- Maldives
- Samoa
- Singapore
- Solomon Islands
- Sri Lanka
- Thailand
- Tonga
- Tuvalu
- Vanuatu
- Vietnam

WSIS Stocktaking 2016 Outcomes

As of April 2016, more than 8,000 updated entries were registered in the WSIS Stocktaking Database, reflecting all manner of innovative WSIS-related activities.

The eighth edition of the WSIS Stocktaking Report and the fifth edition of Success Stories 2016 was officially released during the WSIS Forum 2016 (2 to 6 May 2016, in Geneva, Switzerland). It reflected activities which were submitted to the WSIS Stocktaking process for the period March 2015 to March 2016.

While the 2015 contest was already a record-breaker in terms of the number of projects submitted, the WSIS Prizes 2016 contest hit a new high with a 10 per cent increase in submissions. Following a comprehensive review of the projects submitted, the ITU Expert Group nominated more than 300 projects and posted them online for public appreciation. The 311 nominated projects break down into 179 projects from the government sector, 41 from the business sector, 31 from civil society, 14 from international organizations and 46 from other entities (mostly academic). As regards regional distribution, 86 projects are from the Arab region, 73 from the Asia and Pacific region, 53 from the Americas region, 36 from the Europe region, 31 from the CIS region and 27 from the Africa region, while five nominated projects come from international organizations.

The members of the WSIS multistakeholder community were invited to participate and cast their votes for one project in each of 18 categories. The deadline for voting was 10 March 2016. The list of the 18 most appreciated/voted projects were identified and the winning projects were announced officially to the public during the prize ceremony held during the WSIS Forum 2016. The success stories have showcased examples of projects for implementation of WSIS outcomes, emphasizing the achievements of stakeholders working towards the achievement of WSIS goals and SDGs, transferring experience and knowledge at the global level, and spreading and fostering WSIS values.

Besides the 18 winners, an innovation in this year's WSIS Prizes contest is the WSIS Prize Champions category, which recognizes those contenders having emerged from the online voting phase with at least 245,000 votes from the WSIS community. Their projects are among those having received the highest number of votes and having gained the best reviews by the members of the Expert Group. Among the five projects selected in each of the 18 categories, one was the Winner and the runners-up were appreciated as the WSIS Prize Champions.

WSIS Stocktaking 2017 Outcomes

As of June 2017, almost 9,000 updated entries were registered in the WSIS Stocktaking Database, reflecting all manner of innovative WSIS-related activities.

The ninth edition of the WSIS Stocktaking Report and the sixth edition of Success Stories 2016 was officially released during the WSIS Forum 2017 (12-16 June 2017, in Geneva, Switzerland). It reflected activities which were submitted to the WSIS Stocktaking process for the period 30 March 2017 to 30 April 2017.

While the 2016 contest was already a record-breaker in terms of the number of projects submitted, the WSIS Prizes 2017 contest hit a new high with a 25 per cent increase in submissions. Following a comprehensive review of the projects submitted, the ITU Expert Group nominated more than 300 projects and posted them online for public appreciation. The 345 nominated projects break down into 145 projects from the government sector, 78 from the business sector, 56 from civil society, 22 from international organizations and 47 from other entities (mostly academic). As regards regional distribution, 66 projects are from the Arab region, 104 from the Asia and Pacific region, 45 from the Americas region, 42 from the Europe region, 41 from the CIS region and 42 from the Africa region, while five nominated projects come from international organizations.

The members of the WSIS multistakeholder community were invited to participate and cast their votes for one project in each of 18 categories. The deadline for voting was 10 March 2017. The list of the 18 most appreciated/voted projects were identified and the winning projects were announced officially to the public during the prize ceremony held during the WSIS Forum 2017. The success stories showcased examples of projects for implementation of WSIS outcomes, emphasizing the achievements of stakeholders working towards the achievement of WSIS goals and SDGs, transferring experience and knowledge at the global level, and spreading and fostering WSIS values.

Besides the 18 winners in this year's WSIS Prizes contest, the WSIS Prize Champions category, which recognizes those contenders having emerged from the online voting phase with 2.2 million votes from the WSIS community were acknowledged at the special ceremony dedicated to WSIS Prizes Champions. Among the five projects selected in each of the 18 categories, one was recognized as the Winner and the runners-up were awarded as the WSIS Prize Champions.

WSIS Stocktaking 2018 Outcomes

As at January 2018, almost 11 000 updated entries were registered in the WSIS Stocktaking Database, reflecting all manner of innovative WSIS-related activities.

The tenth edition of the WSIS Stocktaking Report and the seventh edition of Success Stories 2018 was officially released during the WSIS Forum 2018 (19 to 23 March 2018, in Geneva, Switzerland). It reflected activities which were submitted to the WSIS Stocktaking process for the period September 2017 January 2018.

While last year's WSIS Prizes contest was already a record-breaker in terms of the number of projects submitted (345 nominated out of 467 submitted), the WSIS Prizes 2018 contest has hit a new high with a 45 per cent increase in submissions. Following a comprehensive review of the projects submitted, the ITU Expert Group nominated close to 500 projects and posted them online for public appreciation. The 492 nominated projects break down into 245 projects from the government sector, 97 from the business sector, 82 from civil society, 30 from international organizations and 73 from other entities (mostly academic). As regards regional distribution, 85 projects are from the Arab region, 154 from the Asia and Pacific region, 98 from the Americas region, 53 from the Europe region, 55 from the CIS region and 65 from the Africa region, while 14 nominated projects come from international organizations.

The members of the WSIS multistakeholder community were invited to participate and cast their votes for one project in each of 18 categories. The deadline for voting was 10 January 2018. The list of the 18 most appreciated/voted projects were identified and the winning projects announced officially to the public at the prize ceremony held during the WSIS Forum 2018. The success stories showcased examples of projects for implementation of WSIS outcomes, emphasizing the achievements of stakeholders working towards the achievement of WSIS goals and SDGs, transferring experience and knowledge at the global level, and spreading and fostering WSIS values.

Besides the 18 winners, this WSIS Prizes contest continued recognizing the WSIS Prize Champions category (runner-ups). Seventy two (72) were awarded in 2018, during the special WSIS Prizes Champion Ceremony at the WSIS Foroum 2018. These contenders have emerged from the online voting phase with almost one million votes cast from the WSIS community during the Online Voting phase. Their projects are among those having received the highest number of votes, while the Winners have gained the best reviews by the members of the ITU Expert Group. Among the five projects selected in each of the 18 categories, one was selected as the Winner and the runners-up were appreciated as the WSIS Prize Champions. For all details and new updates, please visit www.wsis.org/prizes.

C1. The role of public governance authorities and all stakeholders in the promotion of ICTs for development

In **Bangladesh**, the 999 National Emergency Service is a centralized 24/7 emergency support system allowing any citizen within the country's border to directly connect with the police, fire and ambulance emergency responding teams on the ground, in order to get aid in an emergency. Under the guidance of the ICT Division, the Government of Bangladesh provides a "toll-free" easy-to-remember unique emergency number which readily helps citizens in the fastest and most effective way. With a clear vision of implementing a sustainable project, 999 is an amalgamation of different channels, ideally building communication for information exchange.

Having a call centre with trained officers alongside its website and mobile application integrated with Chatbot, 999 is essentially an aggregation of various technology platforms, developed to serve best in the quickest way possible. Previously, the emergency service agencies – police, fire and ambulance services – operated independently. Through their collaboration and strong commitments, the public service delivery made to the citizens substantially increased by connecting all emergency services in a single platform. Making a call to 999 and receiving relevant information can now be easily obtained from accessible web and mobile apps. All services are subsequently followed up from the call centre, where officers constantly ensure transparency and accuracy. It has been especially designed to immediately assist and empower the citizens. This project is relevant for **SDGs 3, 5, 11** and **16** calling for the promotion of just, peaceful and inclusive societies.

In **Bangladesh**, the MCQ Everyday organization adopted the Convention for the pacific plantation of national revolution in online activities, which have begun to work in 2014 by launching the *Startup educational website* project. Established by the founder, the project promotes national cooperation and achieves peace and security (**SDGs 11** and **16**).

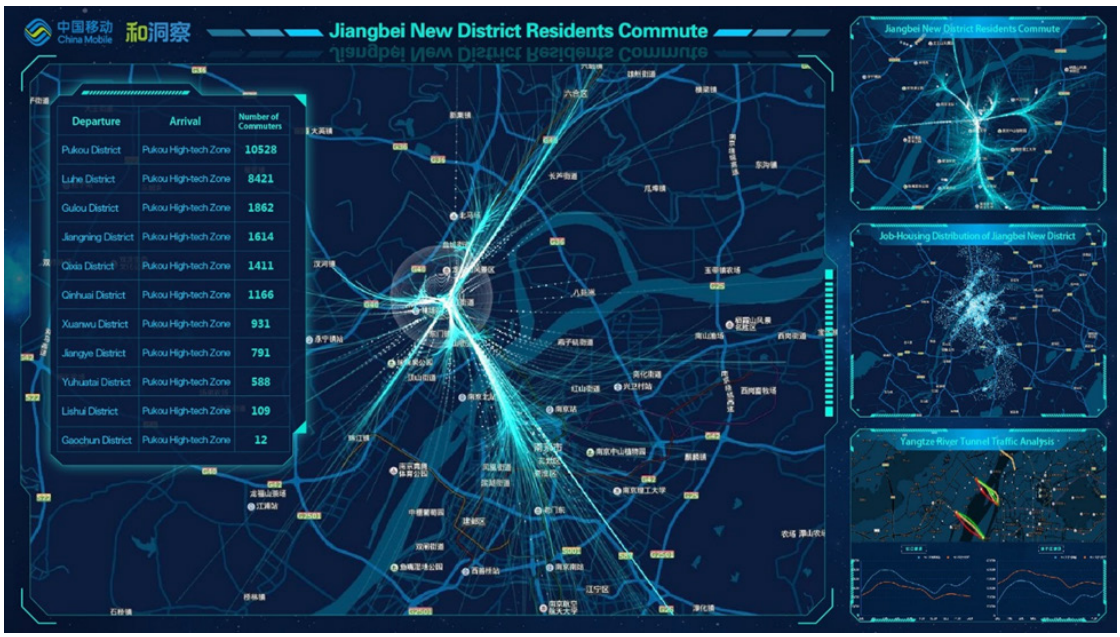
The *Rural Visual Journalism Network* gives voice to the unheard in rural **Bangladesh**. Using iPod Touch and smartphone technology, correspondents in rural Bangladesh identify stories of importance to the rural community. Through impactful storytelling and online distribution networks and by linking with mainstream media, the project provides a platform for rural voices. Issues cover gender, the environment, health and education, and highlight role models in rural Bangladesh who have found innovative solutions to local problems (**SDGs 3, 4, 5** and **15**).

Also in **Bangladesh**, the Bangladesh Rural Advancement Committee (BRAC) has set up *Policy Adda*, which is in line with **SDGs 1**, **2**, **3**, **5**, **8** and **13**. 'Adda' is a Bengali word for informal discussion in a gathering. The project seeks to create a virtual platform where people can gather to share their opinions about government policies, dissect or scrutinize them, and tear them apart, to create mass awareness and consensus on an issue. It is an outlet for sharing views in people's own words about what is right and what is wrong with a specific policy and what can be done to make it better or implement

it more effectively. Policy Adda intends to foster close camaraderie among experts in the field who create the policies and non-professionals who are directly affected by them. It invites policy-makers, students, journalists, development practitioners, lawyers, health professionals and everyone out there who has an opinion and wants to share it with the larger population. So, let's start the 'Adda' and shape the future of our policy!

In **China**, the telecom operator China Mobile Communications Group Jiangsu Co., Ltd. developed a big data platform for smart city constructing and a system for demographic dynamic monitoring, through which it has carried out research and applications with big data technology and artificial intelligence technology on city planning and population management. This helps to improve city planning and population management capability for public management departments, and enhances public information service ability.

Through this ICT project, the company analysed demographic layout, commuter path and income demographics in Nanjing by using the telecom operator's mobile signalling data. Based on this platform, it has completed the planning and site selection analysis of Nanjing North Railway Station, expressway congestion analysis and precaution, the residents' commuter analysis and the tourist information service. The project is consistent with the SDGs in building elastic infrastructure, promoting sustainable industry, and fostering innovation and economic growth, as well as making cities inclusive, safe, resilient and sustainable. The project can be replicated in many medium- and large-sized cities around the world, and it has strong sustainability, which is conducive to the construction of the information society, the development of partnerships and the creation of good communities.



In **China**, Haohan Data Technology Co., Ltd has launched the *High-performance Internet DPI system and practices of big data*, in partnership with China Mobile, China Unicom and China Telecom. Products based on outcomes from this project have been widely deployed in the networks of China's three major carriers, governments, enterprises and public institutions, and applied in the fields of network data acquisition, traffic optimization and control, illegal information blocking, DDoS attack detection, and content resource scheduling. The link bandwidth monitored has exceeded 100 Tbit/s. In the industry, the product wins the biggest market share in international network interfaces and ISP-interconnection interfaces. The project responds to **SDG 11**.

In **China**, the China Mobile Group Jiangsu Co. Ltd started a research project on *urban and transportation planning* based on big data from telecom operators, which can be relevant to **SDG 9**. The project studies the application of cellphone signal data in government planning and intelligent transportation. Operators' data can be widely used in urban planning management, traffic planning, etc. Based on the cellphone signalling data, after data fusing, mining and modelling, a big data application platform is built in the traffic industry. This platform can provide abundant data labelling, data interfaces and standardized products.

Jiangsu Post and Telecommunication Planning Design Institute Co. in **China** has launched a project relevant to **SDGs 3**, **8** and **11**, called the *Quanzhou Municipality "Smart City" Plan (2014-2020).* Forward-looking and practical, this project is capable of moving the construction of "Smart Quanzhou" forward in a scientific and orderly manner, as well as effectively escalating the e-government level of urban administration of the city. The plan follows the guiding principle of "coordination, sharing, integration and innovation" and the methodology of "taking the easiest and the most urgent first, and intensively conducting integration, demonstration and promotion", giving priority to projects

that cut across sectors and have an impact on employment and major livelihood factors. In this way, a construction path with strong operability is developed.

In **China**, Jiangsu Post and Telecommunication Planning Design Institute Co. has established the "*Wisdom Nanjing*" central management operation and service platform, reflecting **SDGs 3**, **6**, **8**, **9**, **11** and **15**. The "Wisdom Nanjing" platform integrates various types of the city's social services and public information resources to serve innovation on urban construction, operation and management. The project creates the first top-thinking design method to facilitate the implementation of a smart city, the smart-city SCP software framework to enhance China's international competitiveness on smart-city technology, a unified information model of multivariate heterogeneous data based on GIS, and the first city resource thread tool (RRT); it possesses 23 international leading independent intellectual property rights, and speeds up the construction of a "strong, rich, beautiful and high-level" Nanjing.

The World City Intelligence Engineering Technology Research Institute in Beijing, **China**, has developed *Refuse Landfill Aerobic Ecological Restoration Technology*, which relates to **SDGs 3** and **15**. Hazardous waste is harmful to the environment and human health if it is exposed to the elements. Safe filling and burying is imperative, but during the filling and burying process there will still be some pollution generated. Higher standards are required in the design and construction of hazardous waste landfill sites. The design of an impermeable layer is the central issue. This project summarizes the design and construction experience of hazardous waste landfill sites in China, highlighting the main design and construction features to make hazardous waste landfill locations genuinely isolated from the biosphere so as to avoid secondary pollution.

Hoaxes, hate speech, digital radicalism, cyberbullying, pornography and other negative content appear to be rising challenges for **Indonesia** in the growing digital society. It is an urgency for the multi-background sectors to find a solution to minimize these contents. From the government side, the solution relies on the establishment and adoption of a systematic national movement on digital literacy that endorses the positive use of the Internet. Meanwhile, the national movement itself should be supported by academics, the business sector and, of course, communities. This year, these stakeholders (the Government of Indonesia, academics, the business sector and communities) have reached an agreement in creating a collaboration, namely "Siberkreasi", a comprehensive, massive and sustainable movement for digital literacy. It is intended to be an umbrella for the community-based and grass-roots level movement all around Indonesia. The four main activities of Siberkreasi are collaborative engagement, curriculum development, community empowerment and cybergovernance. Currently, more than 60 national level institutions and communities have collaborated in this national movement. With such a broad and inclusive participation, #Siberkreasi could be considered as the biggest and the most comprehensive voluntary collaboration on digital literacy, at least in South-East Asia. This project promotes the advancement of **SDGs 5** and **16.**

Also in **Indonesia**, the research institution Centre for Digital Society (CfDS) developed the collaborative programme Knowledge Building toward Indonesian Digital Society. The tale of the digital society in Indonesia is a fascinating object of study. While having enormous potential, the narrative of the digital society in **Indonesia** is still barely developed. CfDS aims to fill the hole by providing a continuous research and programme effort at building knowledge, and provide educational material to actualize the idea of a digital society in Indonesia. CfDS pledges to delve into the study of digital society through three fields: digital diplomacy, digital governance and digital literacy. To this point, the project has provided a substantial contribution to its stakeholders and society in **Indonesia,** both in practical and normative fields. The impacts of this project are an essential contribution to foster the implementation of at least four SDGs. The research products have provided the society with new and updated education material to understand the phenomenon of digital society relating closely to SDG 4.

This project is addressing the inequality problem by empowering and supporting the Indonesian society to have high awareness and understanding of digital technology, in concordance with SDG 10. CfDS is actively advocating the importance of digital technology as a medium of inclusive political and social participation in line with SDG 16. Lastly, CfDS is also involved in the development of digital diplomacy, which can be used to enhance peaceful situations throughout the world in the digital era, as per **SDG 17.**

The Bandung Institute of Governance Studies (BIGS) in **Indonesia**, in partnership with Sinergantara, the Bojonegoro Institute and the Regency Government of Bojonegoro, has launched a project entitled *Data Revolution for Monitoring Sustainable Development Goals*, which is in the process of developing

a platform for monitoring the SDGs. The platform involves the development of software and guidelines. Software is being created for data collection and data visualization for web and dashboard; and guidelines are being developed for data collection by citizens and data management by regency or village government. Thereafter, the institute will move on to the creation of baseline data, allowing citizens to update data, and data verification. In terms of baseline data creation, the institute will provide new information on topics related to SDGs, such as data on pregnant mothers with high risk.

The project can be relevant to **SDGs 1**, **3**, **8**, **11** and **17**.

Indonesia's *Ministerial Decree on ICT Number 23 of 2013* regulates domain name management. Registration is managed by a multistakeholder community in order to ensure the fair and equitable management of the domain name system (DNS), thus contributing to **SDG 16** on the promotion of an inclusive society for sustainable development.

The Government of **Indonesia** adopted *Law Number 11 of 2008 concerning Electronic Information and Transactions* as it totally supports the development of information technology through the infrastructure of law and its regulation. Guidelines are implemented in order to provide security and prevent misuse of ITs vis-à-vis the religious and social-cultural values of Indonesian society, thus promoting equality and open access to information and knowledge for its population (**SDGs 10** and **16**).

Indonesia has formulated the *Indonesian Broadband Plan (IBP)*, a plan to create a better foundation for the Indonesian broadband ecosystem by 2019. By harnessing the full potential of broadband, the Plan envisages the integration of national logistics and transportation systems. It also aims to accelerate the development of broadband infrastructure, digital literacy, as well as a competitive regulatory framework and funding while also accelerating development of a digital services platform.

IBP 2014-2019 is promulgated under Presidential Decree Number 96 of 2014 and included in the National Long- Term Development Plan 2005-2025. It aims to guide the development of a comprehensive and integrated broadband network in Indonesia for the next five years. It highlights the level of ICT prioritization and presence of a digital government strategy, contributing to certain SDGs on the promotion of sustainable industrialization and sustainable use of ecosystems (**SDGs 9** and **15**)

The *National Procurement Portal of* **Indonesia** *(INAPROC)* is a web-based application system that provides various facilities as well as information related to the procurement process for goods/ services in all government offices. The system has been developed to improve the efficiency and effectiveness of the procurement process. Through e-Procurement, suppliers may access certain information including the latest news on procurement updates, information, policy and blacklisted suppliers or vendors. Suppliers may sign up and register online to be a registered vendor and offer their goods and services for the available tenders.

The successful implementation of e-Procurement in Indonesia has become the example of how ICT can support transparency in pursuing good governance, thus contributing to **SDG 16**, **target 16.6** – development of effective and transparent institutions at all levels.

Indonesia hosted the *8th Internet Governance Forum 2013* in Bali, with the theme "Building Bridges: Enhancing Multi-Stakeholder Cooperation for Growth and Sustainable Development". This conference addressed the issue of Internet governance and the global architecture of cyberspace. The multistakeholder nature of the Bali conference brought together government, the business sector and civil society.

The conference thus contributed to **SDG 16** and **17** by providing an open access to information, protecting fundamental freedoms and revitalizing partnership within the country.

Bandung Institute of Governance Studies (BIGS) in **Indonesia** has initiated *Research on ICT initiatives in the governance sector in Indonesia*, with the aim of identifying ways of achieving impactful improvements in terms of government responses and strengthen-ing the role of citizens. After observing ten ICT programmes (Increasing maternal and neonatal survival; Jakarta smart city; Online complaint handling system; Zero-waste por-tal; Online complaint mechanism for school costs; Development village movement; Village information system; Bojonegoro ICT initiative; Weather and climate SMS; and Check my school), the conclusions are that a more participatory process will make ICT initiatives more effective and a strong understanding of the ecosystem on the part of the initiator/implementer and a more open and flexible space will influence the successful development of ICT initiatives. The project is organized in partnership with Sinergantara and the Development Studies Foundation (DSF), and can address **SDGs 3**, **4**, **9**, **11** and **13**.

In the **Islamic Republic of Iran**, the Public Authority for Electricity and Water (PAEW) of Oman requested a financial and technical study for a new telecommunication architecture from Monenco Iran Consulting Engineers for Consultancy Services. The existing PAEW Water System Network includes components such as reservoirs, pumping stations, transmission and distribution pipelines, and district metering points, distributed over the whole territory of Oman. PAEW proposes to integrate these components and monitor or control their operation on a regional basis through regional supervisory control and data acquisition systems. The whole country was managed from the country control room in Muscat. The country control room will be used by PAEW to take decisions, especially under emergency circumstances. The scope of work includes technical and financial studies for securing existing communication networks according to asset criticality, upgrading regional telecommunication networks, creating communication access for assets with no existing communication media, interconnecting the regional supervisory control and data acquisition system to the national country control room, and setting national communication supervision to monitor and manage all PAEW networks. This project addresses **SDGs 1, 3, 7, 8, 9, 11, 12, 13, 14** and **17**

The **Islamic Republic of Iran** Information technology organization has defined a long-term and ongoing programme for measuring the information society of the country and evaluating progress in regard to its existing ICT-related goals and policies in its development plans, as well as towards WSIS targets, the SDGs and other related agendas. As a part of this programme, the Information Technology Organization has developed the ICT Core Indicators of the Islamic Republic of Iran and all needed processes, including data collection, data processing, data evaluation and analysis, data dissemination, reporting and interaction with national and international bodies, continuous improvement processes, and national coordination and collaboration. Also during these years, the needed supporting software and hardware infrastructure have been developed by the Information Technology Organization. Now, all the data and analysis from the existing processes are published in the Portal of Measuring the Information Society of the Islamic Republic of Iran. Establishing the organization and financial structures is an achievement. While developing the programme, the Information Technology Organization has defined a short-term project to measure e-commerce status for the first time in the Islamic Republic of Iran. By considering all the facts that have been mentioned above, it can be seen that this project is related to "data, monitoring and accountability", as one of the systematic issues of SDG Goal 17 targets. SDG Goal 17 is about establishing partnerships between governments, the private sector and civil society for successful sustainable development. For this, there is a need to review and monitor frameworks, regulations and incentive structures that enable investments and reinforce sustainable development. National oversight mechanisms such as supreme audit institutions and oversight functions by legislatures should be strengthened. By 2020, the international community should enhance capacity-building support to developing countries to increase significantly the availability of high-quality, timely and reliable data.

Also in the **Islamic Republic of Iran**, the Telecommunication Research Centre has developed the Persian Native Search Engine. The vision for the Persian Search Engine programme is achieving "the best search services in the Persian language" by providing the most accurate search capability in Farsi and the highest-quality localized services in Farsi. Feasibility and comparative studies, as well as research on search engines and local users' needs, are prerequisites for realizing the above-mentioned vision. According to the harsh competition in the search market, the local search engines supported by the programme should deploy some interesting services based on local content and design for local culture.

This is a multistakeholder programme that includes people, as well as the private and public sectors. Therefore, the empowerment of the private sector through engaging it in the process of realizing the people requirements is an essential approach in this programme. To realize the vision, the

establishment and implementation of different services will be initially put into practice along with public sector supports. It will be possible through the following important goals:

- improvement of security for users according to privacy concerns;
- guarantee of the quality of content provided to users;
- matching the content and ranking it according to the culture and localized information;
- providing both technical and economic opportunity for Iranian small and medium-sized businesses to apply state-of-art technology to develop the localized content and services.

In this way, the search engine promotes **SDGs 8** and **9**. The main ideas of the project regard the localization of web service, empowering the Persian language on the web and considering multistakeholders in web projects to help people have a better life with suitable content access and services, both in health and learning aspects, and in small and medium-sized businesses having a better economy in a resilient web infrastructure. Subsequently, the project closely relates to **SDG 3** and **4**.

Malaysia launched a number initiatives aimed at promoting ICTs for development.

In **Malaysia**, Pos Malaysia Berhad has launched the *Smart Postman - Catalyst of local improvement* project, in partnership with the Malaysian Communications and Multimedia Commission (MCMC). Smart Postman by Pos Malaysia and its regulator, MCMC, promotes the postman as a catalyst for local improvement. It involves deployment of the Smart Postman app enabling postmen to easily record any issues during their daily delivery rounds. Issues such as potholes and dumped rubbish are captured via icons, along with corresponding GPS coordinates and photos. In the background, the telecommunication wireless signal is captured automatically. The issues and the wireless signal are uploaded and relayed to external stakeholders such as government agencies and telecommunication providers for the appropriate action, which will lead to improvements in community, communications and Internet services. The project reflects **SDGs 3**, **8**, **9**, **10**, **13** and **16**.

The *eBorneo Knowledge Fair (eBKF)* is a bi-annual community-based unconference held in the central Borneo highlands of Sarawak. It showcases the local use of ICTs for sustainable development in isolated rural indigenous communities, as well as identifying new research into uses of ICTs that communities will welcome. It is organized in conjunction with the local community, bringing together researchers, practitioners, government officials and policy-makers with the resident indigenous peoples, in both Malaysia and neighbouring Indonesia.

The conference reflects a **considerable number of SDGs** by fighting against poverty and hunger, ensuring access to affordable, reliable and modern energy for all, promoting economic growth, employment and decent work for all, reducing inequality within and among countries, etc.

On 1 January 2008, the Co-operative Development Department of **Malaysia** was transformed to become the Co-operative Commission of Malaysia (SKM). The aim of the Commission is to promote a financially sound, progressive and resilient cooperative sector. All clients are registered in cooperative societies in Malaysia. The *"Perakaunan Sistem Konsep Mudah" (p-SKM)* is a free accounting software that was designed on the basis of the Microsoft Excel platform for the cooperator and Commission staff services. P-SKM's relevance lies in supporting the Commission's objectives, fulfilling the targets of the Malaysian Government and improving the welfare of the people.

The programme is thus in line with several SDGs as it seeks to end poverty and hunger in all its forms, ensure healthy lives and promote well-being for all, promote inclusive and sustainable economic

growth, employment and decent work for all and reduce inequality within and among countries (**SDGs 1, 2, 3, 8** and **10**).

In **Pakistan**, the Ignite National Technology Fund (Formerly National ICT R&D Fund Company) is rolling out the "National Grassroots ICT Research Initiative" for the year 2017/18. The programme aims to assist final year undergraduate students of ICT-related disciplines – electrical engineering, electronics engineering, telecom engineering, computer science, information technology, computer engineering, software engineering, mechatronics and engineering sciences, etc. – by providing them financial assistance for building prototypes and working models of their final year projects, in order to increase their creativity, innovation and hands-on engineering and development skills. The initiative will help to achieve the global SDGs, particularly **SDGs 4** and **9**, related to quality education, industry innovation and infrastructure, etc.

The programme is comprised of two phases. In the first phase, evaluation of nominated final year projects would be carried out for approval of funding by Ignite. The funding under the programme will cover the costs of the purchase of equipment and miscellaneous costs related to the development of prototypes. Maximum funding for one final year project can be up to PR 80 000. Each university/ institute or constituent/affiliated campus can avail itself of funding for up to four final year projects in respect of each ICT department. In the second phase of the programme, a national competition in respect of best funded final year projects will be held. For the national level competition, each university/institution will be requested to nominate one final year project. During the competition, one national champion, and first and second runners up, will be selected.

Also in **Pakistan**, the Prime Minister's National ICT Scholarship Programme has been offering scholarships to students of marginalized areas for undergraduate level studies in the field of ICT across all provinces. The programme has been executed under the ambit of the Ministry of IT and Telecom, initially with the partial funding from the Government of Pakistan through public service development projects, since February 2008. The project was initially approved with a total budget of PR 2 414.84 for five years. The project concept was inherited from the Outreach Scholarship Programme of the Ministry. Later on, the project was continued for fiscal years 2012–2014 and approved through funds

from Ignite National Technology Fund. About 4 761 fully funded four-year ICT-related undergraduate degree scholarships have been offered to the talented and deserving students of Pakistan under this programme in top universities of the country. More than 2 100 students have successfully graduated from top universities in various ICT-related disciplines. A total of 1 580 scholars were studying under the programme during fiscal year 2016/17. Of these, more than 1 000 successfully graduated during the 2016/17 fiscal year and are contributing to the economy or pursuing their higher qualification in national and international universities. A total of 22 students from the 2011 intake have graduated with distinction. This project is relevant to advancing **SDG 4**, which calls for inclusive and equitable quality education, and promoting lifelong learning opportunities for all.

The NED University of Engineering and Technology in **Pakistan** is developing the *Illegal Parking Detector*, which is of relevance to **SDGs 3**, **11** and **16,** with a view to implementing an artificially intelligent software to prevent inappropriate car parking on main roads and public streets (no parking zones) for the safety of citizens. This project is necessary since, although webcams are common on almost all main roads, they only capture footage and monitor ongoing activity, without the ability to take any corrective action. The university's project aims to develop software for a webcam embedded with artificial intelligence which will monitor and detect wrongful parking and generate an alert to the relevant authority.

In **Pakistan**, the National University of Sciences and Technology (NUST) has designed and initiated a *Finding Innovative and Creative Solutions for Society* (FICS) programme aimed at encouraging students to identify social problems and develop innovative, technology-based solutions. FICS comprises a competition engaging all of NUST's 18 schools and colleges, spread across different cities of Pakistan. It involves industry and civil society in identifying problems and developing solutions; mentoring and improving the solutions over a period of six to seven months; demonstrating working prototypes to industry judges; post-competition selection of the best projects; and further mentoring to transform the best projects into social enterprises. FICS is closely aligned with the SDGs, in so far as students can source and develop their ideas from within the SDGs. The partners include the Pakistan Higher Education Commission (HEC), Interactive Group (IAG), the Organization of Pakistani Entrepreneurs (OPEN), the National ICT R&D Fund, the Indus Entrepreneurs (TiE), Crescent Steel & Allied Products Ltd (CSAP), and several other industry partners. The project can reflect **SDGs 1**, **2**, **3**, **4**, **5**, **6**, **7**, **8**, **9**, **10**, **11**, **12**, **13**, **14**, **15** and **16**.

The Department of Information and Communications Technology of the **Philippines**, in partnership with the National ICT Confederation of the Philippines (NICP), which is composed of 70 ICT councils; the Information Technology and Business Process Association of the Philippines (IBPAP); the Contact Centre Association of the Philippines (CCAP); the Philippine Software Industry Association (PSIA); the Animation Council of the Philippines (ACPI); the Game Developers Association of the Philippines (GDAP); the Healthcare Information Management Association of the Philippines (HIMAP); and local government units (LGUs), has launched a *Next Wave Cities* (NWC) programme, reflecting **SDGs 1**, **4**, **8**, **9**, **10** and **11**. The programme aims to provide access to digital jobs and opportunities, contributing significantly to the economic growth of the countryside or regions outside of metropolitan Manila. Through the NWC programme, government, business, academia and other stakeholders collaborate to maximize the use of ICT. Today, out of the 1.1 million direct workers in the Philippine Information Technology and Business Process Management (IT-BPM) sector, around 300 000+ are based in IT-BPM centres in next wave cities, providing remarkable economic benefits to the Philippine countryside.

In the **Philippines**, the Department of Information and Communications Technology has launched the *ICT-enabled start-up development ("seedPH")* programme, in partnership with the Philippine Software Industry Association's Spring.PH); Philippine Society of IT Educators; Ideaspace Foundation; Kickstart

Ventures; Microsoft Philippines; HP Enterprise; Techtalks.Ph; Plug & Play Tech Centre; University of the Philippines- Enterprise Centre; Founder Institute- Philippines; Ideyatech; 1 000 Angels; 1 337 Ventures; Techstars; Huawei Philippines; National ICT Confederation of the Philippines; and the Department of Trade and Industry. The seedPH programme aims to develop the Philippine start-up ecosystem and expand the economic potential of digital entrepreneurship, especially in rural areas. Guided by the Philippine Roadmap for Digital Start-ups, the programme aims to position the government as an im-portant partner in the start-up community by conducting advocacy and capacity-building programmes anchored towards encouraging Filipinos, particularly youth, to help create a nation of innovators, all working towards solving the most pressing problems of Philippine society. The programme is relevant to **SDGs 1**, **4**, **8**, **10** and **17**.

The Department of Budget and Management of the **Philippines** has launched the *Medium-term Information and Communications Technology Harmonization Initiative* (MITHI), in partner-ship with the Department of Information and Communications Technology and the National Economic and Development Authority. MITHI is a process that harmonizes and ensures in-teroperability among ICT-related resources, programmes and projects across the government of the Philippines. It is the process of coordinating, planning, budgeting, implementing and evaluating resources and projects in the government of the Philippines, which includes national government agencies (NGAs), government-owned and controlled corporation (GOCCs), and state universities and colleges (SUCs). MITHI was created in 2012 through a Joint Memorandum Circular between the Department of Budget and Management, the Department of Information and Communication Technology and the National Economic and Development Authority. The project applies to **SDG 17**.

In **Singapore**, the Infocomm Media Development Authority (IMDA) has launched the *Silver Infocomm Initiative* (SII): E-inclusion of seniors for wellness and integration into the community, which is a digital inclusion effort, led by the gov-ernment in strong partnership with industry, academia and the community, to engage seniors so that they, too, will be able to benefit from a digital economy. The

need for this becomes more evident as Singapore develops into a “smart nation”, with many critical government services moving on-line. The success of SII hinges on several features: a multi-pronged approach, strong partnerships, active volunteerism, and sustained government support. These elements are demonstrated through the various strategies implemented under the SII branding.

The project relates to **SDGs 3** and **4**, and involves partners from all sectors: Public sector - Skillsfuture Singapore (previously known as the Singapore Workforce Development Agency), People’s Association, Lifelong Learning Institute, Institute of Technical Education, Nanyang Polytechnic, Temasek Polytechnic, Ngee Ann Polytechnic, GovTech, MoE schools and government agencies with mobile apps (e.g. Municipal Services Office, Land Transport Authority, Sports Singapore, etc.); Civil society - Chinese Development Assistance Council, RSVP Singapore – the Organization of Senior Volunteers, Northeast Community Development Council, Caritas Singapore, Singapore Computer Society; and Private sec-tor- Apple, Google, Microsoft, Samsung, Singtel, M1 Limited, POSB Bank, IBM, Accenture, Sapura, Cognizant, Dell, Hewlett Packet Enterprise, Netlink Trust, Oracle, PriceWaterHouse Coopers, Singapore Pools, Tata Consultancy.

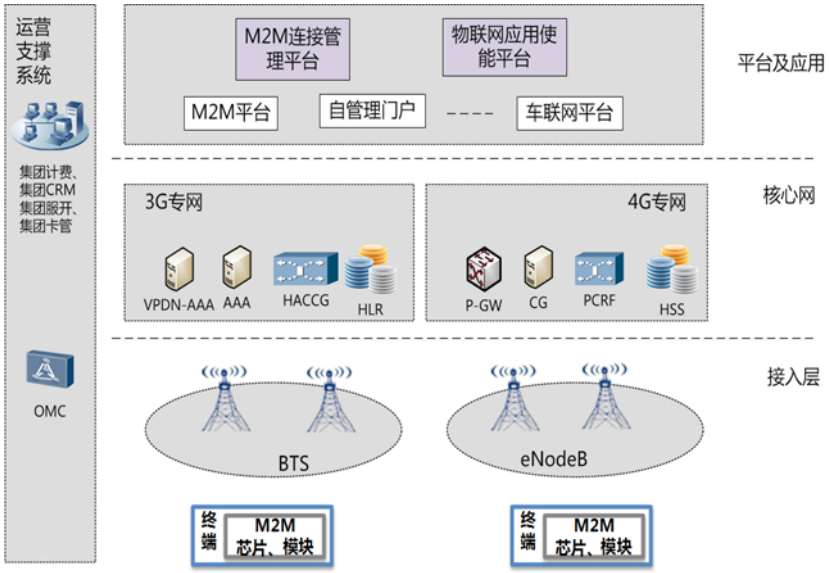
Advance Info Service PLC (AIS) in **Thailand** has launched the *Child Safety App for Community School Bus* project, in partnership with the Ministry of Transportation of Thailand. Its objectives are to build a social community collaboration app for driver, teacher and parent, ensure real-time GPS location tracking and notification, and implement ‘every student accounted for at final stop on route’ and ‘no child left behind’ checks. Expected results are a reduction in the number of school bus accidents and ensuring no child is left in the school bus. The project is linked to **SDGs 3** and **11**.

C2. Information and communication infrastructure

In **Bangladesh**, the national Government created the Info-Sarker project. The project consists of three phases, with the aim of extension of the government ICT network to the lowest tier of administration and root-level citizens. Under phases I and II of this project, a high-speed Internet backbone network with high-capacity bandwidth using Dense Wavelength Division Multiplexing technology has been established in all ministries, government directorates/departments, all 64 districts and 488 *Upazilas* (subdistricts) and 18 130 government offices, and 25 000 tabs have been distributed to government officials for enhancing use of ICT in public sector. The central secretariat is under Wi-Fi connection, 600 police offices are under VNP connectivity, and 800 videoconferencing systems and one disaster recovery centre have also been established. Phase III is aimed at expanding the existing backbone network through 20 000 km of optical fibre cable to 2 600 rural administrative units (Union) and 1 600 police offices by June 2018. At least 60 per cent of the population will directly benefit from this project. The project is expected to increase the fixed broadband connectivity from the existing 5 per cent of households to more than 15 per cent of households and is expected to contribute a 1 per cent increase to gross domestic product. This project is developed in partnership with the China Railway International Group and it is relevant to the advancement of **SDGs 8, 9** and **10**.

In **China**, China Mobile Group Device Co, Ltd (CMCD) has launched the *Altitude for education in Malaysia* (A1s) project, in partnership with YTL Communications Sdn Bhd. The vision of YTL Communications is to use its mobile 4G network to help set up an Internet-driven economy model in Malaysia. CMDC's vision is to provide more affordable 4G mobile phones to accelerate rapid popularization of 4G in Malaysia. Under the programme led by the Malaysian Ministry of Education, we are the first Internet service provider to be able to connect all 10 080 government schools nationwide with Internet connectivity and a cloud-based Frog Virtual Learning Environment to transform the education experience, bridge the digital divide between urban and rural students and establish Malaysia as a model of education excellence. The project is in line with **SDG 4**.

China's China Mobile Communications Corporation has set up the *Smart insight on telecom big data* project, pertaining to **SDGs 7**, **8**, **11**, **12** and **16**. The project has brought good social benefits, including: Reducing energy consumption through smart transportation (**SDG 7**); Supporting business model evolution through the analysis of business outlets (**SDG 8**); Improving city disease prevention capability through disease monitoring (**SDG 11**); Improving product production and consumption patterns through customer insight (**SDG 12**); Enhancing the harmonious development of society with the education index (**SDG 16**). It is easy to replicate applications using telecom industry big data. The project has received wide ac-claim from all sectors of society and government, led growth of relevant partners in tourism, transportation, banking, colleges and other industries, and provided a good reference for smart communities.



In **China**, the telecom-intelligent Internet of Things (IoT) includes core network and open platform for IoT construction by China Telecom, which is committed to building a cooperative, mutually beneficial and win–win ecosphere. Promoting the advancement of **SDGs 9** and **11**, this project is located in Nanjing, China, and covers more than 150 000 base stations, and 38 million users of IoT, 4G, and 3G NB-IoT wireless network. The system supplies the "smart water supply" service, the "smart parking" service, the "intelligent streetlight" service and so on. The total investment is CNY 150 million. In 2017, the income of the IoT intelligent platform was CNY 380 million. Intelligent water supply, intelligent parking, intelligent lighting and other services provided by the intelligent system have been applied in Shenzhen, Nanjing, Hangzhou and other cities in China, improved the city management, reduced the energy consumption and greenhouse gas emissions, improved the city's liveability level, and promoted the cultivation and development of new enterprises.

In **China**, the Nokia Shanghai Bell Co., Ltd. created the oneM2M Technical Specification and Technical Report Transposition strategy. Relevant to **SDGs 9** and **11**, the project focuses on the IoT industrial standards-related work, which include Requirements, Terminology, Architecture, Protocols, Security Solutions, Ontology, Interworking and Bindings, etc. Specifically, it works on the transposition from published oneM2M standards, which include 18 technical specifications and six technical reports into ITU-T SG20. Those oneM2M standards have been widely used in IoT and vertical areas, e.g. the Smart Cities Project in Busan, Republic of Korea. This work remarkably contributes to the convergence of global IoT standards and the alignment of work, as one of the ITU-T strategic objectives is cooperation and collaboration. Furthermore, Industry and Member States of ITU-T can benefit from converged and aligned standards.

Also in **China**, the China Unicom Network Technology Research Institute developed the project Unicom Xingkong Big Data Platform. The platform can realize data parsing, data storage and data management, thus achieving the comprehensive telecom operation analysis among users, services, networks and terminals. Based on the China Unicom Xingkong Big Data Platform, some CUXBDP-supported products were produced for a series of industries, including finance, transport, tourism, government, etc. CUXBDP-supported products include the big data platforms of mobile network operation analysis, mobile network planning support, and tourism operation and management; a city comprehensive planning programme and system; a fox-hunting police security monitor platform; a city transport big data programme; a mobile network-based transport meteorological information service system; a transport Internet operation programme for urban roads and bridges; a Xingkong smart area–urban smart business area platform; and an Internet financial products marketing programme. Moreover, based on the platform, the China Unicom Xingkong Big Data research team published over 50 technical papers (EI/Chinese key journals) and applied for 34 patents. This project is relevant to advancing

SDGs 8, 9, 10, 11, 12 and **13**, and has been developed in partnership with the Beijing University of Posts and Telecommunications and Beijing Polygon Prism Info. Tech. Co. Ltd.

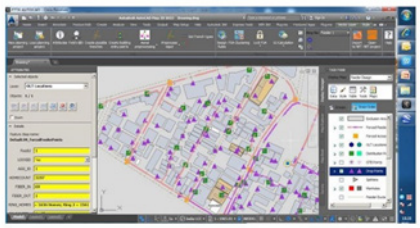
Moreover, the **China** Communications Technology Co., Ltd. developed the project China Mobile National Trunk Optical 100G Dense Wavelength Division Multiplexing Transmission System. With the development of informatization in China, big data, IoT and artificial intelligence are applied in many fields. The further development of these advanced applications needs a high bandwidth, low delay, stable and safe network to support data flows. The optical transmission network is an efficient information expressway and a stable data tunnel. This project lays the foundation for information communication in China and plays a key role in information technology, which enhances the ability of information communication and meets the information development needs of China. This project is relevant to **SDGs 3, 8** and **9**.

In 2017, the **China** Telecommunications Corporation developed a project to promote Internet access in the Cliff Village. Atu Lie'er Village, located in Zhiermo Town, Zhaojue County, Liangshan, Sichuan Province of China is called the "Cliff Village", as its more than 500 villagers live on a cliff, where the traffic conditions are very bad and villagers need to climb nearly 800 metres if they go outside of the village. China Telecom Liangshan Branch and Zhaojue Branch overcame traffic difficulty and conducted network investigations there in September and November 2016. The mobile communication and wired broadband networks were finally fully built and opened at the end of December. China Telecom also gave 50 mobile phones, 50 wired broadband modems and 31 set-top boxes to the villagers for free, and built up two "Love Centres" for the village primary school and preschool. Now, the Cliff Village has communication access to E-surfing 3G/4G, 100 Mbps optical broadband, high-speed Wi-Fi, Internet Protocol television and video call services, having the same ICT level as cities. This important project is promoting the advancement of **SDGs 1, 9, 10** and **11**, making communities resilient, inclusive, safe and sustainable.

The Huawei Technology Co., Ltd. in **China**, in partnership with Spreadtrum Communications and MediaTek, created the project Emerging Market Entry-Level Terminal Industry Alliance, in line with **SDGs 8, 9, 10, 12** and **17**. With the continuous growth of mobile broadband worldwide and the continuous enrichment of digital services, mobile broadband services are the key drivers of the digital

economy. However, there is still a large number of subscribers in some developing countries who can't afford a mobile broadband terminal due to the price of mobile broadband smartphones or other factors. The introduction of the Emerging Market Entry-Level Terminal Industry Alliance promotes the new pattern of cooperation between entry-level terminal makers and operators, in which Huawei acts as the introducer of the alliance. Operators can offer many 3G or 4G terminals provided by those phone makers below USD 50 or even USD 20, which dramatically boosts the mobile broadband penetration ratio of the digital economy. This has now been successfully promoted in the South Pacific, South-east Asia, Northern Africa, Southern Africa and Latin America, among others. This project reduces the emerging market entry-level terminal price, allowing more people to connect to mobile broadband through terminals and developed digital services, greatly enriching people's lives. With the increase of the number of mobile broadband users and digital services, the utilization of the network has been improved, the income of the operators is increased, and the development of the whole industry is promoted. The alliance helps guide the mobile communication department to reduce the tariffs on mobile terminals and to support the development of the communication industry; it has a positive support for both the economy and the surrounding industries.

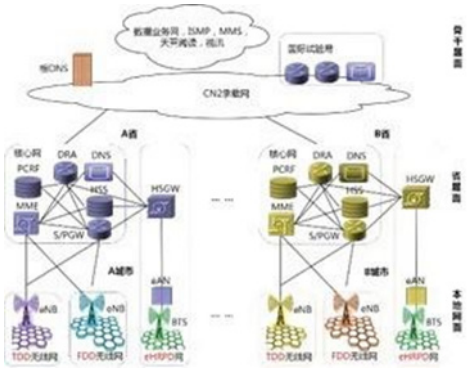
Example of GIS-based automatic design system



The Huaxin Consulting Co., Ltd. in **China** set up the project RJIL FTTx Pilot Network, which covers more than 280 000 households in India, provides 100 Mbit/s broadband access service for each customer, and greatly improves local connectivity, in line with **SDGs 8, 9** and **12**. At the same time, this project formed a set of FTTx network construction specifications applicable to the local conditions in India, covering the entire project life cycle, including planning, survey, design, construction, supervision and acceptance. While the project was implemented, the project team compiled training materials covering the whole process of FTTx construction for the local environment in India. The training materials include classroom training and on-the-job training. More than 500 qualified FTTx engineers and 100 FTTx project managers were successfully trained. RJIL plans to invest USD 10 billion to build a pan-India FTTx network covering more than 40 million subscribers. This project has completed the technical reserve and talent pooling for FTTx network construction. The network construction mode and experience can be easily replicated to large-scale network construction. The project paved the way for the large-scale construction of the FTTx network in India and provided great experiences for other countries to replicate.

In **China**, Jiangsu Post and Telecommunication Planning Design Institute Co. has launched the *Beijing Yizhuang cloud-computing centre building* project, in line with **SDG 9**. The project will achieve an in-stalled capacity of 14 000 cabinets, which can support the global net-work topology, improve service capability, enhance core competitiveness and satisfy significant business development needs. From the standpoint of global informatization, in addition to yielding positive social and economic benefits, the project will powerfully drive industry development in terms of reliability, safety and quality of service. The project can provide differentiated business models, improve social perception of information services, and attain the strategic goals of replication and sustainability by using modular technology.

Jiangsu Post and Telecommunication Planning Design Institute Co. in **China** has likewise launched the *China Telecom LTE network construction* project, in line with **SDGs 8** and **9**. In order to support the development of the national economy and satisfy market demand, China Telecom has planned to implement the 4G mobile communication construction project. From 2014 to 2016, China Telecom helped build more than 400 000 base stations and 160 000 sets of indoor distribution systems to serve subscribers. The project promotes LTE construction and operation, implements the national strategy and upgrades the IT industry. During the construction period, it indirectly boosted national economic growth by nearly CNY 300 billion and created about 500 000 jobs.



In **China**, China Communications Technology Co, Ltd has set up the *South-to-North water diversion (Eastern route) communication optical cable* project for the water resources dispatch and management

system, in line with **SDGs 3**, **6** and **7**. The project laid 1 028 km of optical cable along the pipelines, through the five provinces, which feature complex topography and are subject to severe environmental constraints. In the case of remote sites, cable routing is frequently required to cross rivers and dams, which has to be taken into account in the planning. In this context, a lot of new technology was invented by engineers. The project is a first in applying a communication project to water conservation, thereby filling a gap in terms of the acceptance of long-distance communication projects in water conservation. The story of this project can easily be copied and used by other countries or communities.

In **China**, the Internet Society of China has set up the *China e-Government Information Accessibility System*, in partnership with Telecommunications Authority of the Ministry of Industry and Information Technology (MIIT) of the People's Republic of China; MIIT's National Software and Integrated Circuit Promotion Centre (CSIP); Tsinghua University's Information Accessibility Research Centre; China's Digital Library for Visual Impairment; National Aging Office Information Centre; and iFlytek Cc., Ltd.

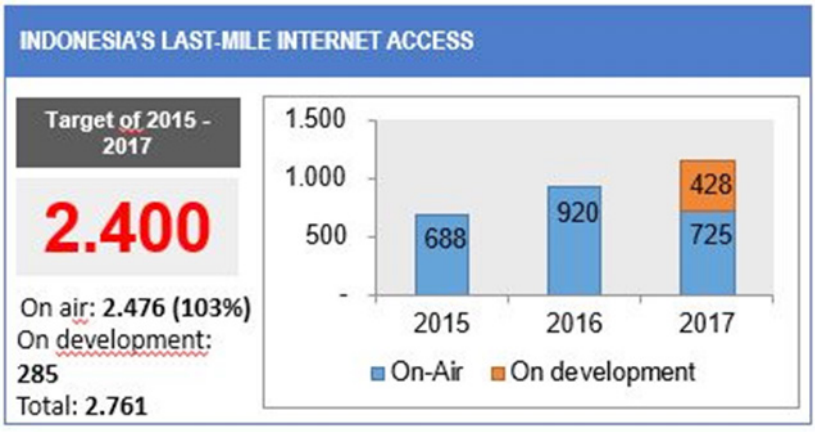
Through the China e-Government Information Accessibility Public Services System, cooperating with all levels of government, institutions and organizations, as well as enterprises, this project aims to build and integrate sub-platforms of provincial, municipal, district and county governments to promote information accessibility technology and service sharing. The project also seeks to ensure that all levels of government, public utilities and commercial sites form an interconnected barrier-free information service system in order to provide equal access to information for disadvantaged groups, including

persons with disabilities, the elderly, the poorly-educated, etc. It plays a strong sustainability role in building an information society that benefits everyone. The programme serves **SDG 16**.

In **India**, the Chhattisgarh State Wide Area Network is a very ambitious project under the National e-Governance Plan to provide the State with a basic information technology backbone, which is being utilized for carrying voice, data and video traffic, facilitating interdepartmental communication and data sharing within the state. The project enables instant online interaction among government departments and agencies, resulting in obtaining reports in real time, improving the workflow processes and the pace of decision-making. The project provides a secure and reliable medium to departments to access government applications and websites for delivery of government-to-government, government-to-business and government-to-citizen services. The project is developed in partnership with Deity, the Government of India Electronics and IT Department, and the Government of Chhattisgarh, and is relevant to **SDGs 8** and **9**.

In **Indonesia**, the Ministry of Communication and Information Technology – in partnership with local governments and telecommunication and other cellular operators, as well as local communities and civil societies – developed the ICT project entitled BTS (Base Transceiver Station) for Rural, Remote and Border Area of Indonesia, relevant to **SDGs 1, 8** and **9**. The programme aims to provide access to areas that are underserved because, due to economic calculations, they have not been considered feasible so have not received enough attention from telecommunication and network service providers. The BTS programme plays a role in growing the demand for this region to become commercially visible and making the quality of services equivalent to that in big cities. By 2017, the Indonesia Ministry of Communication and Information Technology (MCIT) and the Telecommunication and ICT Accessibility Agency had already built 255 "2G" BTSs running on air. In addition to the development results since 2015, a total of 366 BTSs have been built, of which 47 are piloting "generic 4G" services at rural, remote or border areas with very small aperture terminal transport of 4 Mbps. The target is all rural/remote locations and border areas in Indonesia having basic telecommunication services, including through Global System for Mobile communication technology, with a total of around 625 BTSs in 2019. In building these BTSs, the greatest expense is delivering equipment for installation and equipment, since the location is not easy to reach with no public transportation or proper access road. Somehow, the team must lease air or river transport service, followed by using livestock to deliver material to the location. Moreover, on muddy roads, broken bridges, rainy seasons, sea storms, shallow rivers, high rapids, and even some conflict-prone areas are also a challenge.

Also in **Indonesia**, MCIT delivers wireless broadband Internet access with a strong focus on affirmative policy. MCIT has rolled out last-mile connections in "blank spots" – areas with zero connection to any telecommunication service, particularly at busy public facilities (e.g. schools and head village's office). By 2017, 2 476 locations were connected, way above the target for the period 2015–2017, and as many as 285 new on-air locations are on the way. The delivery of broadband Internet access with a focus on affirmative policy has been creating impacts on health and social well-being. Broadband Internet, for example, enables the Ministry of Health to roll out Telemedika, a free-toll line accessible to anyone in Indonesia in need of solicited medical advice. MCIT's broadband Internet access programme has also supported entrepreneurial activities in the easternmost province of Indonesia. Women of Kampung Enggros, Papua's first Internet village, can download new recipes, look up homemade herbal medicine and even source inspirations for their latest *noken* (multi-functional woven bags) production from social media on a day-to-day basis. This project is relevant to the advancement of **SDGs 1** and **8**, promoting inclusive and sustainable economic growth, employment and decent work for all.

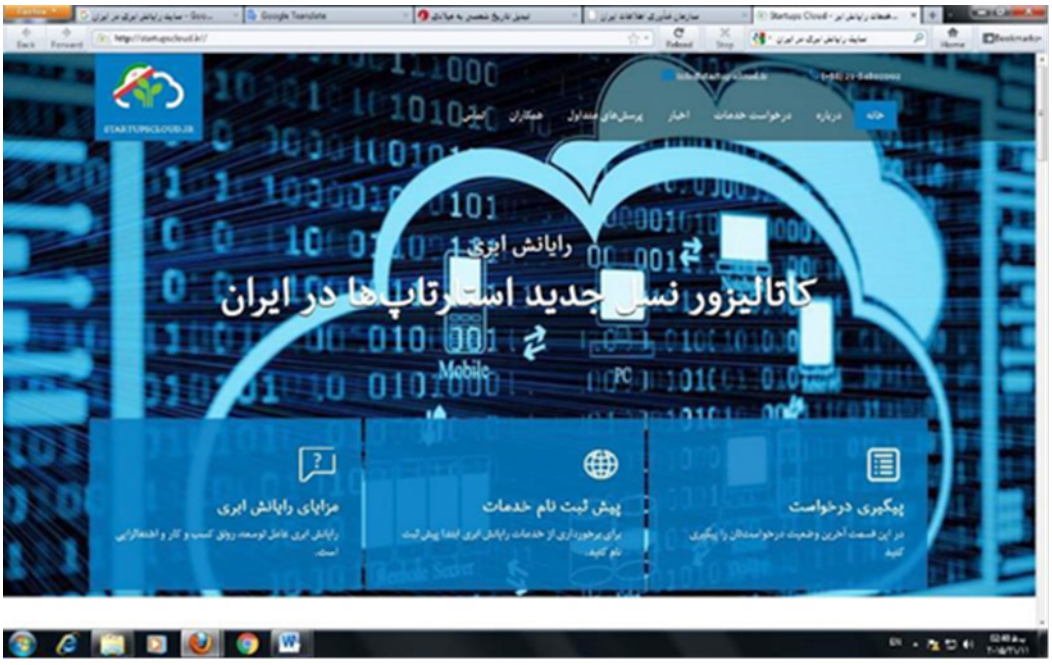


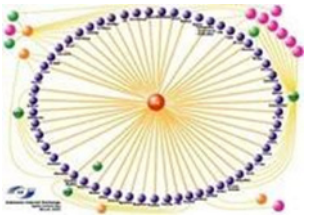
In **Indonesia**, Asosiasi Penyelenggara Jasa Internet Indonesia (APJII) has launched the *Indonesia Internet exchange* (IIX) project, in partnership with Jamalul Izza and Henri K. Soemartono, and in line with **SDGs 8**, **9**, **10** and **11**. The objective of the IIX programme is to form a national interconnection network that has the requisite capability and facilities to meet the needs of each ISP. The IIX project has no end date for the programme as a whole, but is divided into stages that will be developed continuously.

In **Indonesia**, Handoyo Taher has launched the *Indonesia Internet exchange* (IIX) project, in partnership with Agus Budi Raharjo. The objective of the IIX programme is to build a national interconnection network that has the requisite capability and facilities to meet the needs of ISPs that already have operating licences in Indonesia. Currently, the IIX project has no end date for the programme as a whole, but is divided into stages that will be developed continuously. The project is in line with **SDGs 8** and **9**.

The Information Technology Organization of the **Islamic Republic of Iran** initiated the *Cloud Computing for Start-ups* project, the main objective of which is to bring infrastructure-as-a-service (IaaS) infrastructure design into Iranian data centres. It is an appropriate solution for facilitating and meeting the requirements of start-ups and providing the computing infrastructure they need as a service on a cloud-based platform. A package of such services and resources for a limited period (e.g. one year), free of charge, is available to start-ups. This service, tailored to the needs of the user, provides constant and ubiquitous access to intranet and Internet resources.

The project helps start-ups to focus on their creative ideas and provides a database, thereby promoting sustained economic growth of the country (**SDG 8**).



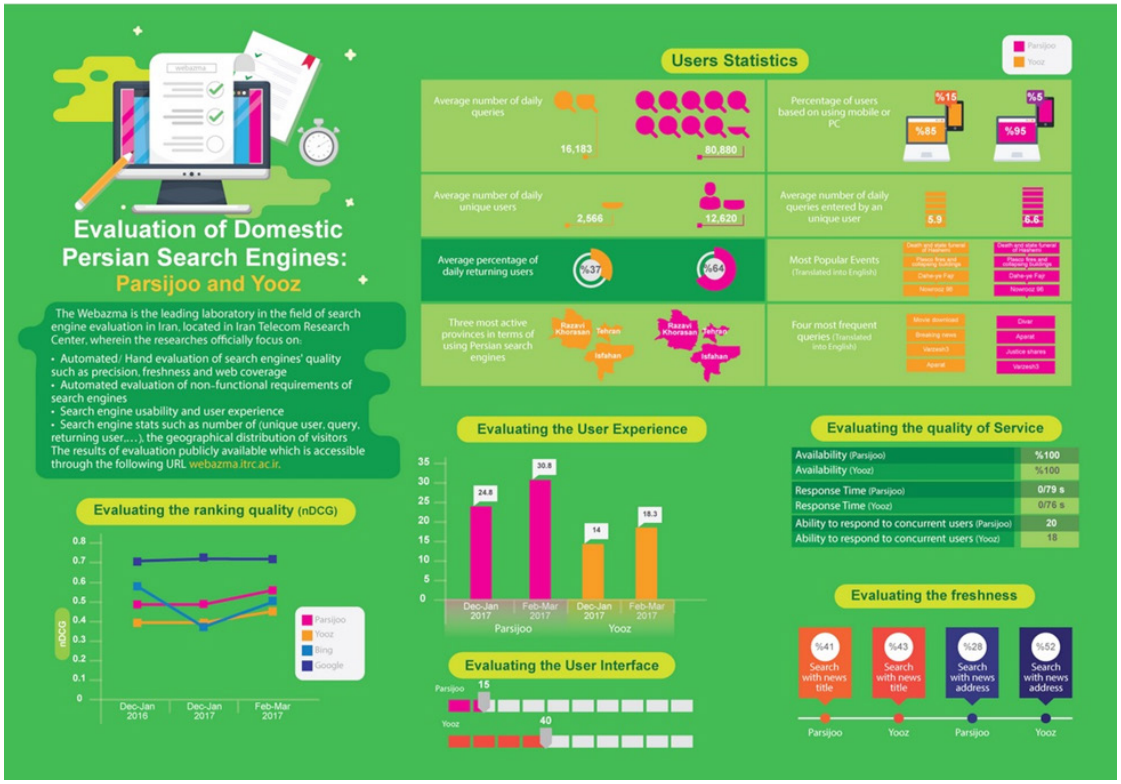


In the **Islamic Republic of Iran**, the Data Processing Company (Parvaresh Dadeha) (DPCO) has launched the *Houshyar OSS* project, as a solution for optimizing and improving the quality and resilience of information and communication infrastructure, in partnership with Ali Rahmanian; Alireza Talebipour; Hadi Mahmoudi; and Amir Mehrabinezhad. Houshyar OSS is a fully-fledged Java-based software that can be used by service providers for unified and integrated monitoring, control, analysis and management of their ICT infrastructure. This is a solution that has been developed by DPCO from scratch for optimizing and improving the infrastructure as the main foundation of the information society. The system can manage different components of the infra-structure, including broadband network infrastructures, mobile and fixed communication networks, data centres (servers, applications, databases, storage solutions, etc.) and e-services. These kinds of systems have a critical role in providing resilient, reliable, high-quality, sustainable and ubiquitous access to ICTs by citizens, businesses and government. Quality infrastructure is positively correlated with the achievement of social, economic and political goals, and undeveloped and low-quality infrastructures limit access to healthcare and education. Houshyar OSS has been used at the national level for managing some of the services of the national information network, telephony switching network and broadband network of service providers. One of its targets being to develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all, the project is relevant to **SDGs 9** and **11**.

Also in the **Islamic Republic of Iran**, the Monenco Iran Consulting Engineers, in partnership with Detecon Germany and Idate, have developed the ICT project First Iranian FTTx Broadband Operator, relevant to **SDGs 1, 7, 8, 9, 11** and **12.** This megaproject consists of four subprojects: Geographical Data Gathering Project, Feasibility Study and Market Strategy Project, FTTx Network Design Project, and Business Plan and Financial analysis project FTTx network design Project. In this project, gathered data includes the shape map, street centrelines, residential and business information, headquarters and mobile network elements considered as input for network software design. Three highly scored scenarios based on different design assumptions were simulated, and the best one was selected. It is noticeable that all design was done with high-precision, international level software, and the result was sufficient to make a decision about network roll-out. Capital expenditures of the network are calculated based on scenario and cost breakdown (feeder layer, distribution layer, drop layer), which was generated automatically by software to eliminate extra costs in each segment of the network. Selecting the optimum solution for customers is based on fibre-to-the-home, fibre-to-the-premise and fibre-to-the-building architecture. Selecting appropriate splitter ration is based on service demand on the subscriber side. Core network planning Optical distribution network (ODN) planning Assessment limitation/consideration on street cabinet (distribution point or branching point) Capacity of street cabinet and fibre optic cable joint box. Technical specification preparation in both passive and active equipment List of Material (LOM) and BOM extraction.

Furthermore, in the **Islamic Republic of Iran**, the Iran Telecommunications Research Centre created a web service evaluation and verification service in conjunction with a search engine programme from the Iranian Ministry of ICT. Web Azma is a testing and evaluating laboratory, established in 2015 in the Islamic Republic of Iran Telecommunications Research Centre, with the aim of standardizing quality assessment of ethnic IT-based services such as search engines, machine translators, e-mails, social services, etc. In the two years of its activity, Web Azma has developed several automatic as well as human-based testing tools and platforms, which have been continuously reporting quality assessment reports regarding web-based services supported by the Persian Search Engine Programme. Web Azma testing tools and platforms can be listed as follows:

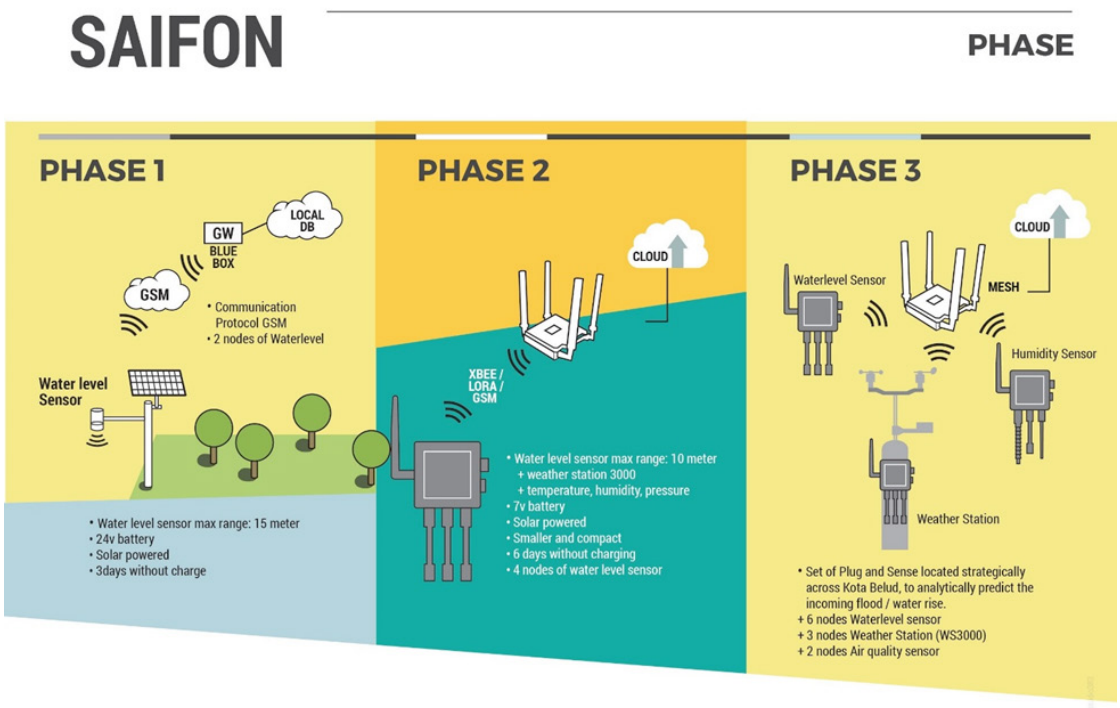
- an automatic testing platform for assessing the effectiveness of Persian text, image, video and audio search engines, as well as measuring the precision of English–Persian machine translators;
- automatic tools for evaluating the availability, response time and capability of handling concurrent users for any web-based services;



- a crowdsourcing platform, with more than 300 users, for designing and executing any kind of testing activity which requires human participation;
- analytical script-based tools for collecting and inferring several statistics about user engagements and their interactions with web-based services;
- UI and UX evaluation platforms for UI/UX assessment of any web-based services.

Using the above-listed tools and platforms, Web Azma has executed several tests whose results have been published on the official website of Web Azma. Moreover, several conference and journal papers have been published in domestic as well as international societies. Currently, the focus of the laboratory is on developing tools for quality assessment of intelligent advertising platforms as well as natural language-processing services such as knowledge graph and tree bank. This project promotes the advancement of **SDGs 8** and **9.**

In **Malaysia**, the Communications and Multimedia Commission, together with the MSD Digital Intelligence Pte. Ltd., created the project Security and Integrated Flood Network System, relevant to **SDGs 9, 11, 13** and **17**. Under the Smart Community initiative, the Malaysian Communications and Multimedia Commission has developed a few key projects to foster challenges in fulfilling the objectives of Smart Nation, which include access to digital technologies. One of the projects is called Security and Integrated Flood Network (SAIFON). SAIFON consists of the basic IOT components – Hardware, Network and Data Analytics – to bring solutions to the communities in creating a better way of life through the use of ICT. This is also in line with one of the objectives of Smart Community. The system is fully developed by Malaysians and is currently being used at Kota Belud Smart Community. SAIFON is designed to forewarn the communities in Kota Belud on the possibility of flood to ensure actions are taken to reduce adverse effects. The authorities are also able to provide safety measures and preparedness in assisting the communities where the properties and assets may be damaged. The authorities are able to manage traffic flow for the public commuting in and out of Kota Belud District before and after floods. SAIFON also contributes towards achieving **SDG 9.**



Also, the **Malaysian** Communications and Multimedia Commission has partnered with Telekom Malaysia Berhad to create the project Malaysia People's Cable System (SKR1M), relevant to the advancement **of SDGs 1, 8, 9** and **11**. SKR1M is part of the Government's initiative to increase the capacity of high-speed broadband, as outlined by the Prime Minister of Malaysia in 2014 and the 2015 National Budget. The Government, through the Malaysian Communications and Multimedia Commission, has appointed Telekom Malaysia Berhad to deliver the project based on the public–private partnership model. The project started in 2015 and was fully completed in June 2017. The total length of submarine cable installed is 3 820 km, connecting Mersing, Kuching, Bintulu, Miri, Kota Kinabalu and Cherating. This project will support the increase of data traffic from Sabah and Sarawak, since the existing submarine cable system has stretched its full capacity and will reach its life span in a few more years. With the completion of SKR1M, the system will be able to provide a total capacity of up to 12 Tbps with current technology and can be upgraded to the latest technology in the future to provide more capacity. The system is designed to last for at least 25 years. On the other hand, SKR1M will also support the implementation of the High-Speed Broadband and Sub-Urban Broadband projects by providing huge backhaul capacity to bring back the traffic from Sabah and Sarawak to Peninsular Malaysia and internationally. These are among the steps the Government undertakes to ensure that no segment of the community is left behind, in order to improve the socio-economic situation through ICT and the Digital Economy.

Also in **Malaysia**, the Administrative Modernization and Planning Unit – in conjunction with all government agencies (25 ministries and 201 agencies, local and international) and GITN Sdn Bhd –developed the project 1Gov*Net Project: Connected Government. 1Gov*Net is a single, integrated, secured and centrally managed telecommunication network service for the Government of Malaysia. It is the expansion of the Electronic Government Network (EG*Net), which was initiated in 1997 as Malaysia was embarking on building the Multimedia Super Corridor in line with its National Vision 2020. 1Gov*Net continues as the single telecommunication network enabler to digital government in the public sector. The exemplary shared services recorded a notable 85 per cent saving in cost as compared to single implementation, with increases of the customer satisfaction index year after year. To date, 1Gov*Net is providing a total of 43 Gbps of bandwidth to 100 per cent of the Government, connecting a total of 10 400 agencies comprising ministries, diplomatic missions, state governments,

local authorities, hospitals, schools and public sector data centres at various international, urban, suburban and rural locations using the IP-Based Virtual Private Network Service, metro-e, asymmetric digital subscriber line and very small aperture terminal technology. 1Gov*Net runs with proactive monitoring 24/7/365 and complies with the ISO standards for quality in administration, ICT security and process automation. 1Gov*Net is adopting agile implementation and future-proof technology, a 99 per cent achievable service level guarantee, and responds to new expectations from citizens for better services, smarter implementation and good policies, thus facilitating the attainment of the SDGs, specifically for the information society. The success of 1Gov*Net has been crucial in ensuring an efficient government service delivery. Malaysia's ranking has improved its rankings in the World Economic Forum's Global Competitiveness Index, the World Bank's Doing Business and the United Nations' e-Government. This project is thus relevant to advancing **SDGs 1, 8, 9** and **11**.

Again in **Malaysia**, *Smart community* is a vital building block of a smart nation vision. As Malaysia pursues its transformation into a smart digital nation, its rural communities need to be empowered through proper exposure to knowledge and by being equipped with adequate ICT facilities. This is one of the main objectives under the Smart Digital Nation vision, which is now spearheaded by Malaysian Communications and Multimedia Malaysia (MCMC). The idea behind Smart Community is about using technology to improve the way of life. MCMC has kicked off a Smart Community initiative in Kemaman, in the state of Terengganu, to expose the local community to technology and to ways in which it can address everyday problems and thereby improve living standards.

The Kemaman Smart Community project relates to several key SDGs, such as promotion of inclusive and sustainable economic growth, employment and decent work for all, reduction of inequality within and among countries and ensuring sustainable consumption and production patterns (**SDGs 8, 10** and **12**).

In **Malaysia**, the Malaysian Communications and Multimedia Commission has set up the project for *Empowering digital inclusion towards reaching connected communities through u-Pustaka knowledge services*, of relevance to **SDG 4**. The availability of more than 12 000 libraries in Malaysia providing information and knowledge services for millions of citizens, with the quantum leap made possible by various technologies supported by broadband infrastructure, has prompted the effort to develop the u-Pustaka ecosystem in order to transform public service delivery for the ease of citizens who need information and knowledge at any time and from any place. The development of u-Pustaka is all the more necessary with the introduction of the government's 'No Wrong Door' policy, which sets high

standards for excellent government services to be delivered by all government servants to the public. Given citizens' expectations and needs in terms of information in today's age, which calls for faster decisions, especially for people on the move, the public library becomes a major enabler to achieve this. Project partners include: Ministry of Communications and Multimedia Malaysia (KKMM); Malaysian Communications and Multimedia Commission (MCMC); National Library of Malaysia (PNM) and seven libraries- State Library of Selangor (PPAS), State Library of Negeri Sembilan (PPANS), State Library of Pahang (PPAP), Pustaka Negeri Sarawak (Pustaka), State Library of Sabah, Kuala Lumpur Library (PKL), INTAN Library at Bukit Kiara; Malaysian Administrative Modernization and Management Planning Unit (MAMPU); Economic Planning Unit (EPU); National Registration Department (NRD); National Centre of Excellence for Sensor Technology, at Universiti Putra Malaysia; Pos Malaysia Berhad; FPX Gateway Sdn. Bhd (MEPS);Bank Islam; Malaysia Berhad; and Touch 'n Go Sdn. Bhd.

In **Pakistan**, the National University of Sciences and Technology (NUST) has launched *Smart Meter Data Collection*. The aim of the project is to collect the data from all smart electricity meters in a community, and transfer them to a central facility for billing and other services. The underlying idea of capturing the data and transmitting them over a wireless channel makes use of a specific wireless technique known as cooperative communications, which is low-overhead and can be implemented using low-cost radios. This would alleviate the problem of electricity theft and allow smart online decisions by both the end users and the utility company to adjust their respective loads. The programme is carried out in partnership with National ICT R&D, Pakistan, and is relevant to **SDGs 9** and **11**.

In the **Philippines**, the Department of Information and Communications Technology created the Free Wi-Fi Internet Access in Public Places Project to accelerate the Government's efforts in enhancing Internet accessibility for Filipinos so that, in turn, economic, social and educational opportunities will be bolstered, and the growing digital divide can be bridged across the country. The first initiative of its scope in South-east Asia, the project's objective of Internet for all is to be achieved through the provision of free Wi-Fi Internet access to a total of 1 634 localities spanning 1 489 from first to sixth class municipalities and 145 cities, with 13 024 sites covered by 18 points of presence

across the Philippines. Public places to be provided with free Wi-Fi include plazas and parks; public libraries; public schools (elementary and high school) and state colleges/universities; rural health units and government hospitals; train stations, airports, and seaports; and national and local government offices. This project contributes to the advancement of **SDGs 4, 8, 9, 11** and **17**.

Launched by **Sri Lanka**, where the *Internet connectivity in* **Myanmar** project is concerned, well-designed and well-executed sector reforms connected millions of the hitherto unconnected at an unprecedented rate. As a result, Myanmar advanced eight positions in the International Telecommunication Union's ICT Development Index, overtaking both Pakistan and Bangladesh in the Asia-Pacific region. Although significant progress was made in terms of the number of mobile connections, the main drivers of better performance on the composite index were Internet-related. Clear and well-implemented policies helped to create the conditions for Myanmarese to benefit from the potential of the Internet.

Meeting a considerable number of SDGs in different domains (**SDGs 1, 2, 3, 4, 8, 9, 10, 11, 16** and **17**), the reforms are both sustainable and replicable.

In **Thailand,** the Electronic Government Agency (EGA) created the *Government Cloud Computing* project to operate as its cloud computing service, focusing on resource management, cost efficiency and convenient access to virtual systems, namely software-as-a-service (SaaS), platform-as-a-service (PaaS) and infrastructure-as-a-service (IaaS). Launched on 1 May 2012, the system was serving 203 government organizations as at 30 September 2014, covering 58 systems such as rice mortgage information tracking and integration, management of the women's development fund, and the strategic water resource management plan.

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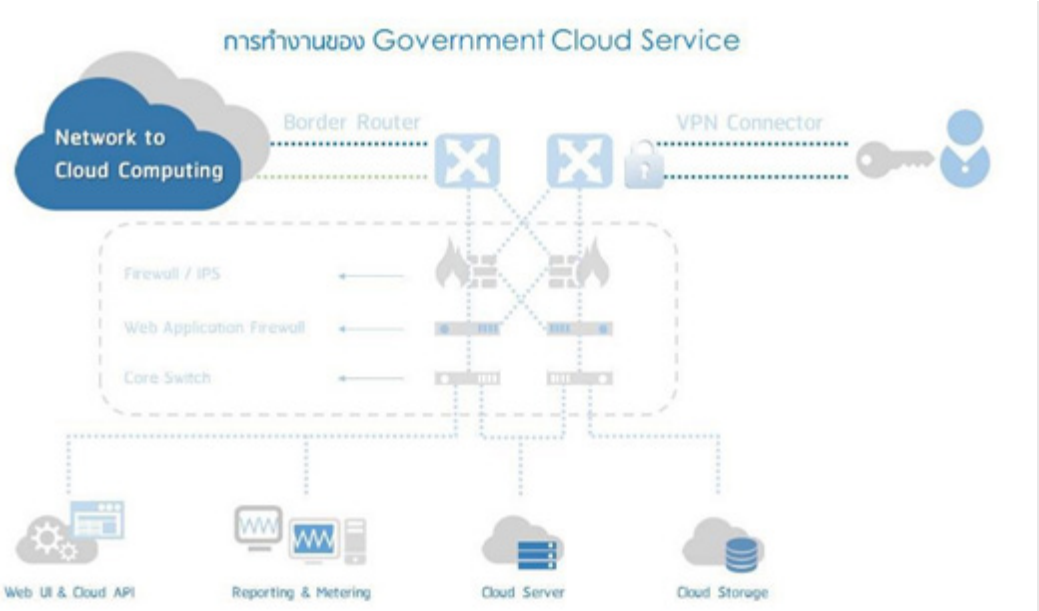


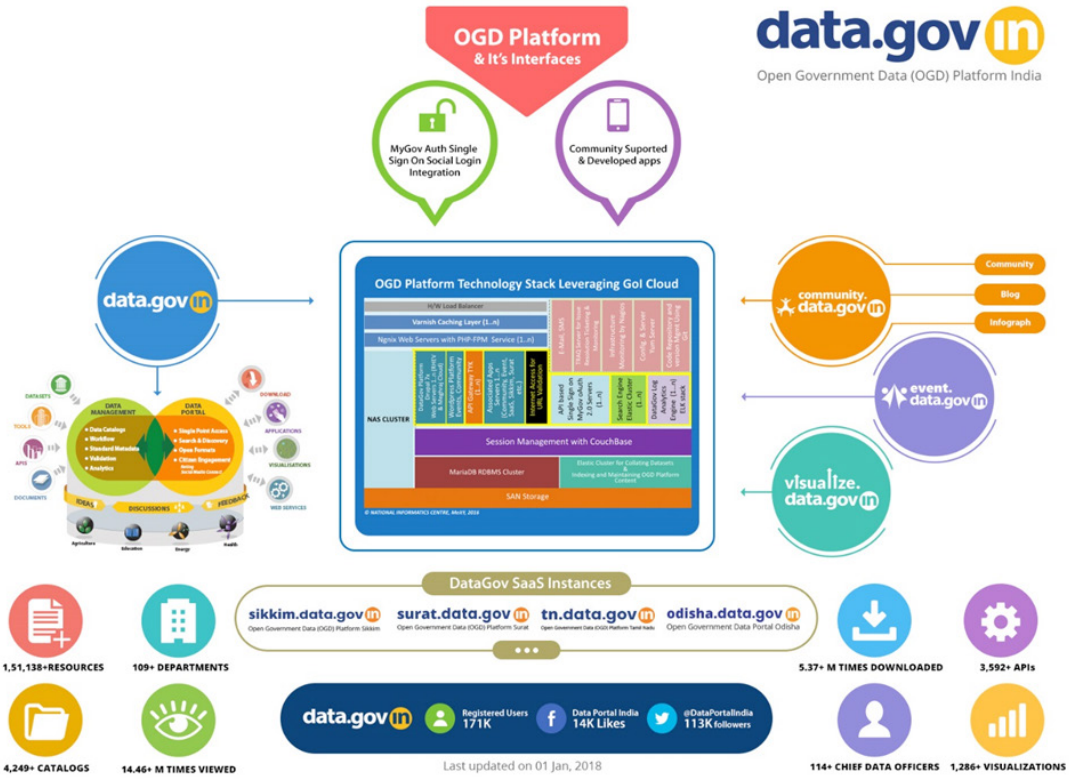
The implementation of Government Cloud Computing will enable government agencies to optimize available resources and achieve high efficiency. By consolidating all services into a one-stop service, redundancy will be eliminated while access to information and services as well as information security is enhanced. The fact that users can work on cloud computing-based systems as if they were based on their organization's own network enables the organization to make savings in the areas of network and system management. The main objective of this project is to eliminate budget redundancy while increasing return on investment and optimizing shared IT resources, thereby contributing to the building of resilient infrastructure, promotion of sustainable industrialization and fostering of innovation (**SDG 9**).

C3. Access to information and knowledge

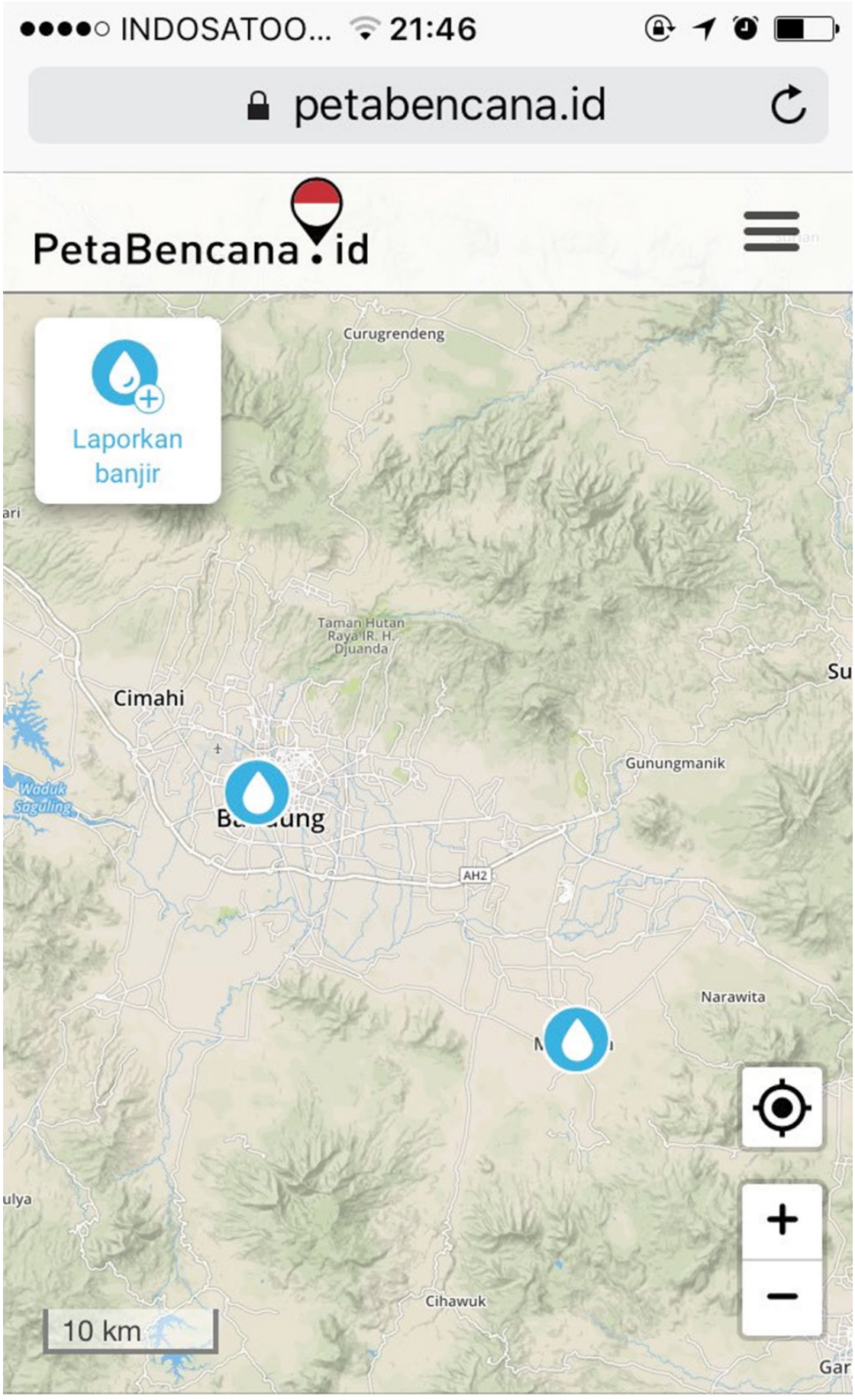
The Access to Information (a2i) Programme of Prime Minister's Office in **Bangladesh** has established the DAISY-standard Accessible Reading Materials for Students with Visual and Print Disabilities project, which aligns with the **SDG 4**. In Bangladesh, around 37% of the population (35% illiterate and 2% visually impaired) is falling behind in society because of inaccessibility to reading materials. With the support of a2i's Service Innovation Fund, the Young Power in Social Action (YPSA) has developed DAISY standard accessible reading materials for students of class 1 to 10 which are handed over to visually impaired students every year on Textbook Day (1st of January) by the Honorable Prime Minister. This has made primary and secondary education inclusive (SDG 4.a) and accessible for all girls and boys, and contributed to improving literacy and numeracy among the user groups.

In **India**, the National Informatics Centre developed the Open Government Data Platform India: Open Access for Information and Knowledge. In a developing country such as India, planning of socio-economic development processes must rely on quality data. As quality data and the associated information are not easily accessible, there is a general need for sharing of the large amount of data generated by ministries/departments/organizations/states of India in an open format for further innovative utilization and/or value addition, to enable effective governance, transparency and enhanced public services delivery. Recognizing the importance of the availability of open data and associated information to its citizen for increased levels of transparency and accountability, and to promote higher levels of public participation, the Government of India, under the aegis of the National Data Sharing and Accessibility Policy, initiated Open Government Data Platform India (data.gov.in) to share government data with its citizens, in line with **SDGs 9, 12** and **16**. This has built a foundation to create an open data ecosystem in the country. The Government Open Data Licence–India has shown the Government's commitment and greatly helped in building confidence among data users. The platform has been set up by the National Informatics Centre, Ministry of Electronics and Information Technology of the Government of India. Data are made available free of cost for commercial and non-commercial purposes to different stakeholders – namely researchers, academia, students, industry, start-ups, developers and the community, among others – to generate insights, innovation, services, etc. All the stakeholders are engaged through various activities for sensitization, awareness and utilization of data.

In **Indonesia**, the Ministry of Information Communication Technology of Indonesia Local Government of Pemalang Resident, West Java Indonesia and Relawan TIK Indonesia developed the project *Pusat Pemberdayaan Informatika dan Pedesaaan* (PUSPINDES, or "Centre for Information and Rural Empowerment" in English). People in rural areas need information and knowledge about subjects such as farming technology, how to sell products, and improving the quality of farming products from anywhere in the world. They also need to find some prospect for selling and have some opportunity for effective partnership. PUSPINDES is a pilot project of Relawan TIK Indonesia with a city in Indonesia, with the objective of empowering people in rural areas to use ICT as an enabler to increase quality of life as well as business. The project was established in 2017 at Pemalang Resident, a city in West Java, Indonesia. PUSPINDES has many services and products to be provided for people in rural areas. The project is in line with **SDGs 1, 2** and **5**.



Also in **Indonesia**, Powered by CogniCity Open Source Software created PetaBencana.id, which is a free web-based platform that produces megacity-scale visualizations of disasters using both crowd-sourced reporting and government agency validations in real time. The platform harnesses the heightened use of social media and instant messaging during emergency events to gather confirmed situational updates from street level, in a manner that removes the need for expensive and time-consuming data processing. These verified user reports are displayed alongside relevant emergency data collected by local and government agencies. By integrating localized knowledge from a variety of sources into a single, robust platform, PetaBencana.id is able to provide a comprehensive overview of disaster events, enabling residents, humanitarian agencies and government agencies to make more informed decisions during emergencies, which advances **SDGs 11** and **13**.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The Government of **Indonesia** created the *Cultural Digital Library* website to access publications of the 32 local cultural libraries which include all museums and technical and operational units under the advisory of the Directorate General of Culture. The public can access books, newsletters, reports and articles on Indonesian culture.

The website thus relates to the development and equality of the public, providing it with free access to information and ensuring learning opportunities, promoting economic growth and contributing to cities' sustainability (**SDGs 3, 4, 8, 10** and **11**).

In **Indonesia**, Pusat Telaah dan Informasi Regional (Centre for Regional Studies and Information) (PATTIRO) has developed *Promoting accountability of village law implementation* through an ICT-based forum and feedback loop mechanism. Kedesa.id is a portal integrating four platforms, namely blog, wiki, repository and forum. The blog is provided to accommodate ideas in the form of short articles that can be commented by other users. The wiki platform provides an-notations about village law prepared by the PATTIRO team, in which users are free to contribute and provide input in the form of relevant information. The repository is used to accommodate documents related to the implementation of village governance, including policies and reports of studies on the practice of the organizing village governance. The forum is an online discussion medium for interactive communication and response to the issue of village development. The project, which relates to **SDGs 8** and **16**, is carried out in partnership with other PATTIRO networks at the national and local level, forming the PATTIRO Raya network.

In the **Islamic Republic of Iran**, the Iran Consortium on National Content (University of Tehran Section) has set up the project *Thematic knowledge generation and sharing in an aca-demic environment*, in partnership with Nader Naghshineh and Seyyed Saeed Reza Ameli. Being the oldest institute of higher learning, at the forefront of modern information generation and distribution for over 100 years, the University of Tehran holds nearly a century of material on academia and its interaction with society. It is one of the biggest generators of e- content in Farsi. Currently, it operates the only integrated.

Academic Intelligence System within the Iranian university landscape. The system not only fulfils the day-to-day and traditional information support roles, but furthermore offers unparalleled opportunity for gauging academic performance as well as the impact of knowledge generated. As a member of the Iran Consortium on National Content, the University of Tehran has played a major role in making these materials and services available to a wider audience. Its success is reflected in the general consensus that the university is no longer confined to Tehran, but rather encompasses the whole of Iran. It currently has branches in Aras Free Economic Zone, Caspian Sea, Qom, Karaj as well as Kish Island. The project is relevant to **SDGs 4**, **5** and **16**.

The **Malaysian** Communications and Multimedia Commission, together with the National Book Council of Malaysia and other regional offices, launched the project e-Magazine Development at Schools for Smart Community Districts in Malaysia. Over the years, schools in Malaysia have always faced the challenge of financing the annual magazine due to a limited budget allocation. The schools' annual magazine, which is usually published by the school with graphic layout and printing done by a private company, is usually financed by the students themselves when they make a purchase. As printing costs become more expensive, and as community advertising and sponsorship become scarce, the burden of a deficit in funds to publish an annual magazine has to be either borne or shared by the schools and parents–teachers associations. Another reason is that, due to the rapid adoption of digital technology, Malaysian schools are facing different challenges in dealing with digital native students. This new generation is less attracted to conventional printing material, while at the same time looks forward to more interactive content. Therefore, the initiative came to train and drive teachers and students to create an interactive digital magazine as their school's annual publication, which in turn helps advance **SDG 4**.

In **Nepal**, Tribhuvan University Central Library has initiated *electronic thesis and dissertation management*. The library receives Masters, M.Phil and PhD theses, which it has started to upload in Dspace for open access. Demand for relevant information is increasing every day, and the supply of information to meet requirements is inadequate on account of several barriers, such as, *inter alia*, the large amount of information, and finance, space, language and time constraints. Sharing of resources is one way to reduce these barriers and to meet the information needs of users. However, networking of libraries in Nepal is only at a nascent stage. Without knowledge of IT and ICT skills, we cannot globalize our service. Librarians know the value of information, but lack the modern ICT skills to properly manage theses and dissertations in our institution. The initiative is in line with all the **SDGs**.

In **Pakistan**, the NED University of Engineering and Technology created the *Getinfo* programme, a website which informs users, mainly students, about the opportunities offered by various organizations worldwide, such as scholarships, internships, sponsorships, jobs, competitions, free certified courses, etc. These are opportunities that enable students to enhance their academic learning, so an up-to-date website providing all such information is a valuable asset. Getinfo opens the way for

students to prove themselves ahead of a valuable career. With its links to the global community, the project fosters access to inclusive and equitable quality education and sustainable economic growth, reduces inequality within the country and revitalizes the global partnership for sustainable development, thus serving **SDGs 4, 8, 10** and **17**).

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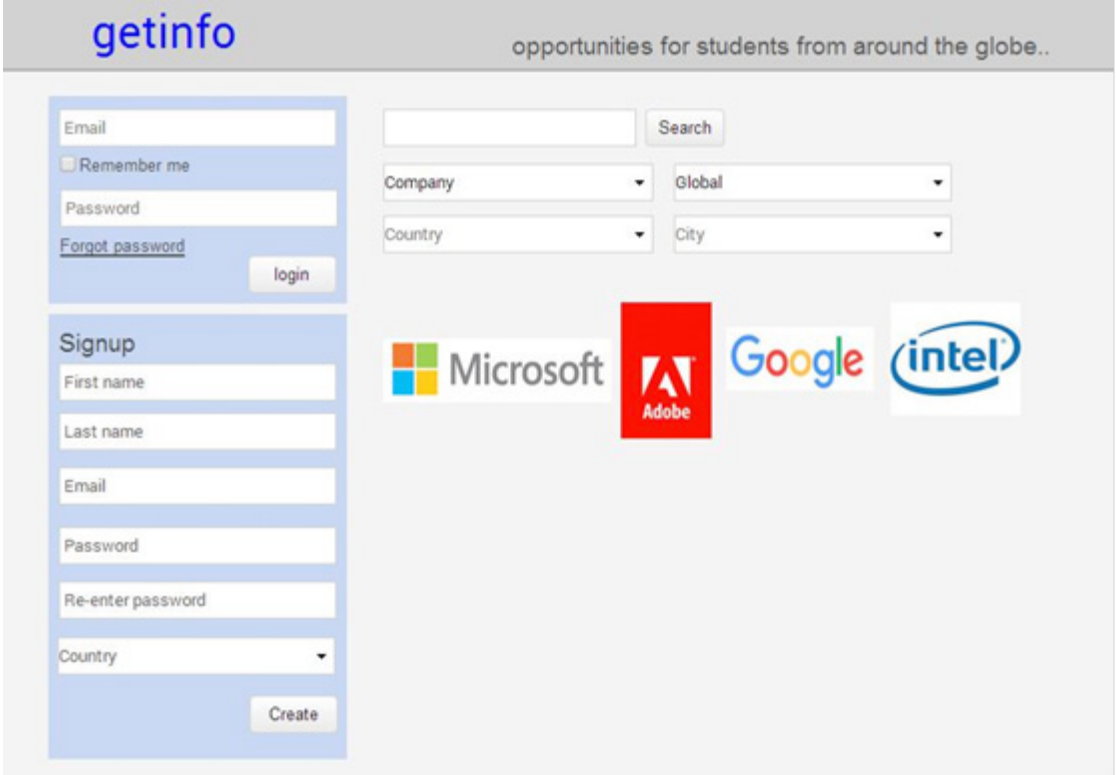


With its links to the global community, the project fosters access to inclusive and equitable quality education and sustainable economic growth, reduces inequality within the country and revitalizes the global partnership for sustainable development (**SDGs 4, 8, 10** and **17**).

In **Pakistan**, the Internet Society (ISOC) has launched the *Hamara Internet* project, a pioneer project to raise awareness of digital violence against women. Funded by ISOC's Beyond the Net, the project is opening a new chapter in the struggle for women's rights in Pakistan, providing women with the necessary knowledge and tools to protect their freedom of expression: training, workshops in universities, legal and psychological support and a crisis centre. Pakistani women deserve to be free to use the Internet to improve education and con-tribute to economic growth. The project reflects **SDGs 1**, **3**, **4**, **5**, **8**, **10** and **16**.

C4. Capacity building

In **Bangladesh**, the Bangladesh NGOs (Non-Governmental Organizations) Network for Radio and Communication, with the help of 17 radio stations in Bangladesh, launched the project English through Community Radio. Since September 2012, the American English Radio Project (AERP) has been implementing plans for upgrading English language skills of the community radio listeners in Bangladesh. The project started as a pilot phase in one community radio station, namely *Pollikontho* at Moulvibazar. On 1 October 2013, the third phase of the project was replicated in an additional four radio stations in four different parts of the country, namely Radio Padma of Rajshahi, Radio Jhenuk of Jhenaidah, Radio Sagor Giri of Chittagong and Radio Naf of Cox's Bazar. The learning of the third phase lessons was adapted in developing the proposal of AERP's fourth phase. During implementation of the project, it was observed that the demand and interest of English learning listeners were increasing rapidly. Listeners were getting a programme-friendly environment in the radio stations. They visited the stations to meet the programme producers, presenters, facilitators and voice players to share their experiences. They sent SMS messages and mail, and made phone calls to the presenters and producers during the live broadcasting. This experience made the AERP Team confident enough to replicate and continue this project in all 17 community radio stations of the country. This initiative is aiding the advancement of **SDGs 1, 5** and **16.**

Listeners are visiting community radio Sagorgiri to collect available audios, scripts and other learning materials from American English Listeners' Corner (AELC)

The **Bangladesh** NGOs Network for Radio and Communication also launched the project Counter Violence Extremism through community radio in rural Bangladesh. The main goal of the project is to strengthen community resilience in preventing violence and extremism. Two community radio stations – Community Radio Sarabela and Community Radio Barendro, located in the northern part of the country – are the implementing partners. Major tasks of the project include a baseline survey, and skill development training for broadcasters on production of issues-based programmes against extremism and violence. The project contributed to better understanding on ideological conflict, social harmony, family ties and community roles in reducing extremism and violence. The project also promoted social dialogue through community radio programmes, helping the advancement of **SDG 16**.

Bangladesh initiated two projects aimed at providing a quality education for its population while at the same time promoting economic growth, employment and decent work within the country. The Bangladesh Reform Initiative for Development, Governance and Empowerment Foundation (BRIDGE) inaugurated the *IT for Differently Able* project, supported by the United States Department of State under the initiative known as the Alumni Engagement Initiative Fund (AEIF) in 2013. The BRIDGE team currently comprises five people for Friday and Saturday classes, five advisers in the committee, four trainers and one interpreter.

The main objectives of the project are to:

- empower people with disabilities, who are now seen as being differently able
- follow the inclusive policy of promoting sign-language users and persons with physical disabilities
- enrich their capabilities through IT, e-graphics, Internet marketing and WordPress enhance their ability to communicate in English help them to become self-employed
- organize social connectivity and networking.

These goals coincide with the established SDGs as they foster inclusive and equitable quality education, lifelong learning opportunities for all, sustainable economic growth, achievement of gender equality, empowerment of all women and girls and the reduction of inequality within and among countries (**SDGs 4, 5, 8** and **10**).

In **Bangladesh**, youth unemployment stemming from illiteracy and a lack of ICT knowledge represents a major problem. Since its formation in 1985, the National Federation of Youth Organizations in Bangladesh (NFYOB) has pioneered a number of social movements including Youth Employment, Poverty Eradication, Mass Education, Environment Protection, Child Rights, Human Rights, Drug Abuse Prevention, Treatment, Motivation and Rehabilitation Programmes, Promotion and Construction of a Sustainable Culture of Peace and Nonviolence. The *ICT for Youth Development* project is necessary for the development of young people in the project area. NFYOB has organized many seminars and workshops for young people for the purpose of educating and informing the participants in numerous areas of concern.

The project ties in with the SDGs relating to the ending of poverty, the ensuring of equitable quality education, access to affordable, reliable, sustainable and modern energy, and the promotion of economic growth and employment (**SDGs 1, 4, 7** and **8**).

The NGOs Network for Radio and Communication **in Bangladesh has launched the** *English Language through Community Radio in Rural Bangladesh* project, in partnership with 17 community radio stations. English is becoming one of the key requirements in ordinary people's lives in Bangladesh; and community radios are one of the best educational platforms for reaching a wide audience at community level. This effective project is now addressing the above perspective, and contributing to improving the overall English-language skills of the broad radio audience in the rural communities. The success stories of development through community radio are inspiring people and give them strength to combat poverty and overcome other struggles in their lives. The project is of relevance to **SDGs 1**, **4** and **16**).

In **Bangladesh**, the Bangladesh NGOs Network for Radio and Communication (BNNRC) is seeking to engage community radio for the *elimination of gender-based violence in rural Bangladesh*, in partnership with 14 community radios. Within this framework, BNNRC has implemented the Girl Power Project in collaboration with Plan International and nine other partner organizations in Bangladesh, to sensitize and activate media professionals (both media initiators and journalists) in the quest to eliminate violence against girls and young women through media. BNNRC has trained 350 community radio broadcasters and mainstream media practitioners. Three awards events were organized for the best reporting and programmes. Around 500 motivated community radio broadcasters and other mainstream media practitioners (both print and electronic) are now engaged and committed to offering more quality radio and TV programmes, reports and news through their own media channels.

Bangladesh has launched the *Infolady Social Enterprise Ltd* (iSociaL) project, in partnership with the ICT Division of the Ministry of Information and Communication Technology, Government of Bangladesh, as an ICT-based door-to-door women's entrepreneurship model for creating employment, alleviating poverty and empowering women in rural Bangladesh (**SDGs 1, 3** and **5**). The objective of the project is to scale up a proven, award-winning model named "Kallyani", designed and developed by a pioneering social enterprise, Dnet (www.dnet.org.bd), and now operated by iSociaL. It is to be noted that this model is currently being replicated in other countries beyond Bangladesh.

Specific objectives of the project include: Creating self-employment for women in rural Bangladesh; Connecting rural communities to national and global markets through the network of Kallyanis; Spanning the last-mile for the delivery of public goods and safety-net benefits to people's doorsteps in remote areas; Significantly improving the health and well-being of adolescent girls and women. Connecting rural youth to opportunities (soft skills development, jobs, training, etc.) available in urban areas and abroad; Creating a vigilance and support network for violence against women; Educating rural youth with modern ICTs; Enhancing income opportunities of rural small farmers by facilitating access to moder agricultural technologies; and Creating last-mile Internet connectivity for rural citizens.

In **Brunei Darussalam**, the Authority for Info-communications Technology Industry of Brunei Darussalam (AITI) – in partnership with the Ministry of Home Affairs, ICT Training Provider and Village Consultative Councils – launched the project Programme Celik ICT. Also known as the ICT Savviness project, this programme is aimed at enhancing digital literacy among village residents so they may leverage on the transformative power of ICT and the Internet to market their village-made products and handicrafts. Programme Celik ICT is provided free of charge, runs for three days, and introduces participants to the basics of website development. Among the topics covered are basic web design, colour theory and how to storyboard websites. The workshop is customized to cater to the basic ICT literacy levels of the participants, and is run by selected training providers as part of Corporate Social Responsibility. The main aim of the programme is to enable Village Consultative Councils, also known as *Majlis Perundingan Kampong* or MPK, to be able to market their products and handicrafts on their websites in order to expand their reach to potential customers, both locally and internationally. This programme is in line with **SDGs 1** and **4.**

In **India**, the *Mukhya Mantri Yuva Swavalamban Yojana* project is a major initiative taken by the Government of Chhattisgarh aimed at improving placement rates of fresh college graduates of three- and four-year degree courses in the IT and IT Enabled Services sectors. The programme envisages

assessing students, and providing employability training and secure placements. The assessments were carried out to understand the trainability and employability quotient of students, and categorize them into "hirable" and "trainable" lots, based on their scores, and accordingly provide training to the "trainables" and interview opportunities to the "hirables". This programme is in accordance with **SDGs 4, 5** and **8**.

Also in **India**, the *Sakhi Samaveshan* project pursues financial inclusion through the empowerment of women, enrolling ordinary self-help group (SHG) members as business correspondents. It has been launched by Narmada Jhabua Gramin Bank, in cooperation with the Rural Financial Institutions programme of the German International Cooperation Agency (Gesellschaft für Internationale Zusammenarbeit) – National Bank for Agriculture and Rural Development (GIZ-NABARD), in four districts of Madhya Pradesh, covering 240 villages with a combined population of 300 000, through 41 Bank Sakhis.

The objective is to "leverage on the existing SHG ecosystem for building a sustainable customer service point network to offer formal banking/financial services in un/under-banked villages". The project utilizes the strengths of SHG networks, their wide membership base and the entrepreneurial interest of SHG members in order to work as business correspondents offering doorstep financial and banking services. It has succeeded in breaking down social barriers, and women who previously never stepped out of their house to participate in banking activities and earn are now driving this innovative project. Male clients who used to hesitate to approach SHG members (Bank Sakhis) to engage in banking transactions now do so freely. Bank Sakhis say that their social status has been enhanced and that they take great pride in being able to offer banking services to their fellow villagers.

In achieving these objectives, the Sakhi Samaveshan project supports gender equality and the empowerment of women and girls, in the service of **SDG 5.**

In **Indonesia**, the Relawan TIK Organization – together with the National Information Society Agency, ITU, the Development Sector Ministry of ICT of the Republic of Indonesia Local Government in Sumatera, Java and Kalimantan – developed the Relawan TIK Goes to School programme, a capacity-building project of Relawan TIK Indonesia (in English, Indonesian ICT Volunteer). This programme has been implemented since 2012 in Bogor, West Java, Indonesia. Since 2017, this project has become a national programme of Indonesia ICT Volunteers and already held on the islands of Sumatra, Java and Kalimantan. The targets of this programme are to ensure gender equality and social status in ICT education and to improve the quality of education through continuous learning, in line with SDGs 4

Also in **Indonesia**, the Ministry of Communications and Information Technology, the Directorate of ICT Empowerment, and the Directorate General of ICT Application, in 2009 launched the Safe and Wise Internet education programme, which in 2013 change its name to INCAKAP (*Internet Cerdas Kreatif Produktif*/Smart Creative Productive). This multistakeholder programme aims to encourage communities, educational actors, teenagers, students, parents, teachers and information activists, as well as local governments, to participate in educating and utilizing the Internet by way of the INCAKAP pillars:

- Smart: Utilizing the Internet in a good sense, following the digital literacy framework, as well as the prevailing the laws;
- Creative: Developing innovative products and services to provide benefits and added value to the national digital economy;
- Productive: Producing as much positive content and useful creations as possible for self-development and the wider community.

In disseminating the INCAKAP programme, the Ministry uses a group communication approach, i.e. resource persons who explain about safe and convenient Internet usage to the group through seminars. The message to the audience is also delivered by educative methods, exposing opinions and experiences as well as delivering data and facts about the positive and negative impacts of Internet usage. Therefore, people may have a complete picture about Internet ethics, norms, culture and regulation to determine their attitudes and behaviour on the Internet. The INCAKAP programme has a segmentation of teenage audience, especially targeting children aged 13–18 years, so that socialization is done among high school students. This project is in line with **SDGs 4, 5** and **16**.

In **the Islamic Republic of Iran**, the *THINGcubator* is an incubator that supports a network of industry partners, technology entrepreneurs, business advisers and financial investors. The incubation model includes hands-on support in developing and growing Iranian business across functions, from general management to sales and marketing and technology. Access to office space and related services is also provided. The THINGcubator, based on a self-sustaining model, helps to accelerate the pace of innovation by strengthening the path for entrepreneurs, providing support for entrepreneurial communities and helping to grow the worldwide entrepreneurial ecosystem.

In this spirit, the project responds to a number of SDGs as it builds resilient infrastructure, ensures sustainable consumption and production patterns, promotes sustainable industrialization as well as

economic growth and employment, and revitalizes the global partnership for sustainable development (**SDGs 7, 8, 9, 11, 12** and **17**).

A number of projects from **Malaysia** offer new ICTs for specific categories of people.

In **Malaysia**, the LEAD Institute created the MyCommunity Heroes project, which is an educational and action-packed social entrepreneurship programme targeted towards the Malaysian Communications and Multimedia Commission's Smart Community districts, which include Putrajaya, Langkawi, Kota Belud, Lundu and Kemaman. The programme aims to equip the students with fundamental skills of social entrepreneurship, where they will identify social problems they want to address in their communities and develop a social enterprise to solve the issue. Updates and awareness will be spread through social media platforms to reach out to the public on the ongoing social projects. Through connecting the community and public with the power of the Internet, the outreach will expand, thus

reducing a great amount of social issues in the community, relevant to **SDGs 1, 3, 4, 8** and **16**, ensuring equitable education and promoting lifelong learning opportunities for all.

Also in **Malaysia**, the Communications and Multimedia Commission – in conjunction with the Ministry of Education, Ministry of Health, Royal Malaysian Police, POS Malaysia (postal agency), 1Malaysia Internet Centres, MyClear, institutes of higher education, National Information Society Agency, Republic of Korea and ITU – developed the programme Malaysia ICT Volunteer (MIV). ICT continues to evolve around the world and Malaysians should not get left behind in this race. With that in mind, the Malaysian Communications and Multimedia Commission has developed the MIV programme to encourage digital- and media-literate citizens to participate effectively, ethically and responsibly, and spur demand for communications and multimedia services. MIV is designed as an empowerment platform to enhance and sustain digital literacy development among Malaysians, relevant to **SDGs 1, 3, 4, 5, 8** and **10.** In addition to promoting digital inclusiveness, MIV has also produced digital leaders within local communities who are capable of developing and creating ICT applications, services and contents appropriate for the user groups in those communities. With the motto "Learn, Enjoy, Serve, Respect", it is hoped that, through the MIV Programme, digital and media literacy will be adopted nationwide.

The *Jayonik RapidBus Simulator System (JRSS)* is a bus training simulator developed by Jayonik and RapidBus with the aim of training highly skilled bus captains for its driver training programme, which teaches bus drivers how to take care of passengers with disabilities and react to "injected" situations that cannot be simulated in the real world. In its memory are 700 km of virtual Kuala Lumpur and Penang city routes, on which real-life training would be hugely costly. The simulator auto-generates a graph of the driver's behaviour so that it can be evaluated with respect to eco-driving, thereby enhancing driver quality and hence ensuring a good service to the public, while at the same time promoting energy conservation.

These goals match with **SDGs 3, 4, 5, 8, 11** and **17** by ensuring healthy lives, quality education, the promotion of inclusive and sustainable economic growth, etc.

The Multimedia University initiated the *Converged Telecommunications Policy and Regulations (CTPR) Master Class* that is designed to offer mid- to senior-level executives in national regulatory agencies, relevant government ministries, telecommunication service providers, broadcasters, and equipment manufacturers/vendors in the Asia Pacific Region a holistic and up-to-date world view on all matters related to the converged telecommunications space. The *CTPR Master Class* achieves:

- exposure to latest global thinking on converged policy and regulatory matters and the way forward in support of capacity building
- a better understanding of related global laws and regulations

- a Holistic understanding of key issues to enable participants to engage in multi-stakeholder and multi-disciplinary discourse, policy-shaping and decision making in the telecommunications space.

In this way, the CTPR Master Class encompasses learning and educational issues (**SDG 4**).

In Malaysia, the *Converged Telecommunications Policy and Regulations (CTPR) Master Class* is designed to offer mid- to senior-level executives in national regulatory agencies, relevant government ministries, telecommunication service providers, broadcasters and equipment manufacturers/vendors in the Asia-Pacific region a holistic and up-to- date world view on all matters related to the converged telecommunication space, giving them exposure to the latest global thinking on converged policy and regulatory matters and the way for-ward in support of capacity building; a better grasp of related global laws and regulations; and a holistic understanding of key issues to enable participants to engage in multistakeholder and multidisciplinary discourse, policy-shaping and decision-making in the telecommunication arena.

In this way, the CTPR Master Class encompasses learning and educational issues (**SDG 4**). It is carried out by the Multimedia University (MMU) in partnership with the GSM Association (GSMA) and the Malaysian Communications and Multimedia Commission (MCMC).

In **Pakistan**, the Ignite-National Technology Fund – in partnership with HEC/members of national curriculum review committees/universities, provincial educational secretariats, and education experts in the ICT industry and industry associations (Pasha, Open, TIE, etc.) – have developed the Digital Skills Training Programme. Ignite (formerly National ICT R&D Fund Company), under the ambit of Ministry of IT and Telecom, has launched a digital skills (DigiSkills) training programme for 1 million participants. The programme is focused on the youth and those eager to learn marketable skills in freelancing and entrepreneurship using the Internet. On directions of the Board of Directors of Ignite, two requests for proposal have been rolled out in connection with soliciting proposals for outreach services of the DigiSkills training programme, to provide monitoring and evaluation services for the programme. Several proposals have been received and are being evaluated. The start and end dates of the project are tentative, and exact dates are based on the directions of the Federal Government. This programme aligns with **SDG 4**.

In the **Philippines**, the Department of Information and Communications Technology has developed the Rural Impact Sourcing Technical Training Project, which aims to reduce the unemployment rate in the Philippines by creating meaningful ICT-enabled jobs in socio-economically disadvantaged areas. The training's mission focuses on empowering local talent with ICT-based knowledge and skills that will enable them to become digital workers and entrepreneurs, in line with **SDGs 1, 4, 5, 8, 10** and **11.**

Also in the **Philippines**, *Free Basic Digital Literacy Training (FBDLT)* is a training activity conducted free of charge by the Malvar Community eCenter (CeC). Four stationary CeCs and one mobile CeC contain 39 desktop and 13 laptop computers. With the goal of making a difference in the lives of constituents,

free training is provided in word processing, spreadsheets, multimedia, Internet browsing, use of social media and e-mail. The clients of *FBDLT* are housewives, retirees, senior citizens, young people not attending school, children with special needs, volunteers, municipal and barangay officials and employees, tricycle drivers, elementary and secondary school pupils and students.

The initiative fulfils such SDGs as fighting against poverty, achievement of gender equality and promotion of sustainable economic growth of the country (**SDGs 1, 5** and **8**).

In the **Solomon Islands**, the Ministry of Education and Human Resources Development (MEHRD) has created the *ICT4BE – Kiokit* trial project in the Solomon Islands, in partnership with Solomon Islands National University, Solomon Islands Government Information Communication Technology, and schools along with their teachers, students and parents. ICT4BE is a MEHRD project funded by the Asian Development Bank. One of its objectives is to trial the KioKit in selected schools in the country. Five schools were identified and selected from Malaita Province (Gwounaoa Community High School and Kilusakwalo Community High School), Guadalcanal Province (Nguvia Community High School and Tamboko Community High School) and Central Islands Province (Kalaka Community High School). Training on the use of KioKit was dispensed at MEHRD headquarters and in the schools. All these schools are currently using the KioKit. Monitoring of implementation was conducted mainly by the ICT4BE team (external), and some positive impacts have been reported in the schools in terms of teaching and learning of students. The project aligns with **SDGs 4** and **5**.

In **Thailand**, the Christian Foundation for the Blind under the Royal Patronage of H.M. the King, aided by the Lipoid Stiftung Foundation from Germany, developed the Project on Barrier Reduction through ICT for Equal Access to Technology: Online Radio Broadcasting Training Programme for People with Visual Impairment. This is one of the projects of the Information and Technology Service Centre for the Blind. Its goal is to provide information in installation and usage of online radio systems to the visually impaired people and promote the knowledge of radio programming as an opportunity for the visually impaired persons to be radio announcers or radio broadcasting operators. The training

includes the installation, configuration and navigation of different radio broadcasting programmes such as SENTOVA CAST, ALTO DJ System and STREAM. The training concentrated not only on the technology but also the etiquette and proper practices to be observed by radio programmers. It was a training backed up with values. The training was attended by 45 visually impaired people nationwide. The lecturers of the training were also visually impaired. It is a technical training for the visually impaired run by their fellow visually impaired. This project is relevant to **SDG 4**.

Also in **Thailand**, the Department of International Trade Promotion (DITP) launched the *Smart Online SMEs (S.O.S.)* programme, operated by Thaitrade.com, in an effort to reduce the gap between the country's rich and poor. Following the realization that the provision of an e-marketplace, Thaitrade.com, did not fully address the problem due to a lack of understanding of the importance of online trading and of the ability to use the corresponding online tools, a series of knowledge-sharing sessions and inspiration-building campaigns were conducted in five provinces. During the period 2010–2015, the programme was delivered to over 4 000 people, of whom some 2 700 from rural areas.

The programme ties in with numerous SDGs by addressing poverty issues, educational and economic growth, inequality within the country, etc. (**SDGs 1, 4, 8, 9, 10** and **17**).

C5. Building confidence and security in the use of ICTs

In **Bangladesh**, the Computer Council launched the project Development of Information Security Policies, Standards, and National Computer Incident Response Team (CIRT) implementation. The Bangladesh e-Gov CIRT mission is to support government efforts to develop and amplify ICT programmes by establishing incident management capabilities within Bangladesh, which will make these programmes more efficient and reliable.

Main objectives of the project include:

- managing cybersecurity in the e-Government network and related infrastructure of the Government of Bangladesh;
- serving as a catalyst in organizing national cybersecurity resilience initiatives (education, workforce competence, regulation, cyberexercises) among various stakeholders;
- making efforts to establish national cybersecurity incident management capabilities in Bangladesh.

To achieve this goal, Bangladesh e-Gov CIRT, during the first stage of its development, will:

- monitor the network for the events that affect security of the government network;
- carry out investigations and containment measures for cybersecurity events in order to minimize data loss or service disruption in the government network and e-services;
- help to solve security-related issues in the National Data Centre, including provision of obligatory instructions for BCC personnel to secure National Data Centre information resources;
- carry out preventive measures in order to minimize disruptions of secure operations of the government network and e-services;
- participate in international and national cybersecurity initiatives;
- promote and strengthen the cybersecurity environment by developing, collaborating and maintaining relationships with other CIRTs and organizations in the country and abroad;
- support capacity building of the existing manpower of BCC to establish national CIRT.

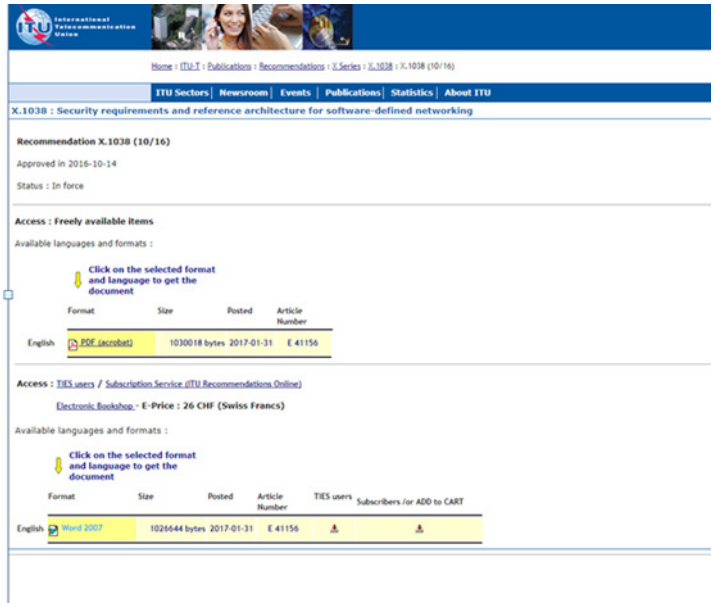
This programme is supporting the advancement of **SDGs 3, 5, 8, 9, 11** and **16**.

In **Brunei Darussalam**, the Cybersecurity Awareness Programme was organized to create awareness among citizens on the importance of practicing safety, security and good ethics when surfing the Internet and doing activities online such as social networking, information retrieval, e-commerce, and connecting with family and friends. The programme included:

- Cybersecurity Awareness Seminars – a series of talks delivered to schools targeting students, teachers and parents, covering various topics that highlight the importance of practicing safety, security and good ethics while engaging in online activities;
- Cyber Security Awareness events – various talks, games competitions and activities, aimed at all age groups, to highlight the significance of cybersecurity and that everyone must play their part;
- the development of a Child Online Protection Framework to address key policies and strategies for children's online safety;
- IC Citizen Certification and Training Programme to promote appropriate use of technology, in response to the growing need to raise a generation of responsible netizens;
- the development of a Social Media Learning Package for schools and educational institutions.

To date, the cybersecurity awareness programme has successfully reached more than 6 000 secondary school students, 2 000 primary school pupils, 1 000 teachers, 600 parents and 700 youths. This programme is in line with **SDG 16**.

In **China**, the Mobile Communications Corporation launched a scheme for protection from harassment or fraud calls. With the rapid development of the information society and telecommunication technology, more criminal activities are taking place in the global network, represented by communication information fraud, which has caused serious problems worldwide. This can especially affect the elderly, who are unfamiliar with information technology, and are thus more susceptible to attacks, which is not conducive to the achievement of the Sustainable Development Goals. Through this project, more than 5.9 billion fraud calls were intercepted before reaching their targets, 96 million people received fraud call reminder alerts, and 270 000 users were effectively protected from DDOS calling. This project creates a safe and reliable national and social environment, and a clear cyberspace, which can provide protection for users' property and life, enhance public trust in the information society, and continuously promote sustainable production and consumption patterns. In order to effectively protect the legitimate rights and interests of telecom users, and cut off the fraud channels, China Mobile has taken advantage of its operators, and carried out a series of practices including fraud calls governance, defrauding call number prompt, DDoS calling emergency prevention and so on. The achievements of this project have provided practical experience for the entire telecommunication industry, and some of the achievements have been published by ITU-T and other international organizations, which can



be promoted to all entities from communication and information fields to enhance public trust in the global telecommunication industry, and to promote the sustainable development and consumption of information society. This project serves **SDGs 12** and **16**.

Also in **China**, the Nokia Shanghai Bell Co., Ltd., in partnership with ZTE Corporation and China Unicom, developed the programme ITU-T X.1038 – Security requirements and reference architecture for software-defined networking (X.sdnsec-2). New technologies such as Cloud, Software Defined Networking (SDN), Network Function Virtualization and Big Data are enabling business transformation including automatic, rapid and autonomous services/applications deployment and operation. Correspondingly, security services will also evolve to become highly flexible, dynamic and adaptive. Recommendation ITU-T X.1038, mainly focusing on SDN security, is to identify new security threats as well as traditional network security threats to SDN; define security requirements; provide possible security countermeasures against new security threats; and design a security reference architecture for SDN, which can guide the developer to design an SDN security functional architecture to support offering customized, flexible, dynamic and adaptive security protection for diversity services/applications, such as Smart City, health care, energy/utilities, contributing to the advancement of **SDGs 9, 11** and **17**. Recommendation ITU-T X.1038 is published internationally and can be implemented in global ICT products by the developers in order to provide customized security protection for diversity services/applications deployed in any country.

In **China**, China Mobile Communications Corporation is enhancing the ability of information security to effectively protect the *rights and interests of telecommunication network users*, in accordance with **SDG 12**. With the development of ICT technology, users enjoy convenience while also facing more

information security risks. In order to protect information security, China Mobile has introduced a wide range of practices in customer information protection, phone fraud prevention, mobile malware control, pseudo base station governance, etc. These efforts effectively reduce the chance of users being defrauded, protect their legitimate rights and interests, and enhance user confidence in ICTs and their sense of well-being. These practices are replicable around the world to enhance information security capabilities and protect all ICT users.

China has established the *12321 Unsolicited Electronic Messages Complaint and Reporting Centre*. With the development of the Internet, messaging abuse such as e-mail Spam, SMS Spam and harassing calls has raised concerns and has even caused property loss on the part of users. On 28 April, 2008, com-missioned by the Ministry of Industry and Information Technology of China, the Internet Society of China (ISC) set up the 12321 Reporting Centre to receive public reports and complaints on unsolicited messaging. The centre supports **SDG 12**.

With the aim of making all non-governmental organizations (NGOs) digitally literate, the Digital Empowerment Foundation (DEF), in **India**, embarked upon the *eNGO Program* to help grass-roots NGOs, which dedicate themselves to improving our world, through the Internet. In 2011, DEF, in collaboration with the Public Interest Registry (PIR), the non-profit organization responsible for global management of the ".org" top-level domain, launched the PIReNGO programme (pirengo.org) as a flagship initiative to create a network of legally validated online NGOs/CSOs (civil society organizations) with IT training and capacities in India, South Asia and Africa. As at November 2015, this initiative has reached out to 6 000 NGOs/CSOs in India and South Asia. For the next phase of development under the eNGO Program, DEF has undertaken, together with PIR, to bring all the not-for-profit organizations across India and South Asia under the new top-level domain ".ngo" – which is specifically intended for genuine, validated NGOs – in the interests of fostering transparency and governance in the social sector.

With its focus on international implementation, the project meets **SDGs 1, 4, 8, 9, 11, 16** and **17** as it addresses such issues as quality education, economic growth, safety of cities and global partnership.

With respect to the interests of cybersecurity and cyber resilience, in 2014 the Government of **Indonesia** established the *Desk Ketahanan dan Keamanan Informasi Cyber Nasional (DK2ICN) (National Desk on Cyber Resilience and Information Security)* project, which includes the representation of ICT multistakeholders. Among other duties, DK2ICN was mandated to effect coordination, collaboration, synchronization, harmonization and control cooperation between institutions of all stakeholders, including government, academia, civil society and business and industry at national, regional and global level. DK2ICN will shortly become the Indonesia National Cyber Agency.

The project contains resources for the implementation of certain SDGs, namely **SDGs 3, 8, 16** and **17,** promoting well-being for all and sustainable economic growth, and building inclusive institutions at all levels and global partnership for sustainable development.

In **Japan**, the National Incident Readiness and Cybersecurity Strategy Centre (NISC) has developed the new *National Cybersecurity Organizational Framework*. Pursuant to the Basic Act on Cybersecurity, a Cybersecurity Strategic Headquarters was established under the Cabinet for the purpose of formulating the cybersecurity strategy, assessing cybersecurity measures by government, assessing serious cyberincidents in government and coordinating overall governmental cybersecurity policies. NISC is the leading governmental organization for cybersecurity issues. The Act has strengthened NISC's functions, which include (1) Government Security Operation Coordination team (GSOC); (2) investigations into causes of serious cyberincidents in government; (3) audit and consultation to government for cybersecurity; (4) programme planning and overall coordination for cybersecurity. These developments are in line with **SDG 9**.

In **Malaysia**, the CyberSecurity Organization – together with the Organization of the Islamic Cooperation Computer Emergency Response Team; the Ministry of Science, Technology and Innovation, Malaysia; the National Cyber Security Agency; the Ministry of Human Resources, Malaysia; the Malaysian Administrative Modernization and Management Planning Unit; the Malaysian Communications and Multimedia Commission; and the Technical University of Malaysia Malacca – developed the Global Accredited Cybersecurity Education Scheme: Building Cybersecurity Professionals Through Fostering International Collaboration. This project aims to enhance the skill sets of cybersecurity professionals and accelerate societal awareness. It has been developed via strategic collaborations with the Government, academia and industries, congruent with local and regional requirements. It embeds universal values, features rules-based, open and non-discriminatory practices, and aspires to make affordable and effective training by providing the peer-reviewed curriculum. The Scheme encourages participation from other countries, permitting technology transfer among developed and developing nations, and fostering greater community involvement across geographical boundaries. Thus, the programme aids the advancement of **SDGs 4, 8, 16** and **17**.

Threats grow with the rapid expansion of data-driven technologies such as the convergence of web, cloud, mobile and the Internet of Things (IoT). As these technologies expand in use, so do the risks, making cyber risk management imperative to organizations today. Protecting against targeted threats without disrupting business innovation and growth is an increasingly critical business, economic and social imperative. The environment of uncertainty, along with the possibility of potential threats, hinders ecosystem players from pursuing cyber-related initiatives, thus restricting economic development.

CyberSecurity **Malaysia** realizes the need for competent cybersecurity personnel by establishing a holistic framework of cybersecurity professionals. The Global Accredited Cybersecurity Education Scheme was initiated in 2016 through strategic collaborations with the Government, academia and industries.

The Scheme is aimed at enhancing the skill sets of the cybersecurity workforce, congruent with local and regional requirements, while ensuring a consistent and high-quality service level from certified personnel. It is the foundation to:

- ensuring workforce capabilities, ethical conduct, trustworthiness and responsibilities;
- securing and validating core skills, knowledge, attitudes and experience.

Also in **Malaysia**, Lee Hwee Hsiung has initiated the *Global Accredited Cybersecurity Education Scheme* (ACE). Needs and demand for human capital are more pressing than ever before, while the environment of uncertainty along with the spectre of potential threats hinder the efforts of players in the ecosystem to pursue cyber-related initiatives, thus restricting economic development. CyberSecurity Malaysia (CSM) is addressing this issue by establishing a holistic framework of professional cybersecurity certification. The ACE scheme was initiated in 2016 through strategic collaborations with the government, academia and industries. The scheme is aimed at enhancing the skill-sets of cybersecurity professionals congruent with local and regional requirements while ensuring a consistent and high-quality service level from accredited personnel.

It is being carried out in partnership with the Computer Emergency Response Team of the Organization of the Islamic Cooperation (OIC-CERT); Ministry of Science, Technology and Innovation (MOSTI), Malaysia; National Security Council, Malaysia; Ministry of Human Resources, Malaysia; Malaysian Administrative Modernization and Management Planning Unit (MAMPU); Malaysian Communications and Multimedia Commission (MCMC); Technical University of Malaysia Malacca (UTeM); International Islamic University Malaysia (IIUM); National ICT Association of Malaysia (PIKOM); Council of Trust for the People (MARA), Malaysia; Cybersecurity Malaysia (CSM), and supports **SDGs 4** and **17**.

Malaysia has launched the *National ICT Security Discourse (NICTSeD): A CyberSAFE Awareness Challenge for Students*. The dis-course forms part of the CyberSAFE (Cyber Security Awareness for Everyone) initia-tives, a dedicated programme developed to raise awareness on the importance of cybersafety and personal information se-curity in Malaysia. CyberSAFE encourages Internet users to be more responsible and safe in using the Internet and other on-line applications. CyberSecurity Malaysia organized the first National ICT Security Discourse in secondary schools throughout Malaysia in 2013. The first discourse encouraged open and constructive conversation on cybersafety and security issues, as well as the development of a fresh perspective on the key issues in the area of cybersafety and security. The project is carried out in partnership with the Ministry of Education of Malaysia and DiGi, and serves **SDGs 9**, **11**, **16** and **17**.

In **Myanmar**, the Myanmar ICT for Development Organization has launched the *SOS - Safe Online Space* programme. This is an initiative run by a local civil society organization to promote peace and tolerance online (**SDG 16**). It is composed of three segments: 1) Training in digital literacy/informa-tion literacy and building an online peace mobilization system; 2) Monitoring and combating online hatespeech; 3) Supporting media and civil society organizations with data and a network for rapid response.

In **Pakistan**, the COMSATS Institute of Information Technology has created the *Smart Surveillance System*. Smart Surveillance is a new and intelligent wireless multi-option security system. It is low-cost and flexible. The system uses an embedded micro-web server, with IP connectivity for accessing and controlling devices, as well as keeping premises secured using an Android-based application. It is basically a remote-controlled monitoring and operating system which will make you the king of your own place. This system intends to control electrical appliances with a user-friendly interface and easy installation. It will not only make your life safe, but also keep you updated with the current situation of your house, including the medical condition of any patient at home/anywhere in the world, so that you can do what you feel is right for you're the safety of your family and property. The project is of relevance to **SDGs 3**, **4**, **5**, **8**, **9**, **11** and **13**.

C6. Enabling environment

Digital **Bangladesh** is a long-term vision of human development through leveraging the flexibility and ubiquity of ICTs. With a whole-of-government approach, a2i (Access to Information) – the facilitator of this innovative agenda from the Prime Minister's Office – has mobilized the entire government machinery through:

Access to Information (Digital Bangladesh)

a2i

জনগণের দোরগোড়ায় সেবা
Service @ Doorsteps

- service process simplification (SPS) and the Services Portal – tool
- a systematic capacity development approach – capacity

- annual performance agreements (APAs) – policy support.

This combination has created an enabling environment to empower civil servants at all tiers of government to improve the quality of services by reducing service delivery inefficiencies. The project also aims to increase transparency, efficiency and responsiveness, while addressing the empowerment of women, inequality and global partnership (**SDGs 1, 5, 10, 16** and **17**).

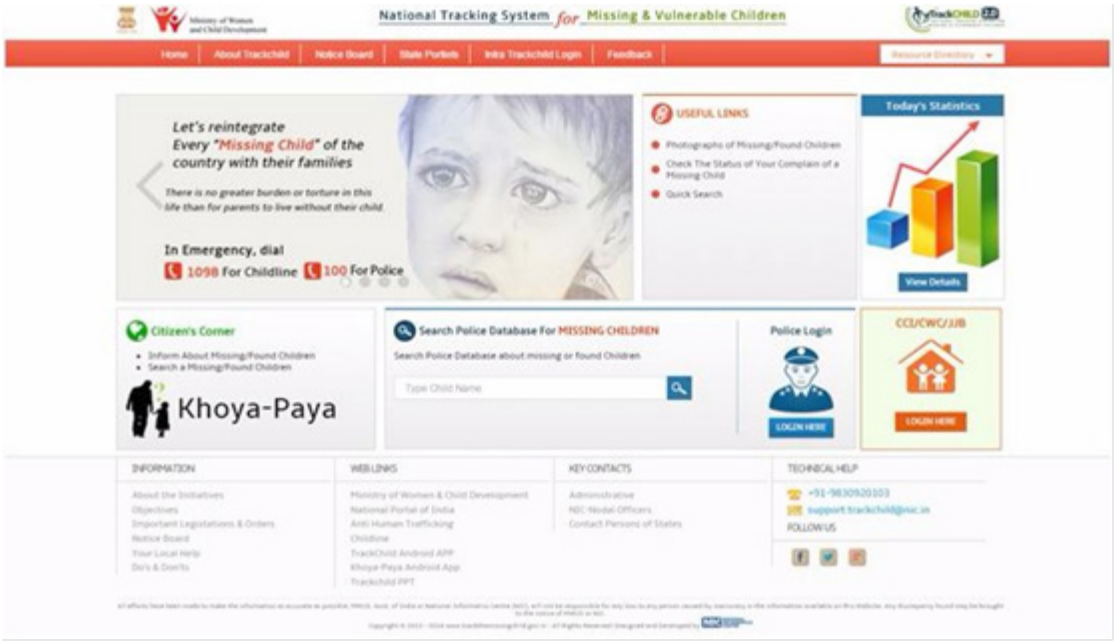
In **Hong Kong, China**, the Hong Kong Federation of E-Commerce has launched the *Hong Kong Trust Mark*, in partnership with the "Belt and Road" E-commerce Strategic Alliance, includ-ing: China Guangdong Electronic Commerce Association (GDECA); Russian Association of Internet Trade Companies (AITC); Ecommerce Foundation by Ecommerce Europe; Thailand eCommerce Association (Thai ECA); Ecommerce Association of India (ECAI); Dubai Chamber of Commerce and Industry (DCCI); Digital Commerce Association of Philippines (DCOM); and World Trust Alliance (WTA).

Hong Kong's retail industry offers a wide variety of International goods and services, and is well known to customers worldwide. The launch of the Hong Kong Trust Mark aims stop people buying from problem online shops, and thereby foster better development of the global e-commerce market. The Hong Kong Federation of E-Commerce (HKFEC) will base itself on the associated Code of Practice to review each application for approval and grant permission to use of the "Hong Kong Trust Mark". Authorized users would then be allowed to post the electronic logo of the "Hong Kong Trust Mark" issued by HKFEC on their website with a link to a given webpage. Online consumers and the general public can click on the "Hong Kong Trust Mark" logo on an approved website to review the detail and status of that particular site. HKFEC will ensure that all members granted the Trust Mark follow the Code of Practice and guarantee never to sell any fake product or publish a misleading service description on their website, thus making it easy for consumers to distinguish between good and honest online merchants and others through the Trust Mark.

The trust mark initiative is consistent with **SDGs 8**, **10**, **11** and **17**.

Elaborated by the Department of Child Development, Women Development & Social Welfare, the *Trackchild 2.0* project is the National Tracking System for Missing and Vulnerable Children in **India**. It provides an integrated virtual space for 17 100 police stations, 5 500 child care institutions, citizens and various national law enforcement and ICPS (Integrated Child Protection Scheme) bodies. It also provides a networking system among all the stakeholders and citizens to facilitate tracking of a child in distress. The portal maintains a nationwide database of missing and found children who are covered by various services under the ICPS and Juvenile Justice (Care & Protection of Children) Act. The portal facilitates data entry and the matching of missing and found children, and also enables the progress of children who are beneficiaries of the ICPS Scheme to be followed up. The software provides facilities for the mapping of vulnerable locations, i.e. those which have a large number of children reported missing, so that corrective action can be taken in those areas.

The project accords with **SDGs 3, 4, 5, 11** and **16** dealing with the establishment of healthy lives, quality education and the strengthening child protection and promotion of peaceful societies.



In **Indonesia**, the goal of the *i-CAKAP* programme, launched by the Ministry of Communication and Information Technology, is to raise the awareness and build the capacity of communities with respect to the use of ICTs in a smart, creative and productive way for a sovereign Indonesia. The programme seeks to help those using the Internet to do so effectively and wisely and to teach them how to develop innovative products/services that are beneficial both to themselves and to other people, thereby improving their livelihoods. It consists of the following activities:

- Initial Initiative (2010). i-CAKAP was initiated through the Gema Insani Declaration in 2010, when 21 institutions – ministries, local government entities, religious organizations, Internet provider associations, teacher associations, schools and universities – declared their commitment to safe and secure use of the Internet to create a knowledge-based community in Indonesia.
- Raising Awareness (2011-present).The Declaration was then followed up by various social actions aimed at making the community aware of the need to use the Internet in a safe and secure way.
- Building Capacity (2011-present). The social actions also covered topics for enhancing the community's ICT skills, such as blog creation, e-commerce, etc.

In 2015, there are 21 social actions and training-of-trainers events being conducted in 18 areas within Indonesia. There are 2 966 people, mostly students in junior and high school, gaining knowledge and skills in the use of ICTs in everyday life. Aside from the social actions and training of trainers, the Ministry conducted a competition in 2013 and 2015 to search for talented high school students to serve as role models in the use of ICTs in smart, creative and productive ways.

The project perfectly reflects **SDGs 4, 5, 10** and **16** as it addresses equitable quality education, gender equality and peaceful and inclusive societies.

In **Indonesia**, the Centre for Innovation Policy and Governance (CIPG) has initiated the project *From Smart City to Open City: The case of Jakarta Smart City*, carried out in collaboration with Open Data Labs Jakarta and funded by the Web Foundation. The project highlights issues related to open data and public participation, using Jakarta Smart City as a case study. The research suggests that al-though the smart city programme has succeeded in providing public reporting tools, it has yet to attain the notion of open city. The project relates to **SDGs 11** and **16**.

The **Islamic Republic of Iran**'s ICT Research Institute launched the programme eService Technology Road Map. In this project – a technology road map for rural and least developed areas in the Islamic Republic of Iran – eServices have been identified in different categories of agriculture, education, health, finance and banking, tourism, public facilities, employment and entrepreneurship, registration, environment, and police and judiciary, and efforts have been made to identify current and desired services for each category through interaction with stakeholders and authorities (**SDGs 1, 3, 4, 5, 7** and **10**). Writing the document of the technology road map for rural and least developed areas in the Islamic Republic of Iran was started in the second half of 2015. In the first part of this project, which came to an end in the first half of 2016, the technology road map was developed in collaboration with more than 25 authorities and then introduced through the unveiling ceremony. Currently, while the road map was undergoing its annual review in the first half of 2017, the pilot projects extracted from the document are being followed up.

C7. ICT Applications

E-government

In **Bangladesh**, the Computer Council established the National Enterprise Architecture Project. The Bangladesh Computer Council is one of the apex bodies of the Government of Bangladesh that has been instrumental in carving the path for the development of e-Governance in Bangladesh over the last two decades. At present, the Council is in the process of ensuring the success of eGovernance in Bangladesh through the establishment of the National Enterprise Architecture and the e-Government Interoperability Framework (e-GIF). This architecture and e-GIF would be the foundation for successful ICT implementation of e-services in the Government. To realize the vision and mission of the Government of establishing "Digital Bangladesh" by the year 2021 through building efficient, transparent and citizen-centric government services, termed as "e-services" through ICT, defining the National Enterprise Architecture and e-GIF for Bangladesh has been one of the key priority projects undertaken (**SDGs 8, 9** and **16**). The objective of this project is to assist the Government of Bangladesh through the Bangladesh Computer Council to design, develop, deploy and use the National Enterprise Architecture and e-GIF to develop strategies, processes, plans, structures, technologies and systems across the Government, thereby developing an environment that enables the government agencies to achieve their key objectives and outcomes through increased interoperability, better asset management, reduced risk and lower procurement costs.

The Bangladesh Computer Council also designed the project Bangladesh e-Government ERP. Objectives of this project are:

- to start a pilot project for establishing a transparent and accountable e-Government system across the whole of the Government of Bangladesh;
- to create an ERP solution using the appropriate available platform for e-Government and using local resources that can be replicated to the whole of the Bangladesh Government offices;
- to develop the skill of the local ICT industry by implementing the e-Government system;
- the establishment of Bangladesh's e-Government ERP, taking into account the whole of government solution approach will ensure utilization of the already established infrastructure for e-government. Furthermore, with a much customized "Bangladesh e-Government ERP" developed from the proven robust Open Source license-free ERP solutions, the Bangladesh Government will create a unique brand for "Digital Bangladesh".

The local software industry will have the unique opportunity to learn to develop from the existing robust Open Source ERP solutions and do deep customizations for the specific needs of the Bangladesh Government. A large number of IT/IT-enabled services companies will have the opportunity to work in various segments of this whole of the government ERP solutions value chain, spanning all the government organizations of Bangladesh. This experience will also help the companies to survive and compete in the global market. This project promotes the advancement of **SDGs 1, 5, 8, 9, 10, 13, 16** and **17**.

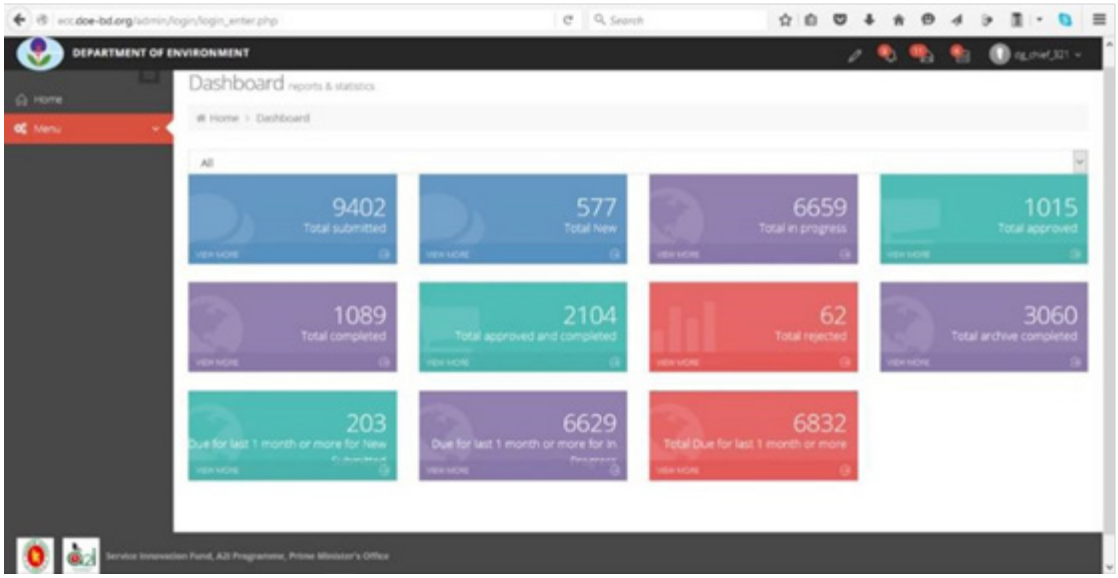
Also in **Bangladesh**, the National Police Headquarters, together with the Ministry of Home Affairs, initiated the programme Police Clearance Certificate Management System. The traditional process of receiving a police clearance certificate was not only very time consuming, but also left scope for corruption and speed money. Moreover, the certificate-issuing authority had a very archaic system of tracking applications and confirming acceptance. Service Innovation Fund of a2i has supported the Bangladesh Police, the chief authority providing this service, to develop an application collection-processing-distribution system for police clearance certificate in a single unified architecture, allowing citizens to access the service anytime-anywhere-online. The simplification and automation of the service process has substantially reduced the scope for corruption and bribery (**SDGs 9** and **16**) and helped transform the service provider into an effective, accountable and transparent institution at all levels.

Subsequently in **Bangladesh,** the Amar Member of Parliament (MP) Social Voluntary Organization launched the project Open Parliament through Digital Engagement. This project directly contributes towards achieving the SDG Targets 16.6: Develop effective, accountable and transparent institutions at all levels; and 16.7: Ensure responsive, inclusive, participatory and representative decision-making at all levels. There will be approximately 20 million new voters by 2018 in Bangladesh and they would be very active on social media. In 2015, In Bangladesh, 95 per cent of the MPs were not using ICT tools to communicate with citizens. Also, MPs were not reachable via the official contacts provided on the Bangladesh Parliament website. Only 15 MPs maintained their personal websites; none of the senior ministers had any social media presence.

This situation developed the obvious communication gap between citizens and MPs in Bangladesh. This is the time when the Amar MP team decided to develop an online platform to connect MPs and citizens directly. Now, more than 150 MPs (45 per cent), 6 000 volunteers, 160 ambassadors and 100 000 users are connected to the amarmp.com platform. Citizens can put any questions to MPs and get responses from them on a regular basis. These MPs have responded to almost 700 questions so far. More than 150 000 youths have benefitted directly and almost 750 000 citizens have benefitted indirectly from the amarMP.com initiative. This ICT tool plays a major role in promoting accountability and transparency, and interaction between the MPs and voters. Thus, this project contributes in achieving SDG targets16.6 and 16.7.

Also in **Bangladesh**, the Department of Environment (DoE) developed the *Web-based Environmental Clearance Certificate (ECC) Application System* project. As the single most important agency mandated to preserve and protect the environment, DoE had to handle the reluctance of businesses to apply for

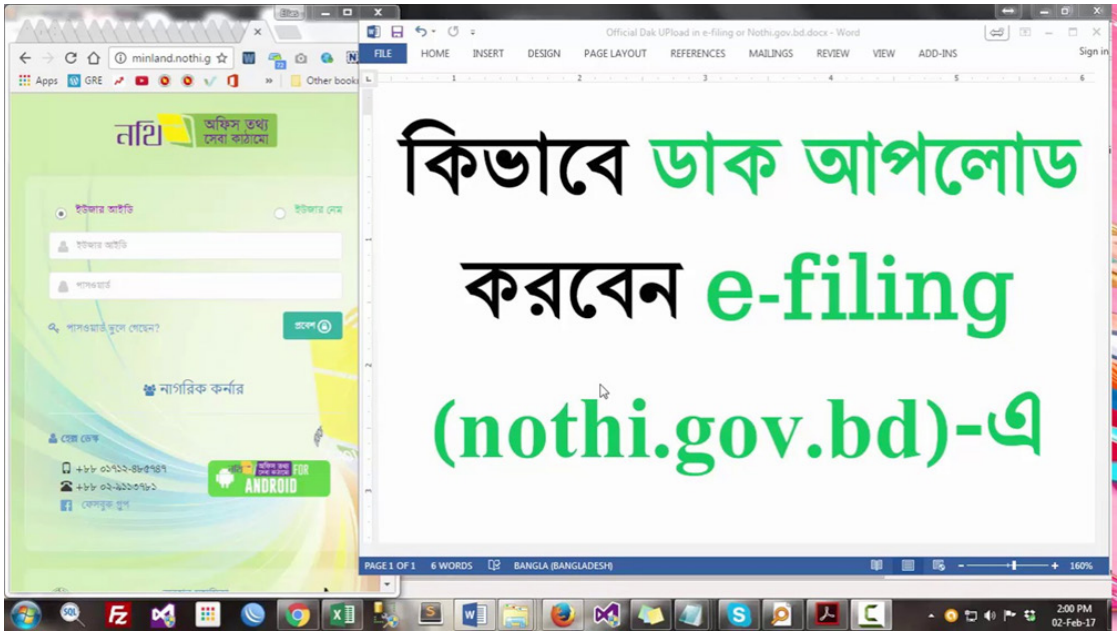
the ECC on account of the cumbersome and time-consuming application process. By developing an innovation supported by the Service Innovation Fund (SIF), it has re-engineered this project, making it more transparent, accessible, accountable and user-friendly, resulting in a 200 per cent jump in applications and a 20/57/33 per cent decrease in time/cost/visits, respectively, within seven months of its launch, doubling the corresponding revenue and demonstrating visible progress on **SDGs 9** and **13** – building of resilient infrastructure, promotion of sustainable industrialization and combating climate change and its impacts.



Also in **Bangladesh**, the Access to Information (a2i) programme has set up *Nothi: the Paperless Office*. In government offices of Bangladesh, paper-based file management and archiving follow an outdated method, which is stigmatized as lacking transparency and accountability, being slothful and providing an inadequate communication channel for citizens. Acting from the Prime Minister's Office and supported by the Cabinet Division – the apex of the bureaucracy – a2i has developed a robust e-file system, called "Nothi" (www.nothi.gov.bd), that allows quick decision-making and service delivery. Since the roll-out of the system, which now covers more than 5 000 offices from sub-district to ministry level, there has been a significant improvement in the level of transparency and convenience for citizens in offices that have implemented the system. By strengthening government institutions, Nothi contributes to attaining **SDG 16**.

Again, in **Bangladesh**, the Access to Information (a2i) programme, under the Prime Minister's Office, has developed the *Web-based Environmental Clearance Certificate* (ECC) application system for the Department of Environment (DoE), in partnership with that department under the Ministry of Environment and Forests.

DoE, which is the single most important agency mandated to preserve and protect the environment, faces the challenge of reluctance on the part of businesses to apply for environmental clearance certificates (ECC) due to the cumbersome and time-consuming application process. By developing an innovation supported by the Service Innovation Fund (SIF), it has re-engineered the ECC application system to make it more transparent, accessible, accountable and user-friendly, resulting in 200 per cent increase in applications and a 20, 57 and 33% decrease in time, cost and visits, respectively, within seven months of its launch, doubling its revenue and demonstrating visible progress on **SDGs 9** and **13**.



In **Bhutan**, the Ministry of Information and Communications created the *Community Centre (Empowering Rural Communities - Reaching the Unreached)* project, which is a single window where all citizens can access numerous government and business services. It is also the point where all these services converge. Content providers can link up with service provider agencies, be they government or private, and share the community centre platform for delivering services under a revenue-sharing agreement. It is the front-end point for government, business and social-sector entities to deliver their services to the citizens of Bhutan. The main objectives of the project are to reduce poverty, empower communities and improve the quality of life and education in rural and remote areas of Bhutan by facilitating access to ICTs, media, postal, banking and other services (**SDGs 1, 4, 8** and **10**).

In **China**, the China Mobile Online Service Co. Ltd. – in partnership with the Government of Hunan Province, Government of Puyang City, Government of Chuzhou City, Government of Linfen City, Government of Guian District, Chnia Mobile Quantong System Integration Co. Ltd. and Youcheng China Social Entrepreneur Foundation – launched the programme Targeted Poverty Alleviation System (TPAS). With this project is implement the "Internet plus targeted poverty alleviation policy" model, and tools to help the Government manage the poverty alleviation programme more efficiently and transparently are offered (**SDGs 1, 2, 3, 4, 6, 9, 10, 11** and **16**). After a year's hard work, TPAS has already been deployed and is used in six provinces nationwide, comprehensively covering 6.7 million

poor people with alleviation staff. Through the system, government staff could use smartphones to collect poor families' information anytime and anywhere, in order to evaluate the condition of families' health status, diet and drinking water conditions, energy adequacy, gender equality and education opportunities. With the targeted evaluation, the Government can help the poor families accurately and effectively. At the same time, information and resources coming from NGOs and Government could be shared among rural poor people smoothly and quickly, so that the poor people can learn about poverty alleviation policies; apply for jobs, social security, health aids, education opportunities and so on; get things done more simply; and find the service more satisfactory. Beyond that, TPAS also offers intelligent and graphical analysis according to the big data collected and updated from poor areas by government staff through the TPAS application on smartphones, to objectively identify poor families concerning their locations, and the reasons for their poverty. The Government will then use this big data analysis in policy-making, project management, funds supervision and public scrutiny, in order to help poor families more efficiently and more transparently.

In **India**, the Ministry of Electronics and IT launched the online portal MyGov. This programme is a crowdsourcing platform of the Government of India, and promotes active citizen participation in India's governance and development. Launched on 26 July 2014 by the Prime Minister Shri Narendra Modi, MyGov facilitates continuous engagement between the Government and citizens. It utilizes multiple media – the MyGov app (tasks and discussions), Swachh Bharat app (sharing of cleanliness activities, taking a pledge and nominating others), SMS-based polls, IVRS-based audio recording and OBD for Prime Minister Shri Narendra Modi's monthly radio address, Mann Ki Baat, to reach the grass-roots level.

At present, MyGov has a registered user base of more than 50 lakh citizens, 64 groups, 1.99 lakh submissions on 699 tasks, 38.50 lakh comments on 752 discussions, 242 polls/surveys, and 166 talks have been registered.

MyGov has achieved successful engagement with the citizens on important policy and governance issues where their ideas are collated for creating national policies, such as:

- education of girls;
- trafficking;
- cleanliness promotion;
- building sustainable and technology-driven cities;
- skills development;
- healthy India;
- union and railway budget;
- net neutrality;
- new education policy;
- Smart City mission and hackathon;
- Mann ki Baat;
- Beti Bachao Beti Padao;
- accessible India;
- goods and services tax;
- Sankalp Se Swachh Siddhi.

MyGov has developed various microsites under its umbrella to emphasize its presence in the Digital India programme and provide platforms for various initiatives such as Start-up India, Blogs, Transforming India and State Instances, etc.

Keeping the above activities in mind, MyGov has played an instrumental role in realizing some of the objectives put forth by the SDGs, such as ensuring healthy lives and promoting well-being for all, inclusive and equitable quality education, gender equality, access to water and sanitation and creating inclusive, safe, resilient and sustainable cities. This project serves the purposes of **SDGs 3, 5, 6** and **11**.

Also in **India**, the Chhattisgarh Infotech Promotion Society with the Department of Electronics and IT, Government of Chhattisgarh, General Administration Department, the Government of Chhattisgarh

and Naya Raipur Development Authority launched a system of Digital Government for automation of document workflows and an electronically-based workflow, filing and tracking all files and documents in government offices. A system of Digital Secretariat is to use e-Governance as the tool to improve accountability, transparency and effectiveness in government administration.

India was ranked 79th among 176 countries in the Corruption Perception Index 2016 released by the Transparency International organization. Some of the issues plaguing current government administration in India are:

- red tape-ism, which involves multiple levels of bureaucratic approvals, which is time-consuming and slows down decision-making;
- theft and missing files, also not uncommon in most government offices;
- important/confidential information often leaked before its official release due to lack of a proper authorization process;
- an average turnaround time for a file of about 20 days, in some case taking a year to clear the file.

Digital Secretariat is designed to address these system issues. By creating digital workflows, it reduces human interventions, resulting in the decimation of the corruption level in government offices.

The system provides automation of document workflows and envisages an electronically-based file movement system for all files and documents in government offices. It also includes a comprehensive knowledge management system that would function as an electronic repository of all important information, such as past decisions, government orders and government Acts, which helps instant references and facilitates quick decision-making. This project contributes to the advancement of **SDGs 8, 9, 10, 12** and **16**.

The **Indian** Backward Classes Welfare Department – together with the National Informatics Centre, Ministry of Electronics and Information Technology – launched the initiative Sabooj Sathi Online. The initiative was conceived with the primary objective of enhancing access to educational services, particularly in rural Bengal. Other important objectives of the schemes are to:

- increase retention in schools;
- encourage students to take up higher studies;
- inculcate a sense of confidence among the girl students by promoting mobility;
- promote environment-friendly and healthy means of transportation.

The scheme's objectives are aligned with four SDGs of the 2030 Agenda for Sustainable Development – **SDGs 3, 4, 5** and **13**. Sabooj Sathi Online is the e-Governance mechanism of the scheme, which ensures end-to-end ICT enabled in management of entire processes, such as capturing of students' records, finalization of bicycle requirements (delivery point wise), supply chain from factory to distribution point, updating distribution records online and proactive disclosure in the public domain.

Also in **India**, the Chhattisgarh Infotech Promotion Society (CHiPS) – together with the DBT Mission, Cabinet Secretariat and the National Payments Corporation of India CSC-SVP – initiated the project Leveraging Technology for Direct Benefit Transfer and Proactive e-Governance. CHiPS is implementing the direct benefit transfer programme across government departments (**SDGs 1, 9, 10, 16** and **17**). The project has already delivered USD 750 million worth of benefits directly to more than 35 million beneficiaries for more than 150 schemes. The DBT cell in CHiPS carries out the following functions:

- issuing directive guidelines and designing standard operating procedures for departments to propel the implementation of the project;
- supporting the departments in government process re-engineering of the schemes for seamless transition to digital identification of beneficiary and digital payment platforms;
- designing a DBT portal to monitor and evaluate the progress of DBT across schemes and departments;
- driving growth and achievement in all the indicators for successful implementation of DBT, such as digitization of data, streamlining beneficiary databases, running de-duplication exercises, etc.;
- assisting in the creation of a beneficiary database, and offering necessary guidance and advice;
- overseeing the implementation of a statewide beneficiary authentication through e-KYC for Aadhaar and other demographic details.

In **India**, the National Informatics Centre (NIC) has launched *MARREG* (Marriage Registration - Registration for Empowerment), in partnership with the Judicial Department and the Government of West Bengal. The Government of West Bengal's MARREG portal is ready for public use. An approach

to implement and establish good governance has propelled this proposed computerization programme by the Judicial Department and the O/o Registrar General of Marriages, with the support of the Government of West Bengal. The portal, designed and developed by NIC, is a huge step forward in the digital world, bringing public services closer to citizens' doorsteps. This is in line with the Government of West Bengal's strategic approach to implement e-governance in this sector in order to enable and support flexible, responsive and innovative public service.

Being a G2C service, the portal seeks the most suitable way to satisfy all stakeholders, keeping uppermost in mind ease of use (user-friendliness). The most critical aspects of a successful e-governance strategy are re-engineering and changing an "as is" mindset so as to build a "to be" process. Such a change, especially as broad-based as in a government-wide initiative, was effected in order to computerize current processes, and procedures were attuned to suit the new environment. This approach should result in improved efficiency and increased productivity. Key features of MARREG, which supports **SDG 5**, include:

- Creating a database of registered marriages
- Allowing citizens to view and benefit from it
- Allowing online printing of certificates (at a later stage)
- Revenue reconciliation
- Shortening the time required to obtain a certificate
- Preventing tampering of records during transit
- Data on volume of marriages registered.

Also in **India**, *Kanyashree Online 3.0* is a multi-user government to citizen (G2C) application that provides comprehensive e-governance of *Kanyashree Prakalpa*, a conditional cash transfer (CCT) scheme implemented by the government of West Bengal. Kanyashree Prakalpa aims to reduce child marriage and increase the educational status of adolescent girls, thus promoting healthy lives, equitable, quality education, gender equality as well as peaceful and inclusive societies (**SDGs 3, 4, 5, 10** and **16**). Kanyashree Online provides end-to-end ICT-enablement to the scheme, serves as a real-time monitoring mechanism for the scheme's MIS, and promotes the scheme's accountability, transparency and efficiency.


Artwork by Debolina Roy, Kanyashree recipient from Paschim Medinipur

In **Indonesia**, Sinergantara Indonesia, in partnership with Making All Voices Count (MAVC) and the local governments of Bojonegoro Regency and Pekalongan Regency, has launched *Game My Village: Innovation for Strengthening Participatory Planning and Public Monitoring in Village Development*. Game My Village (GMV) is an initiative to apply ICT in order to help improve the quality of village development planning and village development implementation monitoring processes, and the participation of citizens therein. In this context, GMV's role is to provide data for village development, help village development actors constitute more participatory forums, and promote planning development that is based on accurate data. GMV's tools and approach have been supporting data revolution implementation in Bojonegoro

District, which is one of the international-level pilot project areas of the Open Government Partnership in 2017. The project is in line with **SDGs 1**, **10** and **11**.

In the **Islamic Republic of Iran**, the National Centre for Business Environment Monitoring–Ministry of Economic Affairs and Finance (Deputy of Economic Affairs) launched the System of Receiving, Reflecting and Pursuing Complaints–Handling of Applicants for Issuing Business Licences. The supervisory System of Receiving, Reflecting, and Pursuing Complaints-Handling of Applicants for Issuing Business Licences began its work in late 2016. The goal of this system is to create effective and safe communication between people and government, eliminating the problems of applicants and economic activists, as well as facilitating the provision of services to business seekers, including the educated, artist, opportunity maker and entrepreneur, especially in low-income groups. This project, by receiving people's complaints in the process of issuing licences and lubricating the process, will improve the business environment as well as the economic growth of low-income groups in society, as ultimately its full implementation will be the solution to the country's economic development. In addition to the above, easy access of applicants to IT, even in the remotest and deprived areas, and free availability of this service, are among other major achievements of the system. This project has been launched in 20 of the Islamic Republic of Iran's provinces, out of a total of 31 provinces. Without limitation in the number of reviews, this system can cover judicial-related cases at once. This project is in line with **SDGs 2, 4, 5, 8, 9, 10, 11, 16** and **17**.

In **Myanmar**, Yin Nwe Cho has created the *Government Administration Management Solution* (GAMS), a cloud-based platform which automates and manages the full range of government office administration, with modules from Human Resources and Document Management to Financial Management, Inventory Control and Management Reporting Systems. GAMS uses stored data to create comprehensive management reports at various levels and transfer them to the relevant authorities responsible for monitoring government structures. The real-time data is used by the government to support decision-making and organize efficient planning for the country's development. In the user-connection segment of the GAMS platform, the public can view open information on government institutions and track news and updates.

The project, which is relevant to **SDGs 3**, **4**, **5**, **8**, **9** , **10**, **12**, **13**, **16** and **17**, is carried out in partnership with the Ministry of Transport and Communications; Ministry of Education; Mandalay City Development Centre; National Parliament of Myanmar; Teromac Technologies; DabLab Advertising; Myanmar Computer Federation; Myanmar Computer Industrial Association Yangon; and Myanmar Computer Professional Association.

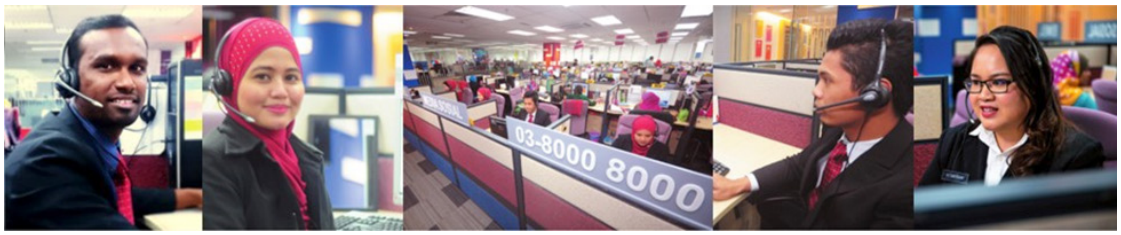
The **Malaysia** Administrative Modernization and Planning Unit launched the Gallery of Malaysian Government Mobile Applications (GAMMA), a one-stop centre housing all government mobile applications, developed by the **Malaysia** Administrative Modernization and Planning Unit, the Prime Minister Department, to enable the public (including business and the international community) to browse and download secure, official and authentic government mobile applications from a single gateway. GAMMA is a mobile-based government innovation service aimed at diversifying government service channels through smart devices. Coinciding with the tagline "Mobility, Smart Lifestyle", GAMMA can

be accessed by anyone, anywhere, anytime and is available on the widely used platforms Android, iOS and Windows. GAMMA is downloadable to smart devices for free, and has user-friendly features enabling easy and quick searches. Prior to GAMMA, users had to search in various platforms to locate the official mobile applications. GAMMA also provides a mobile application development tool called GAMMA AppGen, which enables agencies to build mobile applications quickly, with minimal programming and costs, using built-in components that can be tailored to specific needs (**SDGs 1, 3, 6, 8** and **16**). Besides improving service delivery via mobile delivery channel, the implementing model used has enabled the Government to make substantial savings by sharing government infrastructure and licensing software. Since the implementation of GAMMA in October 2015, there have been 226 724 visitors to the GAMMA portal. Currently, there are 180 mobile applications that are being offered for free in GAMMA, with 1.8 million downloads thus far. Looking ahead, GAMMA will expand mobile application development to the public through crowdsourcing. This initiative enables people to build mobile applications based on their community needs.

The Digital Document Management System(DDMS) in **Malaysia,** initiated by the Administrative Modernization and Planning Unit, is an electronic records management system, a national initiative under digital government project to improve operational efficiency and user productivity in government administration, in accordance with **SDG 8**. DDMS supports entire lifecycle management of public records from creation, maintenance, dissemination and disposition of electronic records, in compliance with MS ISO 16175-2: 2012. DDMS is a web-based system which can be accessed from anywhere, anytime and on any devices (including smartphones and tablets) in a secure manner. DDMS is running in a secured government data centre and private cloud offered to various government agencies on a software-as-a-service basis to lower the total cost of ownership for individual agencies. DDMS is a one-of-a-kind, multi-tenant, centralized records management system for multiple government agencies. DDMS implementation started in 2014 with two pilot agencies. The system has been rolled out to 66 government agencies with a road map to on-board approximately 400 agencies by the end of 2020. For these 66 implementing agencies, the total number of records captured has reached 2 293 471, with 29 348 registered users. DDMS creates substantial value for both Government and citizens by increasing government productivity and transparency, as well as accountability, in record management. It also facilitates fast decision-making as records are captured in a central repository system that can be easily retrieved at any time and place. DDMS enhances public service delivery, improves efficiency and creates trust towards government administration.

Also, the **Malaysia** Administrative Modernization and Planning Unit launched the 1Malaysia One Call Centre (1MOCC), a flagship initiative under the National Blue Ocean Strategy that aims to improve government service delivery and communication between the public (also referred to as *rakyat*) and government agencies. Being a trusted government source of information and communication hub that facilitates interaction between public and government agencies, 1MOCC has been receiving large number of transactions, consisting of inquiries and transfer calls. The transactions from 1 January to 31 October 2017 amounted to 936 706 transactions, of which 99.39 per cent were made through phone calls. 1MOCC had handled a total of 6.06 million transactions as of 31 October 2017, since the start

of its operation on 12 November 2012. Furthermore, the public has had better experience in dealing with the government agencies via omni-channel provided by 1MOCC, as information is available for 24 hours every single day. It also provides the public with reliable and trusted information, thus acting as a single source of authentic information. 1MOCC is an absolute innovation of first contact point in government service delivery to the public and a one-of-a-kind implementation in the world of e-government. This project is in line with **SDGs 3, 4, 8** and **16**.



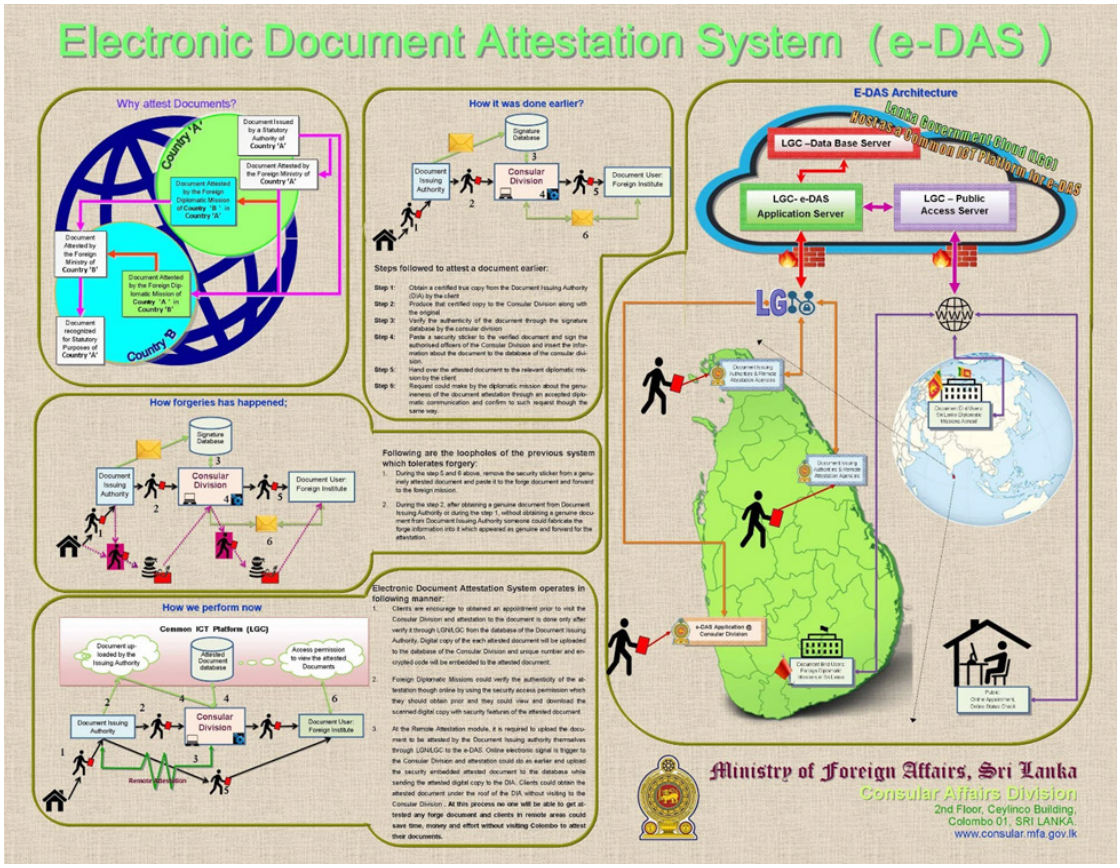
The Board of Revenue, Punjab, **Pakistan,** initiated the *Land Record Management Information System (LRMIS)* project to improve the land records service delivery in the Province of Punjab, contributing to long-lasting tenure security. The outcomes expected from the project included increased access to land records at a lower transaction cost for the beneficiary, through a client-responsive service and increased level of tenure security for land-right holders. A key component of the project was the development and deployment of an automated land records system (LRMIS). The current LRMIS application was developed in a distributed environment with each Tehsil having its own server, LAN, storage, etc. The local information is processed locally and uses local storage. Periodically, each site uploads the local data to a hosted storage site at the data centre. Now the Project Management Unit (PMU) – Board of Revenue Punjab-has awarded Systems Limited the project of replacing the existing LRMIS application software for extension and enhancement as per additionally perceived user requirements. The new software system will be hosted at a centralized, purpose-built PMU data centre.

The project contributes to the economic growth of the country, which relates it to **SDG 8** of the WSIS Action Lines.

The Government of Technology Agency in **Singapore** developed the initiative MyInfo, a service that enables Singapore citizens, permanent residents and work pass holders to provide their personal data only once to the Singapore Government, its agencies, and to the key financial sector players such as banks, for opening bank accounts. Citizens use MyInfo to provide consent for their validated data to be used in transactions, having full confidence that they are in control of their data and how it is used, in an authorized and secured manner. This innovative use of technology minimizes the need for residents to fill out paper forms and submit physical documents such as their social security balances or income tax notices of assessment, reducing the country's ecological footprint (**SDG 12**). With the removal of the need to verify documents and time spent on face-to-face meetings, business efficiency has also been improved and companies can more quickly welcome their customers on board (**SDG 9**). Banks reported an average decrease of up to 80 per cent in application time for their customers, with some seeing up to 15 per cent higher approval rates due to MyInfo's better data quality. Labour productivity will also increase as workers can now focus on higher value-added jobs (**SDG 8**). MyInfo takes a people-centric approach that reduces the cost of service delivery to government agencies,

improves data governance and improves the service between both business and government with the people.

The Ministry of Foreign Affairs of **Sri Lanka** developed the Electronic Document Attestation System (e-DAS), an innovative digital platform based on cloud computing. As an e-government initiative, e-DAS was launched in February 2017 to enhance the efficiency and credibility in the document attestation process at the Consular Affairs Division of the Sri Lanka Foreign Ministry. E-DAS offers online appointments and a paperless office environment to citizens. The manual system took about five hours to attest one document, whereas e-DAS takes less than 15 minutes per document issued through a single counter. Accordingly, four hours and forty-five minutes are now saved per document. E-DAS has so far attested 250 000 documents while enabling document holders to save their valuable time. The total time saved was 1.2 million hours (number of documents multiplied by time saved per document).

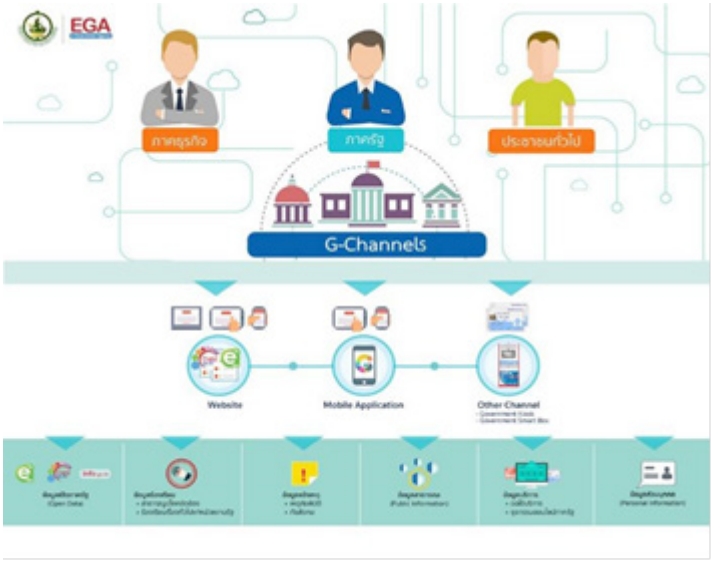


Since diplomatic missions and institutions of foreign governments are able to directly access e-DAS, the document verification process has become transparent to users, and its credibility significantly enhanced. The possibility of the attested documents being forged by human smugglers/traffickers

is almost eliminated. Thus, e-DAS has positively contributed to combating criminal acts. E-DAS is capable of serving 20 million people inside Sri Lanka and about 2 million Sri Lankans living abroad. It has already linked its regional consular office in Jaffna, serving the people by eliminating the need for them to travel to the capital. Therefore, people's time and money can be saved, and severe traffic congestion in the city eased, serving the purposes of **SDGs 1, 5, 8, 9, 10, 16** and **17**. The e-DAS can be replicated in many government institutions

The *Government Channels* project was initiated by the Electronic Government Agency of **Thailand**, to allow people to access useful and reliable information and benefit from the public services provided by government agencies from any location and at any time, using popular communication devices such as computers, smartphones, tablets kiosks, etc. (**SDGs 3, 8, 9** and **10**). Both government agencies and the private sector have been encouraged to increase service channels to serve people, especially in the form of mobile applications, and to develop more software as a service (SaaS). Currently, many services are provided through the following *channels*:

- Government e-Service Website Portal (Website: www.egov.go.th). People can reach the government services and data through the website from a personal computer whenever convenient.
- Government Application Center (GAC). Mobile devices such as tablets and smartphones can be used to access the government services and data.
- Government Kiosk. The Kiosk will be located in public areas for people to access the government services and data.



E-business

The Amar Desh Amar Gram Company in **Bangladesh** developed the Amar Desh Amar Gram (My Country My Village), e-commerce for poverty elevation, which is the first project of its kind that takes computers and web access to the lowest income group and empowers them with a possibility that was not previously available to them. The project creates a virtual marketplace named Amar Desh eSHOP for better economic opportunities for the farm producers, SMME entrepreneurs, underprivileged women and rural communities of Bangladesh, in line with **SDGs 1, 2, 5, 8, 9, 10** and **11**. The system plays a crucial role in protecting the interests of indigenous industries in rural areas by creating income opportunities for rural marginal people. The journey does not end there, as the centres that control this supply chain are controlled by youths who are trained in the infinite world of e-commerce, and they themselves go on to teach others. Amar Desh Amar Gram also aims to

provide a reduction in rural–urban migration by creating secure jobs in rural areas. This unique and first-of-its-kind e-commerce-based poverty elevation project not only provides empowerment but also creates a new generation of entrepreneurs among the youth, who can then strive for self-sufficiency. In 2017, this project grew from 11 centres to 64 centres at 64 locations in the country, with 1 163 youths trained as entrepreneurs to run these centres, with the aim of having 300 000 producers make their e-shops sell their products directly to consumers. By connecting producers in rural areas directly with buyers, it will be possible to secure a fair remuneration to disadvantaged people for the products that they produce.

In **Bangladesh**, the Bangladesh Computer Council (BCC) has developed the *National Enterprise Architecture and Interoperability Framework* for the Government of Bangladesh (GoB), in partnership with the World Bank and Ernst & Young.

As one of GoB's apex bodies under the ICT Division of the Ministry of Posts, Telecommunication and IT, BCC has been instrumental in carving the path for the development of e-governance in Bangladesh over the last two decades. At present, BCC is in the process of laying the foundation for successful e-governance in Bangladesh through the establishment of the National Enterprise Architecture and n Interoperability Framework initiative, implemented through a World Bank financed project entitled 'Leveraging ICT for Growth, Employment and Governance'. The transformational potential of technology, especially for the delivery of government services, can only be harnessed when the efforts towards its adoption, management and subsequent implementation are synchronized among different arms of the government. A robust enterprise architecture and interoperability framework will support achievement of the 'Digital Bangladesh' vision through ICT and emerging technologies.

The components of the Bangladesh National Enterprise Architecture, which is relevant to **SDGs 5**, **8**, **9**, **10**, **11**, **16** and **17**, are as follows

1) National Enterprise Architecture: Establishment of the contours and broad structure for a whole-of-government enterprise architecture framework
2) E-Government Interoperability Framework: Design, development and implementation of an interoperability framework across the GoB
3) Mobile Service Delivery Platform: Preparation of the MSDP architecture and standards
4) National E-Service Bus: Development of a middleware application/platform for e-service integration
5) Capacity Building and Change Management: Delineation of broad guidelines for establishing an enabling smart e-governance organization for capacity development within government.

In **China**, the Jiangsu Posts and Telecommunications Planning and Designing Institute Co. Ltd. developed the project Jiangsu Intelligent Security of Express Delivery Project. This project can effectively enhance safety supervision and public service in the express delivery field; provide convenience for administrations and companies to enhance express delivery process monitoring, management and

optimization; and construct a security defence model with the characteristics of "accurate early warning, standardized supervision and transparent service" to provide a reliable guarantee for sustainable and healthy development of the modern express industry (**SDGs 8, 9** and **11**). The traceability application platform, the intelligence analysis platform and the integrated service platform achieved in this project can be replicated in other cities in China and other communities in other countries.

The Hong Kong Federation of E-Commerce in **China** launched the Hong Kong Trust Mark connecting the e-commerce World. After the introduction of Hong Kong Trust Mark in 2016 and being nominated as the finalist for the WSIS Prize 2017 of Category 6, Hong Kong Federation of E-Commerce has taken an active role in promoting a trusting e-commerce environment between East and West. Hong Kong Trust Mark has become part of Global e-Commerce Trust Mark and brings Safe Shop, a trusted e-commerce platform operated by e-Commerce Foundation, into Asia. Through the translation of Safe Shop in Chinese, the platform was launched in Hong Kong Special Administrative Region of China and in China, together with the China Guangdong Electronic Commerce Association in Guangzhou, on 21 December 2017. This made a remarkable milestone for taking a big step into a healthy, trusted e-commerce ecosystem between China and the West, and it helps and supports **SDGs 1, 3, 8, 10, 11** and **12**.

In **China**, Qingdao Kutesmart Ltd has launched a comprehensive *Source Data Engineering* (SDE) solution for updating traditional enterprises. SDE can be directly applied to upgrade and transform traditional enterprises, constituting a practice case of "Industry 4.0" in China today. It offers a means of using information flow to promote technology flow, capital flow, talent flow and logistics, thereby optimizing resource allocation and efficiency of the whole enterprise. It is especially useful for small and medium enterprises to upgrade successfully and suitably for the prevailing conditions in China. At present, SDE is helping to guide national enterprises towards upgrade and transformation; it has been applied in more than 20 industries and more than 60 companies. The SDE solution will be of interest for **SDGs 8**, **12** and **17**.

In **India**, the Rashtriya e-Market Services Private Limited (ReMS) created the *Unified Agricultural Markets* programme in order to make markets more efficient and competitive harnessing ICT. The e-auction platform has increased transparency in all market operations, with the effective dissemination of price information to farmers and increased competition for better price realization ultimately leading to enhanced livelihoods. The e-auction platform now connects the state agriculture markets to national buyers. Presently, 2.7 million farmer lots worth USD 1 691.87 million (93.98 million quintals) have been transacted. Farmers have witnessed increased prices and demand for their produce.

The programme's ambitious goals meet SDGs as they deal with poverty and food security, contribute to economic development and promote inclusive societies (**SDGs 1, 2, 8, 12** and **16**).

Another project from **India,** *Microlekha-Connecting India to Disconnect Poverty,* uses 3G-connected tablets and an innovative, Android-based Microlekha application to improve the efficiency, profitability and transparency of microfinance institutions (MFIs) by automating and streamlining many routine tasks, expediting the loan application and approval process and improving communication with customers. These improvements work to build the confidence of borrowers in the lending process and stimulate the economic activity of underserved communities, thus fighting against poverty and gender inequality as well as promoting a peaceful society, which coincides with **SDGs 1, 5, 8** and **16** of the WSIS Action Lines. The new system also stores all know-your-customer (KYC) documents digitally, which eliminates the need for borrowers to submit paperwork each time they apply for a loan. Further, customers making loan repayments receive transaction receipts and account updates via SMS.

Hubco is a web-based service-oriented e-commerce system with ICT development impacts on the businesses of the **Islamic Republic of Iran** that includes a software solution along with all the required processes (e.g. development, training, support, sales and marketing, business consultancy and empowerment) and infrastructures for providing the supply chain management (SCM) functionalities as a service to the suppliers and consumers. Launched two years ago, the Hubco Network acts as a match-making service among consumers of materials and their suppliers, providing information on the price and quality of the goods they need. The primary target audiences of this network are more than 3 million small and large businesses in the country, which automatically makes the network very efficient. It also contributes to economic development, facilitation of infrastructure development as well as the strengthening of technological capacity to move towards more sustainable consumption and production patterns (**SDGs 8, 9** and **12**). Presently, the system is active in the cement, power,

industry, food, transportation and steel industries. One of the services of this network is e-procurement. Consumers send their requests for quotation (RFQs) to this network and interested suppliers provide their responses. The consumer can see and compare the responses and choose the best supplier among the existing suppliers with the help of this system.

The **Malaysia** Digital Economy Corporation initiated the project eRezeki, which enables low-income households to earn additional income via digital crowdsourcing platforms. The eRezeki programme is based on the crowdsourcing concept – with specific focus on the bottom 40 per cent of society as the "crowd" providing services to earn additional/supplementary income (**SDGs 1** and **8**). The programme aims to provide opportunities for the bottom 40 per cent to supplement its income via various crowdsourcing/gig/sharing economy opportunities. This initiative is aligned with two SDGs: to promote inclusive and sustainable economic growth, employment and decent work for all, which ultimately could lead into eradicating poverty at all levels.

In **Malaysia**, Pos Malaysia Berhad has launched *Address for All* (AFA) to enable the fulfilment of e-commerce for everyone. AFA is a newly-assigned national address initiative aimed at solving the issue of premises with incomplete addresses. No fewer than 12 per cent or 1 million Malaysian addresses are still incomplete. In the era of global e-commerce localization, it is obvious that having a proper and correct address is crucial to ensuring the availability of e-commerce for everyone. In 2016, Pos Malaysia, in cooperation with its regulator, the Malaysian Communications and Multimedia Commission (MCMC) - www.mcmc.gov.my - has provided more than 20 000 Malaysian households with a complete premises number. By 2020, more than 100 000 households or 400 000 Malaysians will have their own addresses. This project will assist **SDGs 3**, **8**, **9**, **10**, **11**, **16** and **17**.

In **Nepal**, *TrackMandu* is a solution allowing the general public and private fleets to obtain information on their cellphones and computers. The information consists of their current location, timestamp, speed and course of their fleet. Basically, there are 4 components to this system: device (GPS/GSM-based), web server that runs the application, database server that handles the database (accessible only by web server) and mobile/web application communicating with the server to request the data required by the application.

The project perfectly contributes to **SDGs 10** and **16,** providing equal public access to information and reducing inequality among Nepal's population.

In the **Philippines**, the *Hapinoy Mobile MicroBusiness (Money) Hub*, a programme co-developed with

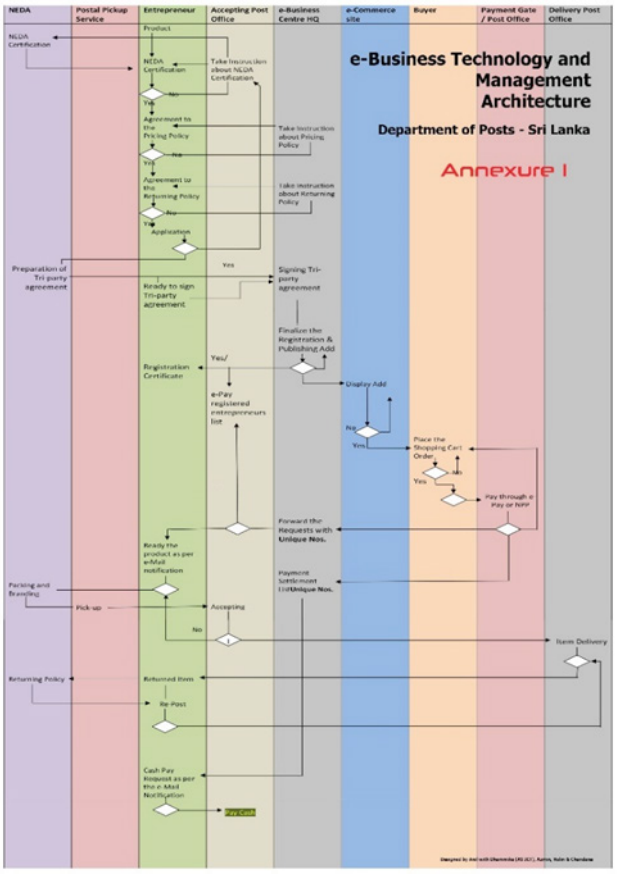
Qualcomm Wireless Reach, addresses the concern of financial and digital inclusion in rural areas. The programme's shared vision is to bring mobile-based services closer to these rural communities, most especially to the financially and digitally excluded. This is done by enabling women micro-entrepreneurs who own hole- in-the-wall-shops with mobile technologies to offer mobile money services, mobile payments and mobile commerce.

Thus, the programme combats poverty and gender inequality and promotes economic development in the country (**SDGs 1, 5, 8** and **10**).

In **Singapore**, the V3 Smart Technologies Pte. Ltd. launched the project V3Transformer – Transforming Manual Surface Maintenance Equipment into Autonomous Machine. V3 brings 15 years of industry experience in fleet and asset tracking and management, mobile workforce applications and transport scheduling and optimization spanning across logistics, municipal, construction, waste management and taxi services industry. Four years ago, in order to meet the dynamic needs of its clients and to stay ahead as the leading technology provider, V3 ventured into robotics and IoT devices design and development to complement the company's software development. The company produces a first-of-its kind made-in-Singapore patented (Singapore Patent Application No. 10201402614Y) technology solution that transforms manual surface maintenance machines into autonomous intelligence system-driven equipment. This project is a useful tool towards the advancement of **SDG 9**.

Singapore launched the Accreditation@SG Digital (Accreditation@SGD) programme in July 2014 as a new approach to growing promising local technology MSMEs. Instead of the traditional approach of providing government grants and subsidies, Accreditation@SGD accredits Singapore-based companies to help establish their credentials and track record to potential buyers and investors, as well as assist and guide them to innovate and grow, both in Singapore and internationally (**SDGs 8** and **9**). By the end of 2017, Accreditation@SGD has helped accredited companies generate a strong pipeline of contracts worth more than S$ 200 million in both the public and private sectors, and raised more than S$ 82 million of growth capital.

In **Singapore,** Singapore Customs, in partnership with the Government Technology Agency of Singapore (GovTech), is launching the *National Trade Platform* (NTP), a one-stop trade information system developed as an open innovation platform, to support firms especially in the logistics and trade finance sectors. The NTP is another example of the committed effort by the Singapore Government to continually embrace cutting-edge technologies and streamline competencies in trade and logistics. It builds upon the success of Singapore's TradeXchange and TradeNet systems to facilitate more seamless data exchanges across global supply chains. The project takes into consideration current business needs and emerging trends in global trade. In the NTP, the government closely collaborates and co-creates with business communities and service providers to build a vibrant and innovative trade ecosystem. The NTP will also seek closer collaboration across borders, in order to enhance Singapore's value-added to global trade. This project supports **SDGs 8**, **9** and **11**.



In **Sri Lanka**, the Department of Posts launched the portal bepost.lk Beyond the Post. This portal is an in-house-developed e-business web application and the total

trade facilitation software solution of the Department of Posts – Sri Lanka. The solution was officially launched by H.E. President Maithripala Sirisena on 9 October 2017 at the World Post Day ceremony. Bepost.lk provides e-trade and products and facilitates delivery to the MSMEs of Sri Lanka, as per the global trade facilitation programme introduced by UPU. Government institutes for assuring the quality of products and support to MSMEs might be the bepost.lk partners. At the same time, the National Enterprise Development Authority of Sri Lanka is a partner of the bepost.lk. On the other side, registered MSMEs for bepost.lk are the main partners of bepost.lk. More than 200 entrepreneurs registered to bepost.lk in the first three months after its launch, and more than 1 500 MSME products were registered to the system. One thousand entrepreneurs were registered within the next three months, and 3 000 are expected for 2018. Expected registered MSME products are more than 15 000. This programme relates to **SDGs 1, 3, 5, 8, 9, 10, 12, 16** and **17**.

Thailand boasted a significant number of projects within this category aimed at promoting its economic development, providing lifelong learning opportunities for its citizens and achieving full and productive employment (**SDG 4** and **8**).

In **Thailand,** the Electronic Transactions Development Agency (public organization) initiated the *National Payment Message Standard* (NPMS) project, to set a standard for payment messaging, which is deemed to be crucial for future phases of payment systems development. The NPMS enables businesses and financial institutions to exchange payment data more conveniently by using standardized messages complying with ISO 20022 (Financial Services) in order to reduce data handling costs. The standard has been continually developed and improved by its stakeholders, which include the Thailand Payment Market Practice Group (TH-PMPG), consisting of commercial banks, financial institutes and corporations. The project is relevant to **SDG 8.**

The *Electronic Document Management (EDM) System* aims to improve the organization's filing system, ease file sharing within the organization, increase productivity by providing updated information to the intended personnel, and scrutinize any illegal sharing of files by unauthorized parties, without compromising the security of the organization vis-à-vis outside threat. The environmental impact is also taken into consideration through reduced paper document usage and optimization of office space previously used for storing paper files (**SDG 15**). File back-up and ease of access by designated and authorized personnel at different locations within the organization constitute further advantages of this programme.

Thailand's *Location Information Management System (LIMS*) is an accident notification system available via the customer's smartphone for the motor insurance business. A claim submitted by the customer, including claim details, can be received immediately after the accident. LIMS is easy to use, and enables customers to conveniently submit their claims or make a prompt appointment with the surveyor via the smartphone interface. The precise accident coordinates will be sent by the customer to the call centre using the smartphone's GPS signal, reducing the stress associated with explaining the accident location. The surveyor can refer to the GPS coordinates and find the location quickly and easily.

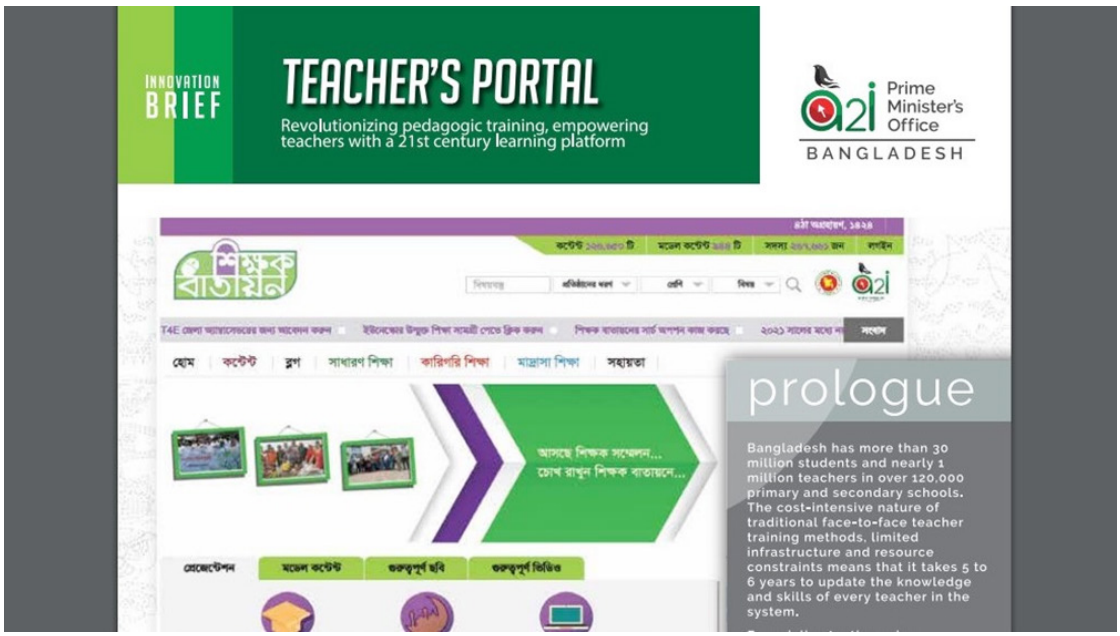
The project thus contributes to promoting well-being for its customers (**SDG 3**).

In **Thailand**, the *Location-Based Information System (LBIS)* was developed as the most effective tool for executives to efficiently conduct business analysis, evaluate marketing strategies, and ultimately make optimal business decisions. Moreover, LBIS is fully supported by Microsoft Azure (cloud platform), thereby enabling businesses to swiftly expand their services globally. A key attribute of this fully web-integrated system is to precisely and accurately present business information topographically. For any large organization with massive data distributed across many systems, LBIS effortlessly compiles all information to be analysed without compromising the current systems or altering the staff's roles and responsibilities.

E-learning

In **Bangladesh**, the Prime Minister's Office's Access to Information (a2i) programme initiated the MuktoPaath, Facilitating Use of e-Learning in Skills and Professional Development. The 27 directorates under 23 ministries in the Government of Bangladesh are faced with multilateral challenges when providing training opportunities to professionals, semi-professionals and unemployed persons from their facilities (SDGs 4 and 8). A2i has developed key partnerships and led a unique project to facilitate coordination and capacity development of institutional content developers, and developed a national e-learning platform, MuktoPaath (muktopaath.gov.bd/login/auth), to promote anywhere-anytime learning by anyone using validated content and relevant performance appraisal. This platform has made meaningful contributions to attaining **SDGs 4** and **8**. At a more micro level, it is helping to achieve SDG Target 4C of substantially increasing the supply of qualified teachers by 2030. Children

In **Bangladesh**, the Prime Minister's Office has created the *Teachers' Portal for Empowerment* (TPE) as a smart mechanism to supplement Bangladesh's ailing teacher-training system, which serves 900 000 teachers with its modern learning facility of 1 500 seats. Costly face-to-face training is often prohibitively expensive for the teaching administration and teachers. TPE, a collaborative, co-creative and problem-solving continuing professional development (CPD) platform, has fast become popular among teachers for creating/sharing digital content on all subjects. As its membership exceeds 100 000 and is growing, the portal is already the largest local repository of educational content. An offline annual conference instituted recently has also sown the seed for a vibrant community of learners. The portal thus serves to advance a number of SDGs, providing equitable quality education, reducing inequality and revitalizing the global partnership for sustainable development (**SDGs 4, 5, 10, 12, 16** and **17**).



In **Brunei Darussalam,** the Al-Huffaz Management enterprise developed the Al-Huffaz Project, a platform for Islamic religious-based services, aimed at matching Al-Quran educators with students who wish to study the Al-Quran. Only 19 months after its inception, Al Huffaz Management currently has more than 100 highly qualified, licensed and competent educators, who have each been endorsed by the Brunei Islamic Religious Council. More than 500 students, ranging in ages from 2 to 70 years old, from Brunei Darussalam, Australia and even the United Kingdom have subscribed to the services provided by the company, and the number is expected to grow further. One of the main advantages of Al-Huffaz Management is the fluidity and flexibility of location and time, as well as the ability to choose an educator according to the students' preference. Al-Huffaz Management, which was founded by Haji Muhammad Loqman bin Haji Hamdan, not only provides employment opportunities to fresh

graduates with an Islamic academic background, but also nurtures an Al-Quran-literate generation both locally and globally, therefore supporting the advancement of **SDG 4**.

In **China**, the Unicom Network Technology Research Institute developed the Mobile Network Solution of Smart Campus, which has the following functions: electronic courseware sharing, online classroom, multi-school experimental resources sharing, classroom reservation, face recognition attendance, augmented reality-aided teaching and other campus applications to improve the quality of education, in that way to realize the smart campus. The project can lead everyone to have the same opportunity to get online education and to facilitate the process of the educational informationization (**SDGs 4, 8, 10** and **16**). It can also provide the incubating environment for students' practice and innovation through the opening interface of the open platform, and expand the ability and the application of educational informationization in the mobile network environment. This project can be replicated on different campuses and the campus applications can be extended based on the service capabilities in the mobile network. This project applies the resources and capabilities of mobile network to the education industry in the form of services and then transforms capabilities into business and services. The project will establish good partnerships between all manufacturers, schools and other parties to jointly develop new business ecosystem.

Also in **China**, the Communications Technology Co., Ltd. China has initiated China Mobile's "AND" Education, a Solution for Mobile Online Learning. In China's remote and poor areas, many school-aged children are left at home as their parents have to work outside all year round. These children are known as "left-behind children" while their teachers are called "rural teachers" and their parents are called "migrant workers". This project aims to help the above-mentioned three vulnerable groups in China's remote and poor areas to get the best education resources with ICT technologies, to improve teaching standards in poor areas, and to solve family and occupational troubles for migrant workers **(SDGs 4, 8, 11** and **16**). The project seeks to provide left-behind children with remote "double-teacher classroom" learning opportunities and online learning services to ensure that they can get access to the same education resources as children in developed areas. It also intends to assist rural teachers in improving the teaching effect. Besides, it offers various services, including vocational training and job information, to migrant workers. The experience of this project can also be migrated to other communities in the same condition.

In **India**, the Jain Institute of Technology – together with the Mr. Venkatesh Satyala Centre Head and Skill India–Prime Minister's Initiative Chikkabalapur – initiated the programme E-Learning Complimenting Underprivileged, Disengaged Youth and Drop-Outs. Education plays a significant role in the empowerment of young people in all income brackets, from poverty-stricken to affluent. Education can open up better economic opportunities for them, improve the quality of their lives, and empower them to make the world a better place for others in their sphere of influence. There are underprivileged young adults who are unable to attend college because they are too busy working to make a living, taking care of disabled parents or helping their parents care for younger siblings, or sometimes they are school dropouts in low economic conditions. Online education is particularly useful for inspiring youths and dropouts to achieve these benefits. E-learning can help students transcend the limitations of their geographic locations, conquer their financial difficulties, overcome time constraints, solve their problems and better their lives in every imaginable way, given an opportunity and minimum guidance (**SDGs 1, 4, 5** and **8**). Disengaged youths can also benefit from the flexibility that online learning offers. E-learning can provide opportunities for young adults who are recovering alcoholics, drug addicts or high school dropouts. Mentors at disengaged youth programmes should encourage the young people they work with to take advantage of the full range of opportunities made available to them through access to distance learning.

In **India**, *the E-Learning Programme* of the Wockhardt Foundation aims at ensuring academic excellence through quality and innovative teaching methods. The e-learning programme is intended to make learning a fun-filled and interactive experience. It is developed by quality e-learning experts and qualified instructional designers. The programme is designed for children from standard 1 to 10 for all subjects. The curriculum is as prescribed and followed by the Maharashtra State board. The complete syllabus is provided in an audiovisual format in the Marathi, Hindi and English languages. The audiovisual format comprises an interactive question bank and is designed with a child-friendly interface.

Hence, the programme ensures equitable quality education and gender equality and promotes lifelong learning opportunities for Indian citizens (**SDGs 4** and **5**).

Launched by the Government of **Indonesia**, the *Open High School* programme is a form of formal education operated under the regular school institution but applying independent learning methods utilizing web-based modules for its students. The dominant model of online learning services, referred to as "Domon" or "Dominan Online", comprises self-learning guidance services conducted online using ICT facilities, with 80 per cent of tutoring online and 20 per cent face-to-face. The open and distance high school offers the opportunity for students aged 16 to 21 to learn according to their particular needs and conditions. It targets junior high-school graduates with geographical, social, economic and/or time constraints. Currently, there are 7 schools educating 960 students through no less than 126 modules on the system.

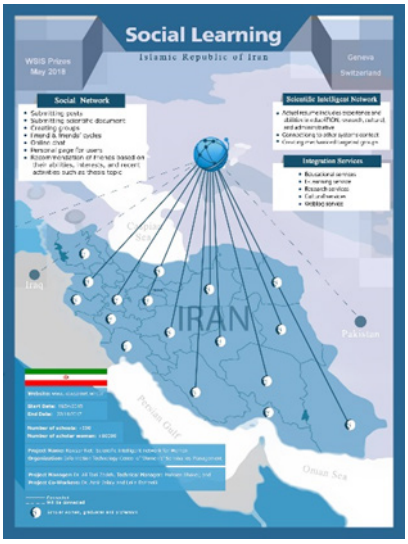
The programme's results meet **SDG 4** by providing lifelong learning opportunities, ensuring equal access to affordable education (**target 4.4**).

The *Universitas Terbuka/UT (Open University)* of **Indonesia** applies a distance and open learning system. The term distance means that learning is not performed face-to-face, but makes use of media, whether printed (modules) or non-printed (audio/video, computer/Internet, radio and television broadcasts). Open means there is no limitation as to age, year of graduation, period of study, registration time, and frequency of examinations. The only limitation applied is that UT students must have graduated from high school (SMA or equivalent). UT students are expected to learn independently. This self-learning method means that a student learns on his/her own initiative.

UT provides learning materials specifically designed for independent learning. Aside from using materials provided by UT, students can also take the initiative to make use of the library, take tutorials, whether face-to-face or via Internet, use radio or television broadcasts, or use computer-assisted learning materials and audio/video programmes. When faced with difficulty in learning, students can request information or tutorial assistance from the local Learning Program Unit of the Distance Learning Open University (UPBJJ-UT).

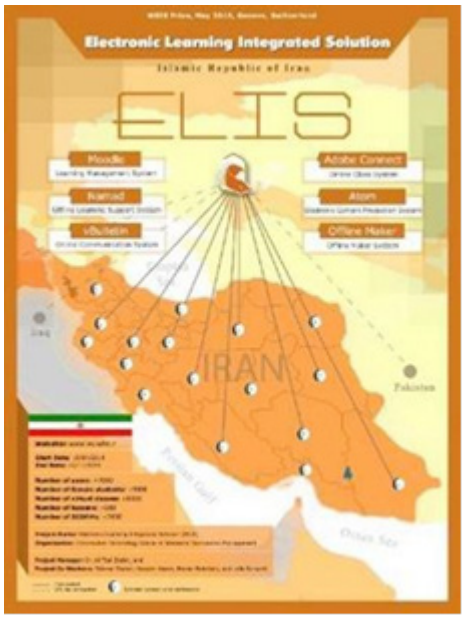
The project thus provides access to distance education for all people without any gender or age limits (**SDG 4, target 4.4**).

In the **Islamic Republic of Iran**, the Women's Seminaries Centre launched the initiative Social Network-Based Learning. Shamim network started in 2017 with the purpose of establishing a safe and pure relationship between teachers and students. It aims to share knowledge and ideas, as well as enable social, scientific and advertising activities (**SDGs 4** and **10**). This project improves the equitable education and closes the gaps across small and capital cities. Based on novel techniques, embedded in the social network, the results lead to empowerment of teachers and students accessing and using effective social networking to increase their education progress.



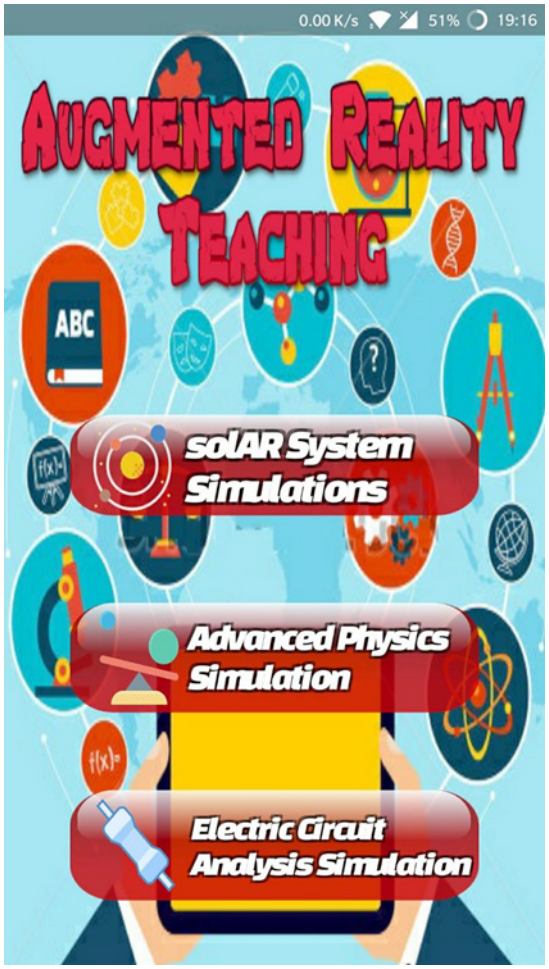
The Information Technology Management Centre of Women's Seminaries (ITMCWS) in **the Islamic Republic of Iran** started its activity with the *E-Learning Integrated Solution (ELIS)* for women in 2007.

Its main objective was to upgrade women's knowledge in religious science, as a basis and prerequisite for playing a role in Iranian communities. In this regard, and in an endeavour to reduce communication deficiencies in many small cities, various custom-made software packages like Namad, Atom, Offline Maker, etc. were implemented and incorporated in ELIS. Specifically, the solution presented and integrated by ITMCWS has increased opportunities for women in small cities or villages to access e-learning services, and has empowered women's knowledge, thus advancing **SDGs 4** and **5** on educational and gender matters.



In **Pakistan**, the COMSATS University Islamabad developed the project Augmented Reality Teaching (ART). ART is a new field that is quickly gaining momentum due to technological leaps in recent years. This project will help students learn more effectively by integrating ART into their regular syllabus. The major barrier to this in the past has been acquiring a suitable medium that is easily available to and understandable by the general populace. We solve this problem by using a standard Android device as our medium, which ensures that every student will have easy access to ART. Our goal is to change the way education is taught and make interactive learning a standard and not a mere novelty. Our project ART is an augmented reality-based Android application. It not only facilitates educators but

students as well in extending the physical world with a virtual overlay. Educators are well aware of the fact that students have a deeper understanding of a subject when they approach it with a creative and interactive approach, not just through reading and listening. We wish to help in providing a platform for educators and students to make that possible. Incorporating augmented reality into lessons will make students excited about learning. Being in the digital era, students will continuously be excited about studying by being stimulated with augmented reality. Visualization tools will help anyone who has access to a phone to work in a virtualized environment anywhere and at any time to learn concepts that are otherwise hard to acquire in a classroom/lab setting. We can expect educational institutions to change their focus more on visual learning and less on abstract theoretical learning, while making learning more fun. The following illustration generalizes the execution process of ART. The process starts with camera input and ends with rendering a virtual object on screen. Augmented reality continuously looks for tracker/object input frames and, when the tracker finds them, it will display virtual objects on screen. This project helps the advancement of **SDGs 3, 4, 5, 8** and **16.**



In **Palestine**, the Al-Quds Open University created the initiative Introduction to Computer as A SMART Course. In 2016, after two years of preparation, Al-Quds Open University (QOU) announced for the first time the SMART courses model, and published the courses as Open Educational Resources (OERs) worldwide. Including the computer SMART course, eight complete courses are published online for both QOU's students and learners worldwide. The computer course was offered for QOU students as a SMART course for the first time in the spring semester of the academic year 2016/17. And since that time, the course is offered each semester on 19 campuses of QOU in the West Bank and Gaza, and more than 8 000 students have been enrolled in this course so far. Moreover, the computer SMART course is designed and developed to take into consideration six principles: content modularity, diversity of learners, content interoperability, open accessibility, engagements and collaborations. The impact of these principles was clear on the survey results, according to the students. Also, the

results indicated that the students' attitudes have been affected. This project serves the purposes of **SDGs 4** and **5**.

The Pakistan Institute of Development Economics (PIDE), a degree warding institute in Islamabad, **Pakistan**, has developed the *PIDE Smart Application* (PSA). The app bridges the gulf between students and teachers and provides relevant information instantaneously to students. It transmits notifications to remind students about their classes in accordance with the timetable, as well as readings of the day, which are also made available through the app. With the increase in cellphone users in Pakistan, PSA will help to better control and administer student information. The inherent shortcomings in the traditional ways of sending information to students will be overcome at low cost and with a high degree of effectiveness. Furthermore, this will allow students to concentrate on studies rather than keeping check on schedules, plan changes and bus routes and important business economics news, which will be handled by PSA. The project aims to facilitate teacher-student relations and con-tributes to fast and effective information-sharing (**SDG 4**).

Under another project in **Pakistan,** Knowledge Platform has set up the *Blended Learning Solution*. This solution, which aims to reach 50 000 students across Pakistan by 2018, provides easy access to

specially designed content mapped to the country's local curricula for students in low-income areas nationwide. It also pro-vides performance data which can be especially useful for policy-makers in the education sector. Currently, Knowledge Platform operates globally with major ventures in China and the Philippines. We hope that the blended learning solution makes an impact in the education sector in Pakistan, and are currently partnering with several foreign and local organizations to ensure scalability and effective commercialization. The project, which is conducted in partnership with Khan Academy, Sabaq, Sindh Agricultural and Forestry Workers Coordinating Organization (SAFWCO), Idara-e-Taleem-o-Aagahi (ITA) and Jazz, ad-dresses **SDG 4**.

In **Pakistan**, Developments in Literacy (DIL) has launched the *Mobile Taleem* project, which is in line with **SDG 4**.

Mobile Taleem significantly enhances conventional teacher-training programmes by providing in- service teachers with the re-sources they need to deepen their content knowledge. A product of DIL's extensive expertise in education, and designed in collabo-ration with local teachers, Mobile Taleem features more than 150 localized lessons focused on the learning needs of teachers and students in Pakistan's least developed areas, accessible through mobile smart technology. In the pilot, average growth among teachers was 47 per cent, signaling tremendous potential for improving the quality of teaching and learning, particularly in marginalized areas. DIL is scaling up Mobile Taleem to reach 2 000 teachers and 40 000 students in 2017. The USAID Small Grants Ambassador Fund Programme, Pakistan, funded the pilot from 2013 to 2015, and Netsol is building the Mobile Taleem application for philanthropic use.

Another project from **Pakistan,** the *Daakhla.pk* project, is the online platform that provides centralized information on educational institutions and their courses, and free counselling for students. In Asia, literacy rates are low, so people seeking admission to degree programmes do not have prior knowledge. The project therefore provides such people with complete information. In addition, the unique online admissions portal allows people to apply to different universities without going there.

In this way, the project saves applicants time and money, and provides quality education as well as equal access to all levels of education (**SDG 4.4**).

In **Thailand**, the National Science and Technology Development Agency developed the Thai Open Educational Resources (OER) project under the Online Learning Resources for Distance Learning in the Celebration of Her Royal Highness Princess Maha Chakri Sirindhorn's 60th Birthday Anniversary. It is an ongoing project and has been evolving since 2015. Thai OER aims to provide high-quality teaching and learning resources to students, teachers, educators and learners anywhere and at any time, free of charge. The resources include different types of educational materials and cover a range of topics in different fields, ranging from science and technology to Thai folk wisdom and traditional arts and culture. These resources are produced and shared in the OER system by different organizations in Thailand under open license. The project supports lifelong learning of the Thai people by providing high-quality educational resources which include more than 70 000 records of educational materials that are free of charge and access barriers. The number of users and downloads from Thai OER is continuously increasing, to approximately 2.4 million users and 3.8 million downloads at present. It encourages knowledge production and sharing in Thai society, in line with **SDGs 4, 10** and **16**. Today there are, in both the public and private sectors, more than 88 organizations and more than 1 700 individuals from different fields participating in Thai OER by producing and sharing their quality educational resources. The project concretely promotes academic morality and ethics through open license and open technology platform.

E-health

In **Bangladesh**, the Ministry of Health and Family Welfare has created the programme Strengthening Bangladesh's National Health Information System. Bangladesh's fragmented and inefficient Health Information System (HIS) does not provide policy-makers with timely, comprehensive and quality data for monitoring population health and targeting health interventions. The Ministry of Health and Family Welfare, with support from GIZ, has enabled public health facilities to report routine health information electronically through an internationally renowned open-source software, DHIS2. It also promotes the use of routine information for decision-making by training health managers in health informatics. It has resulted in dramatically reduced administrative burdens, as more than 7 000 health facilities now report routine information electronically, and better services as health workers use individual records to track pregnant women and children. An openly accessible electronic data repository, with 33 interoperable datasets from different departments and vertical programmes, enhances the work of health policy-makers, while growing adoption of this common reporting platform is streamlining HIS governance. It is possible to bring about a more harmonized health information system even in the absence of an overarching HIS policy and framework. Bangladesh's HIS has been strengthened incrementally, in part through the introduction of low-cost technologies, which enjoy widespread use in developing countries. This project is advancing **SDG 3**.

Also in **Bangladesh**, the Bangladesh NGOs Network for Radio and Communication initiated the project Family Planning in Bangladesh – Improving Quality and Access, through community radio. The aim of this programme is to improve and increase women's access to safe family planning, menstruation regulations and post-abortion care services by increasing knowledge and a supporting environment. The scope of work is to improve and increase community awareness of family planning services to increase the uptake of quality family planning services for women and men, including adolescents, young adults and newly wedded couples, through implementation of a community radio programme. The project provides accurate information to the general public, combating myths and misconceptions about modern contraceptive methods of family planning and long-acting methods, and promoting post-partum family planning and post-abortion family planning and raising awareness about the family planning services available in local facilities. Furthermore, the initiative aims to build the capacity of community radio station managers, selected producers and local level government personnel, in their ability to communicate and facilitate shame-free, medically accurate information and conversation on family planning methods, menstruation regulations and post-abortion care with local communities through radio programmes and community listener group members. Goals and purposes of Bangladesh NGOs Network for Radio and Communication are to assist and build capacity for community radio stations on programme planning, designing and broadcasting for promoting quality family planning, and to supplement/complement efforts for achieving the desire goals of the project. This project supports the advancement of **SDGs 3** and **4.**

The **Bangladesh** Friendship Education Society developed the programme Amader Gram Palliative Care Tele-System, also named AG Palliative Care, which is a services delivery platform for patient-centred palliative care using patient cell phone symptom reports and website best practices and prescription capabilities. The project has developed a cell phone application of the Amader Gram Symptom Survey, which has been found to be a reliable, feasible symptom assessment tool. The app presents a 15-item questionnaire rating the magnitude of 12 common cancer-associated symptoms, with four scales measuring dimensions of pain. The items are from evidence-based instruments, the Edmonton Symptom Assessment Survey and the Brief Pain Inventory, plus questions from oncology clinical practice on constipation and sleep quantity and quality (6, 15, 16). Items are sequentially presented in English and Bengali using written and audio formats. Patients respond by moving a cursor along a 10-point analogue line, the well-validated Likert scale. The app is thus available to illiterate patients. Currently only an Android application, it will be expanded to run on other platforms. Patients complete the app questionnaire daily at home and submit it to the ag-palliativecare.net website, where it will be available to their physicians. The website can provide historical item ratings to facilitate interpretation. Physicians will be notified of updated reports by e-mail or text messaging on Mondays and Thursdays, days with low clinical loads. They will also be alerted automatically if there is a rating increase of more than 1, found to be significant (17), or any rating over 7. However, it is emphasized to physicians that all clinical decisions remain with them. This application aids the advancement of **SDG 3.**

Dr. Fatima Bintee Azad of the Amader Gram Breast Care Center, Khulna, reviewing doctors' site ag-palliative care clinical practice guidelines for information to treat her patient.

Palliative Care specialist Dr. Rumana Dowla(Chairperson of Bangladesh Palliative and Supportive Care Foundation) is checking patient data with her patients

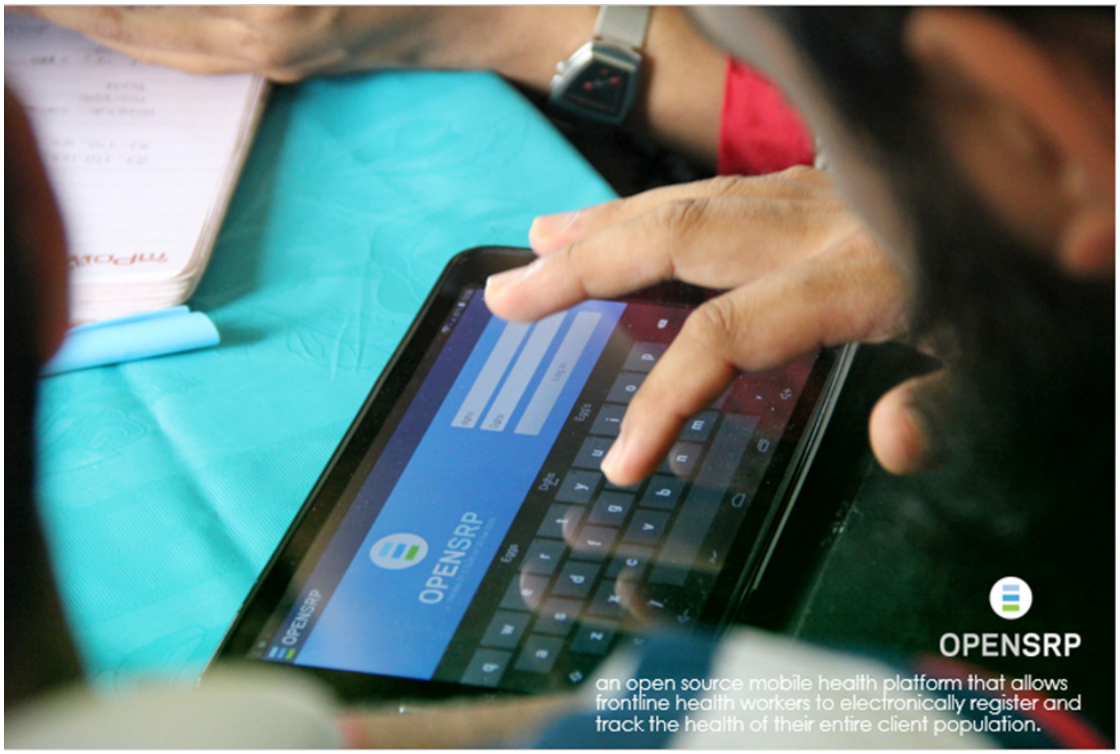
Also in **Bangladesh**, the company mPower has created a vaccination app to drastically increase the timeliness of immunization. To address the Tika disease crisis, mPower has developed a digital system using Open Smart Register Platform (OpenSRP), with support from WHO, that digitizes the registration of pregnancies and birth events, and also assures access to that information by immunization workers, so they can take proactive and targeted measures if a child misses an appointment (**SDG 3**). For the benefit of beneficiaries, the system sends out automated SMS and interactive voice response reminders for vaccination dates and locations, and also gives them push–pull SMS-based access to their immunization records. MPower has run pilots in collaboration with Johns Hopkins University, ICDDR,B and the Ministry of Health, and demonstrated that these double-sided interventions have led to a five-fold increase in vaccination timeliness and about a 30 per cent increase in vaccination coverage.

The **Bangladesh** Friendship Education Society initiated the Amader Gram Breast Care e-Health Programme, which is a diagnostic and treatment centre for women with any kind of breast problem. The centre provides in one place affordable and high-quality services to diagnose breast problems, take pathology tissues samples if necessary, plan treatment, provide medical treatments for breast cancer (chemotherapies and hormonal therapies), and provide symptomatic care at home using regular cell phone communications for women with serious cancer. At our Breast Care Centre in Khulna (Bangladesh), we diagnose, plan treatment and provide medical treatment for women with serious breast problems and breast cancer. We have written guidelines for diagnosis and treatment of breast cancer, based on the best international data, for any doctors and patients to read. At our Breast Care Centre in Khulna we offer "one-stop" care for women who have a breast problem. We create an electronic medical record. We do a careful, complete physical examination. We perform a breast ultrasound examination with a high-resolution scanner. For any patient who has a breast change that may be cancer, we recommend and do an immediate painless needle biopsy to obtain tissue to make a pathological examination. For any patient who we find has a serious breast problem, the patient's situation is reviewed at our weekly international patient management telemedicine videoconference with international experts. This centre supports **SDG 3**.

The Ministry of ICT of **Bangladesh** initiated a project for the development of *Bangladesh National Formulary (BDNF) Online: The Authority on the Selection and Use of Medicines in Bangladesh*, in partnership with the Centre for Internet & Society (CIS), Bangladesh, and in line with **SDG 3**.

How to take medication in the right doses and the right time? What are the possible mistakes and side effects? What are different dosages and forms of the product available? These common questions regarding the rational use of drugs (RUD) invariably occupy the minds of all categories of people whenever they need to take medicines. Regrettably, however, prior to this initiative, Bangladesh had no online version of its official drug information. Moreover, there was a risk that the drug information that is posted on the Internet could be of dubious quality and even downright misleading, owing to cultural and language variations. The other problem is that unauthorized and commercial online drug indexes may contain advertising, as well as confusing, biased or wrong information (e.g. drug price, blacklisted drug, etc.). This situation is at odds with the Right to Information Act, 2009 and the Digital Bangladesh Vision, 2021 policy.

BDNF Online is an informative pharma-indexing website providing tailored solutions for the Bangladesh market and covering over 30 000 prescription drugs, over-the-counter medicines and natural products



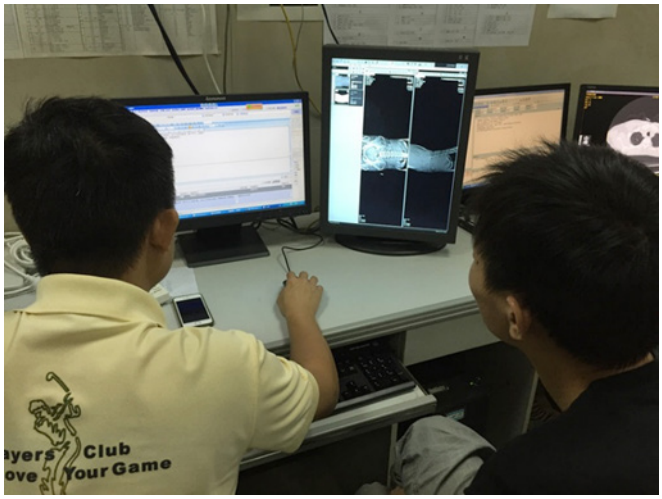
according to the official publications of the Directorate General of Drug Administration (DGDA) of Bangladesh. It is designed as a digest for rapid and easy reference, compiling, through ICT, drug information specifically on the drugs available in Bangladesh.

The **Bangladesh** NGOs Network for Radio and Communication (BNNRC) has launched *Bini Suter Mala* (Necklace with-out cotton thread) as part of the project "Nirapod- Saving women from unwanted pregnancy and unsafe menstrual regulation". The objectives of the project are to improve sexual and reproductive health of young people and assess the results of programmes on family planning and adolescent sexual reproductive health rights, violence against women, rights-based approach and menstrual regularity, by broadcasting radio programmes on seven community radio stations. The project will advance **SDGs 1**, **3**, **4**, **5** and **16**.

Despite significant health achievements in recent years, the absence of a properly functioning health information system (HIS) in **Bangladesh** has prevented policy-makers from monitoring the population' health in real time and targeting interventions accordingly. Bangladesh's HIS is highly fragmented with multiple overlapping reporting systems resulting in heavy paperwork and poor data quality. For this reason, the **Germany's** Society for International Cooperation (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH) elaborated *A Quiet Revolution: Strengthening the Routine Health Information System in Bangladesh* project that has distributed laptops and wireless modems to almost 15,000 government-run health facilities countrywide (**SDG3.d**). Some 7 000 facilities now report routine information electronically, using DHIS2.

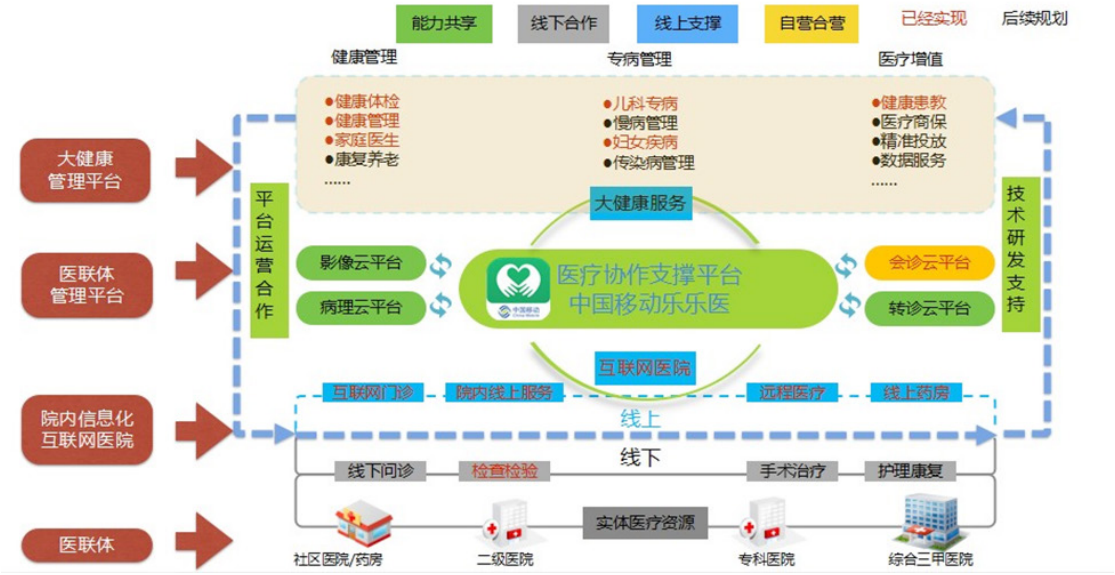
In **China**, the China Telecommunications Corporation initiated the programme China Telecom Medical Imaging Cloud and Applications (Imaging Cloud). Medical Imaging Cloud uses cloud computing and Big

Data technology to analyse, compute, return, transmit and visualize the data in the medical imaging information database, then to form a standard image that meets medical treatment standards. It can help medical institutions to solve their problems, such as saving, searching, acquiring and analysing for patients' image data, multi-party participation and remote treatment, which can help to show advantages of high-quality medical resources and improve the efficiency of medical services, as well as the nature of science and accuracy of medical diagnosis (**SDGs 3, 10** and **11**). China Telecom deeply cooperates with the Health and Family Planning Commissions and medical and health institutions at all levels. China Telecom developed and promoted the Medical Imaging Cloud platform in order to provide integrated applications of medical imaging, which include cloud services for medical image archiving and storage, clinical application, Picture Archiving and Communication System, teaching practice, mobile remote image application, etc., to support real-time cross-regional remote consultation. This Medical Imaging Cloud platform from China Telecom is also famous for providing safe and stable service. It provides a reliable guarantee to medical treatment and helps hospitals to innovate medical service modes by using multi-level storage, so that it can help to improve efficiency and level of medical service, and to meet diversified and multi-levelled medical and health requirements from people.



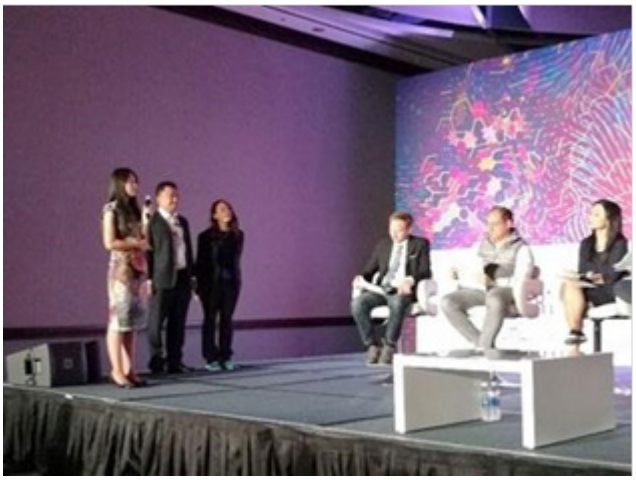
Also in **China**, the Mobile Communications Corporation Government and Enterprise Service Company created the programme National Telemedicine Integrated Service Platform. With the goal of deepening medical reform and serving people's livelihoods, and a target of improving primary care to society, the project has built a national-level telemedicine integrated service platform, together with the China–Japan Friendship Hospital, directly under the guidance of the National Health and Family Planning Commission of the People's Republic of China. Under the guarantee of China Mobile's communication capabilities of 4G, Internet of Things, data leased line and so on, and giving full play to the integration advantages of operators in the "cloud-access network-terminal", the platform accelerated the business expansion process by utilizing the advantages of low-cost autonomous terminals and the like. Until now, it has supported a number of state-level medical and hospital construction projects, covering more than 400 hospitals in 30 provinces, and has supported 20 000 people. At the same time, the platform is supporting China's first major livelihood project – the Internet + Health Poverty Alleviation pilot project (Yingtan). More importantly, the platform is jointly united with the many authoritative hospitals across the country to build a broader national specialist medical cluster and a national system of classification and treatment of diagnosis and treatment, and to rapidly bring the high-quality medical service resources of big cities to the grassroots level. The project fully integrates ICT with health care, and its business philosophy and service system provide an example for international markets and other healthcare-related areas. This project is in line with **SDGs 3, 8, 11, 16** and **17**.

The **China** Mobile group Sichuan launched the application LeLe Doctor App. The shortage and the uneven distribution of medical resources cause it to be difficult and costly to some extent to see a doctor for people in China. Sichuan Mobile and the medical centre of West China Hospital, Sichuan University integrated mobile users' resources and West China Hospital, Sichuan University's medical resources to design and build a mobile app called LeLe Doctor, a platform that contains health consultation and follow-up service after consultation. Based on ICT technology, the model of the LeLe Doctor app is more sustainable compared with the traditional medical treatment model. LeLe Doctor App helps doctors communicate with patients through text, voice, telephone and other means. For one thing, the LeLe Doctor app effectively relieves the pressure of the problem that it is difficult for patients to see a doctor by creating a quick access to the doctors. More importantly, it releases the limited medical resources of doctors' hospitals via a more scientific and systematic online arrangement. Since the implementation of the project, it has received great attention and strong support. Currently, 100 patients have entered the stage of surgical treatment evaluation. This app is in tune with **SDGs 3, 8, 10, 11** and **16**.



In **China**, Beijing Qianyi Health Management Co. Ltd has created the *Yihudaojia* application. The Yihudaojia app constitutes a platform that connects doctors, nurses and patients to meet the rigid demands of on-site healthcare services for the elderly with limited mobility, pregnant women and children. At present, there are 27 000 practising nurses certified by the platform, the app has been

download by users more than 35 million times, and the on-site services cover 240 cities. Yihudaojia relates to **SDGs 1**, **3**, **5**, **8**, **12** and **13**.



In **China**, the China Mobile Communications Corporation Government and Enterprise Service Company has established the *Medical Transportation Management System facilitated by Telemedicine Technology*. The project creates a mobile cloud-based management system during emergency evacuations, applying state-of-the-art ICT to this highly specialized medical field. In view of the rapid development of global medical assistance services provided by the project's partner, International SOS, the project has huge potential to be used in more countries and regions, and effectively improves the quality of medical service and patient experience in modern international medical evacuations. The project is also of great significance as an exploration of cross-cutting business cooperation and a development model solution which may eventually benefit social life by accelerating technical applications to meet the needs of highly specialized domains. The project is of relevance to **SDG 3**.

In **China**, Neusoft Xikang Healthcare Technology Co. Ltd, partnered with Ningbo, has developed the *Ningbo Cloud Hospital*. The cloud hospital, first established in 2014, is a third- party health-management service platform that integrates data collection, education, remote diagnosis and such like, by combining several leading technologies. Ningbo Cloud Hospital achieves online and offline integration of diagnosis and treatment services and promotes the development of hierarchical diagnosis and treatment systems, thereby creating value for multiple stakeholders and providing extensive primary healthcare services to residents. The project shows how cloud hospitals can be developed and popularized in emerging markets to relieve the increasing burden on the healthcare industry. It serves the objectives of **SDGs 3**, **4** and **10**.

In **India**, the BBC Media Action (India) Ltd. – in collaboration with the Government of Bihar, the Bill and Melinda Gates Foundation, the OnMobile OnionDev Technologies and Pathfinder International – launched the application Mobile Kunji. In trying to solve the public health problems of our times, technology is a compelling answer. Yet there are questions. How do you use low-end technology for high-end gains? How do you create an interface that can be used by the most marginalized, base-of-the-pyramid audiences? How do you then sustainably scale these solutions across millions of people? Our challenge: Create a job aid that could accommodate 11 health behaviours and over 100 attitudinal, normative and belief arguments, which could be carried by a community health worker at all times (**SDG 3**), and at the same time create excitement and motivation among the community health worker and families. The solution lies in a multimedia job aid – Mobile *Kunji* ("guide" in Hindi) – that brings together an interactive voice response-based mobile service and a printed deck of cards on a ring. The Kunji cards have been designed to look like a mobile phone, with illustrations, supporting arguments and key messages. Each card has a unique mobile short code that corresponds to a specific audio message in the interactive voice response service. Mobile Kunji gets around the challenge of delivering audio and visual content without distributing expensive hardware. Since 2012, over 100 000 community health workers in Bihar have been equipped with Mobile Kunji, and 43 000 community health workers use Kunji every month, playing over 1 million minutes of content. Impact evaluations show that the quality of engagement between community health workers and families improves significantly, and significantly more families adopt lifesaving health behaviours (such as family planning and nutrition) when exposed to Mobile Kunji.

Also in **India**, Operation ASHA initiated a project for the Assimilation of Technology and Human Effort to obtain unprecedented results in last-mile delivery at an extremely low cost. Operation ASHA obtains unmatched results in delivery of healthcare and reduction of dropout rates in schools by training local youths rigorously and empowering them with technology applications. These applications have been developed in collaboration with target communities, beneficiaries, technology experts and

psychologists. Every application is loaded on off-the-shelf tablets, which have Internet or SMS connectivity. In line with **SDGs 2, 5, 8, 16** and **17**, Operation ASHA has developed a unique, patient-focused, local, deep, community-driven, technology-supported, scalable, replicable and highly cost-effective model for delivery of services to the doorsteps of the most disadvantaged living anywhere, in urban slums or the remotest villages. The model was developed in collaboration with patients, field staff, target communities, psychologists and subject matter experts. It empowers local youths to help their communities access high-quality health services, both public and private, and prevent exploitation by unqualified health providers. Each application is described below. ECompliance is a biometric technology, which tracks employee-client meetings. If a meeting is missed, the system automatically escalates the matter to successively higher levels. EDetection guides workers to ask relevant questions and provide proper advice to the client. EAlert mimics a manual lab register. It sends results via a text message. The Electronic Medical Record System collates data automatically into reports. ECompliance Suite enables various applications to speak to each other automatically, without human intervention. ECounselling ensures high-quality counselling of each client and their families. EFAQ is a searchable database of FAQs. ESurvey is used to carry out surveys. It records the global positioning system location and the time of every survey. Trip Tracker records physical movement and calculates the distance covered and transport entitlement. EAudit allows an auditor to enter observations and qualitative answers electronically. The application awards a score, which is used to pay incentives. EAttendance is a modification of eCompliance to record school attendance and reduce dropout rates. ENurtition is another modification of eCompliance. It tracks delivery of nutrition products to disadvantaged persons. EReceipt records the presence of concerned persons through biometrics and allows recording of cash payments and comprehensive cash management.

Also in **India**, the ZMQ Development Company initiated the MIRA Channel – Mobile Phone-based Channel for Rural Women on Maternal and Child Health, using RMNCH+A Approach. MIRA is an integrated mobile-phone channel on maternal and child health using an RMNCH+A approach based on WHO standards. MIRA provides health communication and information to rural women and connects them in a timely manner with public health services. MIRA is used by community health workers, midwives and communities – pregnant women, children 0–5 years of age and adolescent girls. MIRA has multiple subchannels – such as prenatal care, child immunization, newborn care, family planning and adolescent girl health – with the RMNCH+A objective of improving maternal and child health (**SDGs 3, 4, 5** and **17**). MIRA delivers information in an iconic-graphical mode with localized context/audio, which works as a "talking toolkit" for millions of semi-literate and illiterate women. It has numerous trackers and calculators, such as a pregnancy week-by-week tracker, menstrual cycle calculator, ANC calculators, immunization calculators, newborn danger-sign calculator, etc. Women are also asked five high-risk pregnancy questions to identify the high-risk symptoms, which are sent over cloud to midwives on another toolkit to keep track of five high-risk pregnancy questions, to take immediate action if required. MIRA has a live dashboard that tracks minute-by-minute progress of

pregnancies, high-risk symptoms, ANC check-ups, immunization follow-ups, institutional deliveries, etc., and produces instantaneous "live data" for the State to take timely decisions. MIRA also provides numerous value-added-services for capacity-building of rural women using digital storytelling and decision-making tools on critical health-issues, building sustainable behaviour change. MIRA is operational in India and has successfully scaled to three more countries: Afghanistan, Uganda and Rwanda. Recently, a MIRA global case study has been published by an independent report from the UNESCO–Pearson initiative on digital literacy.

In **India**, Padmaseetha Technologies Private Ltd has launched the *Wearable Alternate Kidney* (MIRACLE). The vision is to empower the millions of renal patients world over with a near normal lifestyle through a safe and affordable continuous ambulatory peritoneal dialysis (CAPD) solution. Patients in rural areas often have to travel many hours for their dialysis, imposing a phenomenal burden in terms of time and costs. More than 90 per cent of patients, unable to cope with the financial, clinical and psychological burden, give up hope and die, leaving a devastating impact on their dependants. Mobile CAPD (m-CAPD) allows renal patients to carry out CAPD dialysis anytime, anywhere without taking time off work, and is accessible to patients located even in remote corners of a country. Patients are always connected with their doctors through a cloud-based patient management system, taking care of consulting, consumables and logistics in the most affordable manner. MIRACLE dialysis will bring down the cost per patient per month to less than USD 200, a phenomenal tenfold reduction in relation to the current cost.

The project, which supports **SDGs 3** and **17**, is carried out in partnership with several agencies (BIRAC Dept. of Biotechnology, Government of India; GITA, Ministry of Industrial Product and Promotion, Government of India; IITMadras Incubation Cell; MSME, Government of India), which have provided grants for this effort to the tune of INR 10 million.

Also in **India**, ZMQ Development has developed *FreedomTB - Active Compliance System for TB Control*, a 'technology for development' initiative to combat tuberculosis through multi-level intervention using a 360-degree model. It follows a bottom-up approach, whereby patients and communities are part of the solution design. They are connected to the TB health system to improve adherence, case detection, treatment management and capacity building through digital connection and behavioural change technology tools. The initiative is based on ZMQ's fully-Technology Linked Model (f-TLM), which effectively uses ubiquity of cellphones. It is being implemented in two states of India- Haryana and Rajasthan- and in Wakisto and Kampala districts in **Uganda**.

The project addresses **SDG 3** and is carried out in partnership with RNTCP-India (Revised National TB programme of India); Haryana State TB Office, India; Delhi State TB office, India; National TB

and Leprosy Programme of Uganda, with initial support from the UK Department for International Development (DFID), Bill and Melinda Gates Foundation (BMGF) and Indian Knowledge Park (IKP).

In **India**, *Trust+* is an innovative app solution which uses a social media app platform to connect parents, adolescent girls and boys, differently-abled children and teachers, so they can discuss sexual and reproductive health-related topics without any hesitation. Trust+ works to eradicate the social stigma which stops users from talking about their sexuality in a contextually suitable, age-appropriate, normal and humanly sensitive way. This has a high impact in preparing the next generation to combat sexual abuse in schools and at home and empowering them to talk about such topics in a respectful manner. The project relates to several SDGs, by ensuring, *inter alia*, healthy lives, equitable quality education and gender equality (**SDGs 3, 4, 5** and **11**).

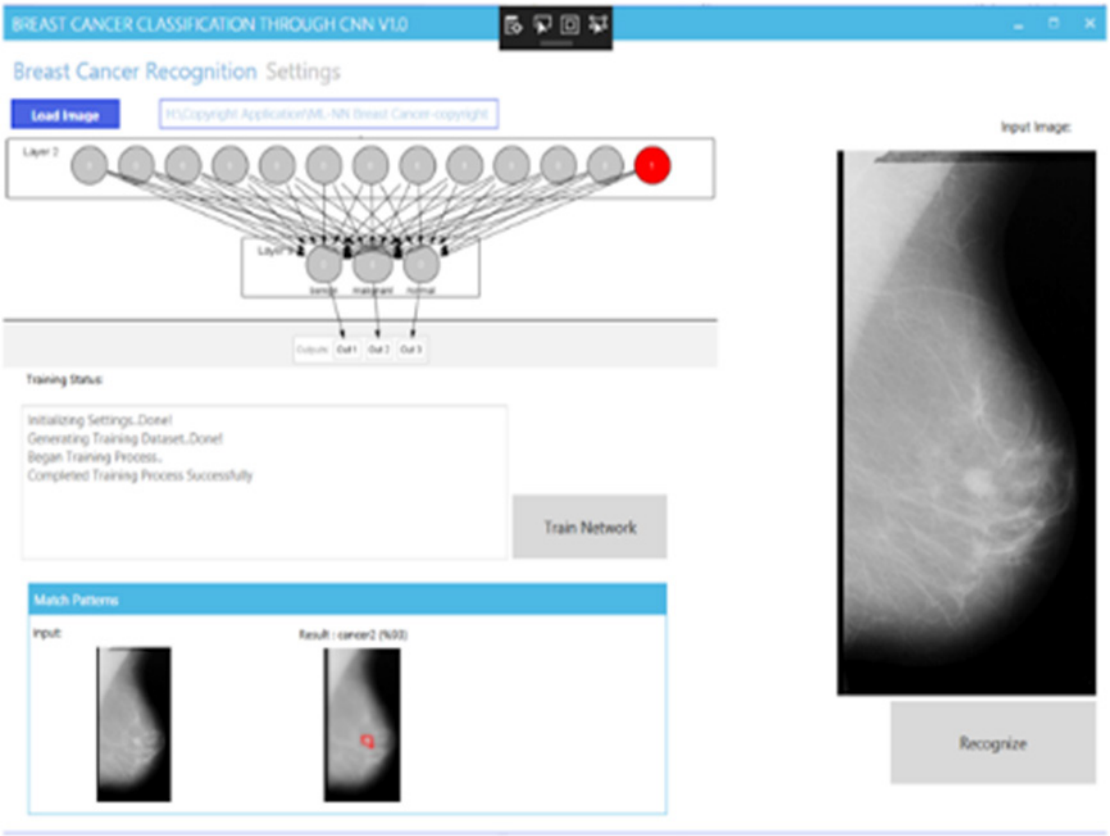
In **Indonesia**, the MedUp Company has released MedUp – AI Powered Healthcare Platform. MedUp is a platform to reach nearby and specialized hospitals with ease. MedUp helps people obtain health information through the integration of trusted doctors and health facilities (hospitals, clinics, dental clinics, beauty clinics, etc.) using Artificial Intelligence. MedUp focuses on providing comprehensive and reliable medical information and medical facilities. MedUp also helps health facilities or health providers to expand practice information more quickly and easily. We have more than 150 medical services in 79 hospitals in town. We have been operating in Yogyakarta, Indonesia, since October 2017, connecting more than 1 500 doctors with patients every day. We know that specific users need specific medical treatment, which is why we use Artificial Intelligence to know what users really need for their everyday treatments. Reliable data are our concern, and we try our best to provide the user with such data. This app supports the advancement of **SDG 3**.

Also in **Indonesia**, the Nuesto Technology initiative developed the project Qiwii: Virtual Queuing System and Big Data Analytic Dashboard to Improve Quality of Community Health Centre Services in Bandung, serving **SDG 3**. As the top three problems that Indonesia faces are health issues, one of the Government's main programmes is building community health centres in every area. However, due to the large number of visitors every day and manual queuing process, there are new problems such as disease diffusion in unhealthy waiting rooms and unproductive queuing times of two to three hours. The manual queuing also made the policy decisions slower, because the data will be gathered only after three to six months. All these problems made the health issues worse. However, after researching the problem, we found that the problems may be solved with a simple technology virtual queuing system we named Qiwii. Qiwii is built to simplify the queuing system with three main features: (a) registering from different channels; (b) estimated queuing time; and (c) real-time analytics and data update. Since the implementation of Qiwii, health services in Bandung improved 50 per cent with two main indicators: average time of queuing decreased from two to three hours to only 30 minutes to an hour, and real-time data analysis for health sector stakeholders have been updated. The decrease of average queuing time also made a great impact for disease diffusion and disease handling, because the waiting room is not as crowded as using manual queuing. Also, spread of disease was reduced 40 per cent, according to the report of the local deputy of health, and the system simplifies both patient and customer service flows. Productivity and customer satisfaction have increased from 3 (out of 5) to 4.5.

Pompi Club is an initiative from the National Agency for Food and Drugs Control of **Indonesia**, relating to the means of sharing large amounts of information and ideas about health issues, including but not limited to good nutrition, quality products for consumption, pollution, safe and unsafe food, preservatives and food colouring, and many more, thus matching **SDG 2** on achievement of food security and good nutrition for everyone. This website platform is established as a reference for the family, especially children, in terms of health awareness and food safety. The website is also equipped with e-learning materials such as e-book, interactive games, with many of interest to children, making education on health more interesting and exciting (**SDG 4**).

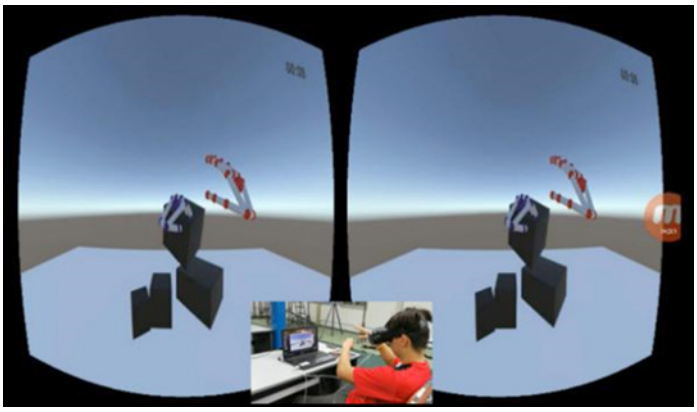
In the **Islamic Republic of Iran**, the Office for Statistics and Information Technology–Ministry of Health and Medical Education has a strategy for implementing the WSIS action line and **SDGs 9, 10** and **11** at the national level. Their project SEPAS is one of the biggest national electronic health record (EHR) projects of its kind in the world, aiming at building a nationally integrated citizen EHR for every Iranian citizen. Since 2008, the Islamic Republic of Iran has moved from a starting point of no EHRs to 90 per cent EHR coverage for Iranian citizens. To our knowledge, SEPAS is one of the most unique experiences of building a nationally-integrated EHR for the triple purpose of healthy citizens, informed government and enabled researcher. We believe our experience opens a new path of application of IT in supporting evidence/information-based healthcare management with local to international applications.

In **Malaysia,** Multimedia University has initiated the Multilayer Neural Network for Breast Cancer Classification project, serving **SDG 3**. Through the employed algorithm, it can classify the medical images into benign, malignant cancer and normal patient without prior information regarding the images. It is designed to assist medical doctors in breast cancer diagnosis through the Multilayer Neural Network for breast cancer classification. The learning capability of designed neural networks enhances the quality of classification. The invention is applicable in medical image processing-relevant industries, such as medical imaging devices companies and medical institutions.

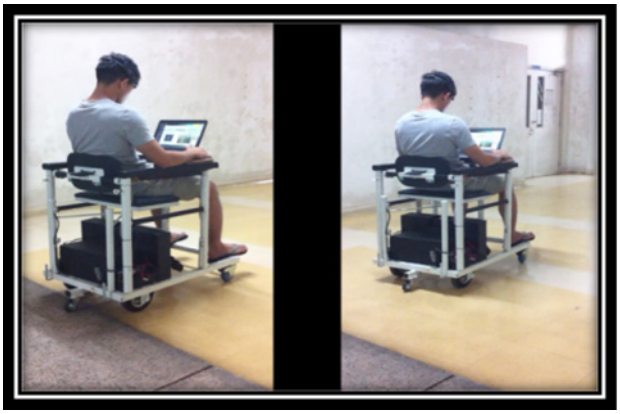


With another project called Brainwaves Controlling System Implemented on Ambulatory Assistive Device, **Malaysia** implements this local strategy in **SDG 3** as well. According to WHO, the number of disabled personnel increases annually. Our innovation is aimed at enabling all the immobilized disabled personnel, especially those who suffered from quadruple amputation and neuromuscular disease, to regain their mobility. In this innovation, we introduce a wheelchair-type ambulatory assistive device that can be directly controlled by human brainwaves. This ambulatory assistive device is equipped with enhancement features in the entire control system to provide comprehensive assistance for the

users. Patents and copyrights have been filed for this invention; journal and conference papers have been accepted; and it has won several national and international awards.



Also developed in **Malaysia** is the Post-Stroke Rehabilitation System Using Virtual Reality Technology, which serves **SDG 3**. This project describes the development of a virtual reality application for post-stroke rehabilitation purposes. The rehabilitation training involves motor and balance rehabilitation. Two applications have been developed in this project to serve motor dysfunction and balance impairment. The virtual reality headset enables an individual to expose the three-dimensional virtual environment. Then, the immersive virtual reality is able to offer mirror therapy in post-stroke rehabilitation and thus aids in recovery. With the integration of a leap motion sensor and a Kinect sensor, the individual can interact with the virtual world. This invention engages virtual reality for in-home physical therapy training.



Innoteva in **Malaysia** has implemented its regional project in support of **SDG 3**, IntelligenT Eye Scrutiny for Treatment. This project presents innovative development of a low-cost, smartphone-based intelligent system integrated with a microscopic lens that allows patients in remote and isolated areas (developing countries) to have regular eye examinations and disease diagnosis. Since mobile technology has enabled the practice of care anywhere in medical fields, such as for patient monitoring, it is becoming a reality that a doctor need not be physically present to monitor patients or obtain their biological data. However, compared with other mobile-based intelligent health monitoring systems, there are limited developments focusing on retinal disease-related detection.

In **Malaysia**, the *Compact Rehabilitation Robot (CR2)* is being developed, in partnership with the National Stroke Association of Malaysia (NASAM), Universiti Teknologi Malaysia (UTM), Collaborative Research in Science, Engineering and Technology (CREST) and DF Automation and Robotics, to help therapists assist patients with rehabilitation training and boost their motivation using virtual reality games. CR2 is a compact rehabilitation robot that provides multiple customizable therapy modes, including smart assistance therapy, wherein the robot assists the patient's training movement when required and applies resistance to improve the patient's muscle strength. The CR2 robot offers three

training modes: passive, assistive and active. The training data are uploaded to the cloud, and users can easily review progress via the Internet. With interactive robotic assistance, patients are more motivated to do physiotherapy training during the rehabilitation process, hence facilitating healthy integration into everyday life, and helping to attain **SDG 3**.

NASAM News

COMPACT REHABILITATION ROBOT - CR2 PILOTS AT NASAM PJ

At the handover of the CR2 series - (from left) Dr Yeong of UTM, guest-of-honour Associate Professor Dr Arham Abdullah, Director of Industry Relations Division, Ministry of Education, Chris Low, NASAM Vice-Chairman and Sylvia Chong, NASAM General Manager.

Since October 2014, selected members at NASAM PJ have been training with a new rehabilitation device, the CR2-Haptic and the CR2-Motion, designed to improve muscle control.

The CR2-Haptic is used to improve wrist and forearm movement, more importantly, the system is able to sense and automatically provide assistance when needed or resistance, when the user starts to improve. The CR2-Motion is a rehabilitation system that is used to train arm and trunk movement. Both systems keep members engaged through fun and motivating virtual reality games.

Both systems are on loan for one year following a collaboration between NASAM and Universiti Teknologi Malaysia (UTM). The Compact Rehabilitation Robot was invented by a team of researchers led by Dr Yeong Che Fai, a senior UTM lecturer. **(To know more about the technology visit cr2connect.com)**

Members Vivian Lee (above) and Tan Chin Huat (below) exercising the fun way with the CR2-Haptic.

Also in **Malaysia**, the Faculty of Engineering and Technology, Multimedia University, has launched the *Brainwave Control System* (BCS), implemented on an ambulatory assistive device. According to the World Health Organization, the number of persons with disabilities is increasing annually. The aim of the BCS innovation is to enable all the immobilized disabled, especially those who have undergone quadruple amputation or suffer from neuromuscular disease, to regain their mobility. It involves a wheelchair-type ambulatory assistive device which can be directly controlled by human brainwaves.

This ambulatory assistive device is equipped with enhancement features throughout the control system in order to provide comprehensive assistance for the users. Patents and copyrights have been filed, journal and conference papers have been accepted and the invention has won several national and international awards.

The project, which addresses **SDG 3**, **4** and **8**, is carried out in partnership with PERKESO Rehabilitation Centre Melaka, Malaysia; Deakin University, Australia; Putra Specialist Hospital, Malaysia; National Medical Research Registrar; Neurotech (M) Sdn Bhd; and YIM Technology Resources Sdn Bhd.

Another project from **Malaysia,** entitled *InnovaBoard,* relates to a number of SDGs on health quality, education, economic development, and other domains (**SDGs 3**, **4**, **7**, **8**, **10**, **11**, **12**, **15** and **16**). InnovaBoard is an interactive wobble board, developed to help people to improve their body balance through training and strengthen their ankle muscles, and further motivate them using virtual reality games. It is a compact training device that provides multiple levels of difficulty, thus enabling patients to start with a very easy level accessible to everyone. Ankle sprain is a common injury that affects many people, not least athletes (one report estimate that 50 per cent of sprint injuries are ankle sprains, and 9 million people in America suffer ankle sprain every year). Other ankle rehabilitation solutions are available on the market, but most existing systems are complex, voluminous, too basic and less interactive.

The project is undertaken in partnership with DF Automation and Robotic Sdn Bhd, technical experts from Techcare Innovation Sdn Bhd and clinical professionals from the National Stroke Association of Malaysia (NASAM).

In **Pakistan**, COMSATS University Islamabad launched the project Disabilities Meet Complete Solutions for Disabled People. This is an application with specific hardware that provides a complete package to disabled people. It covers four categories of disability: Blind, Deaf, Dumb and Gait disability. Our system aids the user in reading, recognizing currency, crossing obstacles, human recognition, vehicle detection, colour dominance, speech-to-text, text-to-speech and speech-to-sign. We have figured out a way to distinguish between different types of gait disabilities, such as Diplegic, Hemipleg, Stomping, Stepage and Wedling Gait Disability, providing complete real-time information of the patient's gait in comparison with the reference angle of the gait, in accordance to **SDGs 3, 4** and **5.** The result is then displayed in the form of a graph that can be saved and checked in the future. We have used Android Studio as a development platform for the software part. Raspberry Pi and Python are used for the hardware portion. The computer visions library has been used in this project. The software part is to be interfaced with the hardware module, which can then be used by the blind to guide their path for indoor walking, making life easier and simpler. For blind people, the application contains Vehicle Detection, Human Detection, Weather Guidance, Map Guidance (outdoor map), Optical Character Reference, Colour Dominancy and Currency Recognition. The hardware portion is a special feature of the system that is basically for the blind. In this part, the application is interfaced with a server, where a database is developed and then is interfaced with Raspberry Pi and Android Studio. This module is then interfaced with a Kinect sensor, which is used for virtual mapping of a room, guiding blind people on their way. For Dumb, text-to-speech language is used to communicate dumb people

with speaking people. For Deaf, speech to sign and text to speech feature is included to convey the message of deaf to hearing people and speech-to-text for communicating with the deaf. For Gait, we use three different colour bands that are tied up on a patient's body and find the angle between them, providing the patient complete information about his/her gait.

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Also in **Pakistan**, the *Sehat Kahani* ("Story of Health" in Urdu) initiative created programmes for E-Health Clinics to provide easy access to health care. Sehat Kahani is a health tech initiative based in Pakistan providing healthcare accessibility to needy patients through the provision of employment opportunities to female physicians, who are otherwise unable to work due to social and cultural

reservations utilizing e-health. Sehat Kahani currently operates three healthcare verticals which include the following:

- E-Health Hubs: Sehat Kahani creates e-health clinics in the marginalized populations in order to create access to health care. Currently, Sehat Kahani has 14 E-Health clinics located in three provinces of Pakistan.
- Enabling Outreach – Preventive health: Through an extensive portfolio, Sehat Kahani creates health awareness and messaging in the communities as well as other populations. We are currently working with Engro, GSK and Unilever Lifebuoy, to name a few.
- Sehat Kahani Mobile Application: A holistic mobile and web-based platform providing access to physicians around the clock through a smartphone. We are currently launching this in the business-to-business market, enabling access to physicians through an online OPD mechanism.

Through these three healthcare verticals from which Sehat Kahani has reached out and impacted more than 500 000 lives. Sehat Kahani is a for-profit company ensuring a sustainable business model around each vertical, thus ensuring sustainability as a company. With WSIS, we aim to expand our E-Health Hubs portfolio and create five tele-health clinics in the marginalized communities of the ignored provinces Baluchistan and Sindh, ensuring healthcare expansion and impact. The ultimate vision and mission of Sehat Kahani is to democratize health care by making it a common norm for people belonging to all walks of life within Pakistan. This initiative is in line with **SDGs 3, 5, 6, 8, 9, 10, 11** and **17**.

Surgical care in **Pakistan** is very scarce owing to the small number of hospitals and surgeons and the high incidence of post-operative com-plications. Minimally Invasive Surgery (MIS) facilitates quick recovery and reduces post-operative infections. However, it requires special skills, like expert hand-eye coordination and precise handling of instruments. These psychomotor skills can only be acquired through rigorous training. Various simulators have been developed for MIS training, but their licences are very costly, making them unaffordable for developing nations like Pakistan. In order to overcome this obstacle, a cost-effective MIS simulator called *SmartSIM* has been developed by the National University of Sciences and Technology (NUST), in collaboration with the Holy Family Hospital, Rawalpindi, Pakistan, and Dow University of Medical Sciences, Karachi, Pakistan. SmartSIM has been successfully used to train hundreds of surgeons in order to ensure quality health and education systems (**SDGs 3** and **4**).

In **Pakistan**, Telenor has launched *Digital Birth Registration* (DBR). This is Telenor Pakistan's flagship sustainability project, carried out under a tripartite (public-, private- and social-sec-tor) partnership in collaboration with UNICEF and relevant government departments of Pakistan, in pursuit of **SDGs 3**, **10**, **16** and **17**. The DBR project is designed to increase the birth registration rate in Pakistan, which happens to be one of the lowest in the world. It secures the fundamental right of identity for thousands of children across Pakistan. In 2015, DBR was piloted in three villages in Pakistan, where the birth registration rate in-creased by 206 per cent. On the basis of the promising results of the pilot, we were able to scale up the project in 2017 to 800 union councils (villages) in nine priority districts (Pakpatan, Rahim Yar Khan, Muzaffargarh, Bahawalpur, Rajunpur and Multan in South Punjab; and Thatta, Badin and Nushero Feroz in Sindh), under the same tripartite partnership.

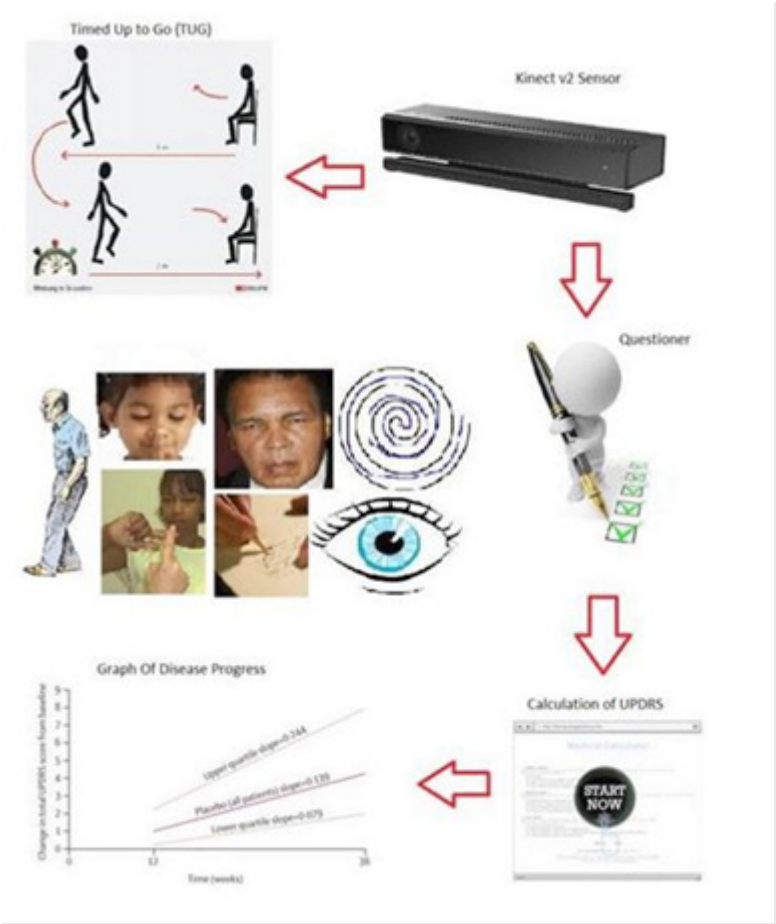
Also in **Pakistan**, Zeeshan Alam has launched the *Medical Alert System* (MAS) for dementia patients and caregivers/helpers. The purpose of this project is to provide care and help to both dementia patients as well as caregivers. Dementia is a heartbreaking kind of serious disease suffered by millions, which cannot be cured today and has become a very common and fast-growing illness. People with different types of dementia like Alzheimer's tend to be at greater risk of falling, which can often lead to surgery, and the death rate following a hip fracture for patients with Alzheimer's is also higher. A fall is the most significant cause of injury for the elderly. On occasion, people with dementia may shout, moan or use abusive language, too. This can be very stressful for caregivers as well as the patients themselves. These issues can be addressed by means of digital tools that will detect falls or shouting (when a patient gets agitated and starts shouting or crying loudly).

Our two-in-one MAS system will detect both falls and shouts, using a detection algorithm which is based on a simple threshold method, and alert the caregiver on their Android smartphone; it can also send SMSs to the caregiver and doctors. In addition, it includes a pill-reminder function, which prompts the caregiver to give medicines on time. Easy-to-use, cost-effective and ethically acceptable, the system facilitates remote monitoring by caregivers and helps to reduce stress. It serves the objectives of **SDG 3**.

Again, in **Pakistan**, Dawood University of Engineering and Technology in Karachi has launched *Ferox Virtual Reality*. This project investigates a novel medical rehabilitation system for curing varieties of phobia by creating different virtual environments using virtual reality (VR). The idea is to create natural environments using VR technology and, in addition, utilize a head-mounted display (HMD) to provide more realistic feelings to phobia patients. For manipulation and navigation, it will use the commercially available KinectTM motion sensor. For evaluation and monitoring of the patient's response to the virtual environments, a separate screen will be installed which will be directly connected to the VR control system. The researchers on this project believe that VR technology can significantly improve treatment methods and can play a vital role in reducing stress and anxiety, thus enhancing the quality of a patient's life. The project, which addresses **SDG 3**, **4** and **9**, is a collaboration between Naima Urooj, Sadia Asghar and Benish Rashid.

Trequant is a tremor quantifier which is used to detect, monitor and track tremor-based movement disorders in **Pakistan**. Its aim is to help people suffering from tremors to lead normal lives and also help doctors to cure tremor patients more success-fully. At present, there is no proper way to monitor essential tremors (ET) and doctors cure such patients on a trial and error basis. Data collected from the Trequant device will help pharmacies develop specific medicines for tremor patients. In this way, they might eventually be fully cured and lead normal and healthy lives. The project, which addresses **SDG 3**, is a collaboration between Usman Amjed, Usman Shabbir and Fawad Bhatti.

Another project from Pakistan in this category, the Parkinson's Disease Management System, has been launched by the NED University of Engineering and Technology. Parkinson's disease (PD) is a degenerative disorder of the central nervous system. It is a neurological disorder for which no specific diagnostic tests exist. In occasional cases, doctors may suggest surgery to regulate certain regions of the brain to improve health. Studying the symptoms and current clinical methods of diagnosis, and focusing on the proposed methods of diagnosing motion-related disorders in people, NED University



has proposed a technological solution to diagnose Parkinson's disease more accurately in its early stages by performing different (motion) tests on the patient according to the unified Parkinson's disease rating scale (UPDRS) using a Kinect V-2 sensor powered by Microsoft. The project, which addresses SDG 3, is a collaboration between Rabea Tahir, Shaher***vx*** Bano, Maseera Tehareem and Asma Afza.

In **Palestine**, Al-Quds University has launched the *Electronic Nose for lung-cancer detection*.

Lung cancer is one of the malignancies causing deaths worldwide (e.g. 1.59 million in 2012). This makes it the most common cause of cancer-related mortality. There are a range of non-invasive diagnostic techniques used for cancer detection, but the problem with those currently available is that they are expensive and are not suitable for general screening purposes. In many cancer conditions, early detection increases the chances of successful treatment. An electronic nose (an e-nose is a device that identifies the specific components of an odor and analyses its chemical make-up) specifically designed for capturing and analysing breath samples may be the best solution for detecting the presence of cancer as a first-stage diagnostic technique.

The India-Palestine Centre team working on the project, which relates to **SDG 3**, comprises ten specialists in different fields: embedded systems, networks and security, desktop applications, and mobile applications.

In **Thailand**, the Meditech Solution Co., Ltd. created the project SenzE: Eye Controlled Communicative Device for Paralyzed Patients. "SenzE" is the world's first Eye Tracking System embedded with Thai software. An image processing technique is employed, and a high-definition camera and infrared sensor would detect the patient's eye, just from looking at and holding for two seconds the desired position and entering the command. The paralyzed patient may communicate in a manner which is grouped as feelings, needs, food and drinks, and activities. Also, the live chatting keyboard could be done by the patient and is now supported in 18 languages with an auto translation system. Monitoring

systems through tablet or smartphone help doctor or caregivers tracking the patient in real time, and we have an Emergency Alert menu for emergency situations. SenzE Version 4 is also a complete entertainment device. The patient can surf the Internet, send e-mails, or look at Facebook, YouTube, online television news, games, e-books, movies and e-commerce. In addition, we also have SenzE Tablet Version, which is portable and more convenient to use. This project promotes the advancement of **SDG 3**, ensuring healthy lives and promoting well-being for all.

In **Thailand**, the Village Health Volunteers (VHVs) team working for the Tambon Health Promoting Hospital relates to a subdistrict hospital catering for the rural area. With the development of smartphones and the Internet, the intention is for the Advanced Info Service (AIS) to support VHVs with an application that uses digital means to assist and simplify the working process – the *Social Network for Health Promoting Hospital*. Sharing, monitoring and the prevention of epidemic diseases constitute the major feature the application provides. It also adds the agility of fast reporting which the Tambon Health Promoting Hospital uses to analyse health in the coverage area.

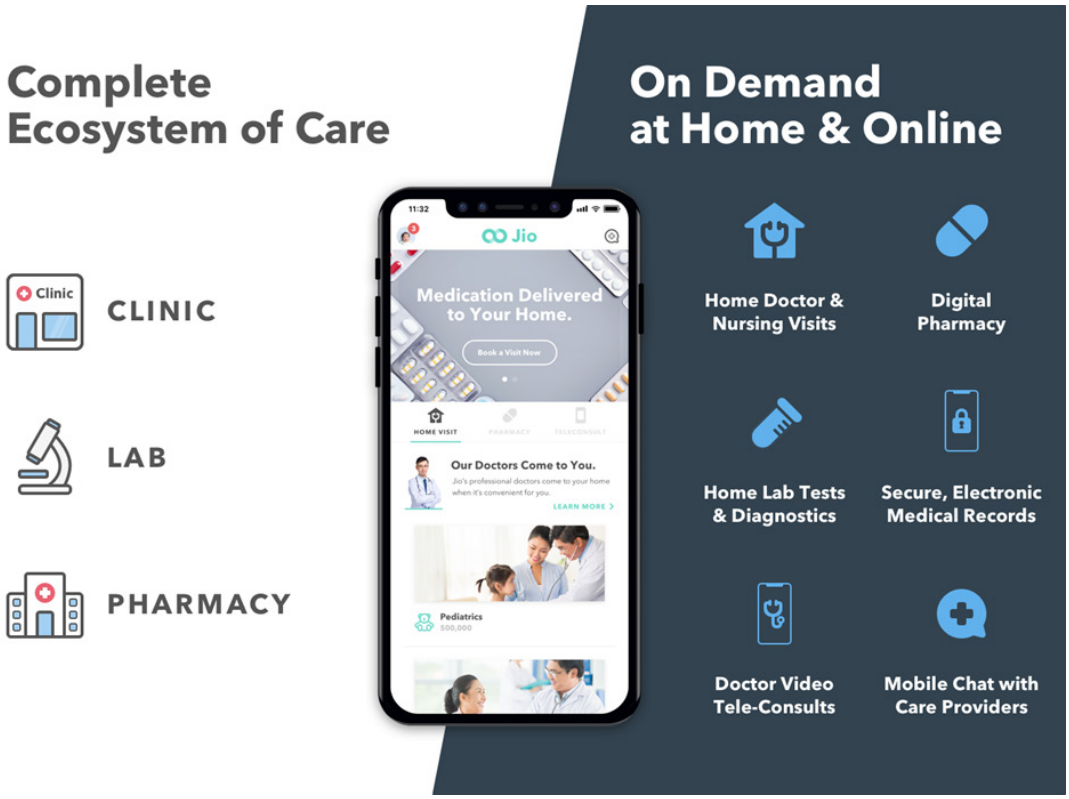
The project meets certain SDGs by ensuring the capacity for warning, risk reduction in regard to diseases, and promotion of lifelong learning opportunities (**SDGs 3.d, 4**).

In **Vanuatu**, the Chief Information Officer in the Office of the Government has launched the *Vanuatu Inter-Island Telemedicine and Learning* (VITAL) network project. The VITAL project began in the geographically isolated and remote village of Naviso on Maewo Island. A community with no cellular network successfully lobbied for Internet access to communicate with doctors at a hospital in Luganville, on Santo Island. Leveraging a multistakeholder approach, in less than six months, the two villages have engaged with doctors over 1 250 times and have helped 32 patients. This includes six life-threatening cases involving mothers and children, and ten patients who

would have been permanently disabled without intervention. This project, conducted in cooperation with the Vanuatu Ministry of Health, Vanuatu Telecommunications and Radio communications

Regulator and Maewo Telecommunications Committee, is relevant to **SDGs 1**, **2**, **3**, **4**, **5**, **7**, **8**, **9**, **10**, **11**, **16** and **17**.

In **Viet Nam**, the Jio Health enterprise has developed the programme Universal Access to Healthcare. Jio Health is a vertically integrated healthcare system that delivers care with the scalability, service excellence and innovation of a consumer technology company. Our combination of technology and clinical services empowers consumers with 24/7, on-demand access to triage, urgent care, preventative screenings, post-surgical and elderly nursing care, and chronic disease management, online and at home. Patients can use the Jio Health mobile app to connect with licenced, internationally trained care providers via free video consultations and care chat; book doctor and nursing visits at home and at our facility; request home lab specimen collection and delivery of prescribed medications; and securely access their medical records, including lab results, clinical notes and prescriptions. Our care providers are equipped with real-time patient health data, including lab results, clinical notes and sensor data, to enable informed, proactive care planning at the point of care. Furthermore, we enable our care providers to efficiently coordinate the care of our patients by collaborating within our network of multidisciplinary specialists. Jio Health targets **SDG 3** by emphasizing prevention and healthy living, leveraging epidemiological data to amplify the clinical reach of our care providers to serve larger populations, migrating the costs of health care from the labour cost curve to the technology curve, and empowering consumers with 24/7 universal access to quality, affordable care.



E-employment

In **China**, the Internet Society of China plans to set up the *APEC SME Informatization Promotion Centre*. With the aim of promoting employment, innovation, cooperation and sharing, and achieving win-win development, the centre will facilitate the integration of information and the development

of small and medium-sized enterprises (SMEs), in order to promote cooperation among economic entities in the Asia-Pacific Economic Cooperation (APEC), as well as to improve informatization capacity building in the Asia-Pacific region. The establishment of the promotion centre will not only boost the economic development of Asia and the Pacific, but also benefit employment over the world. Thus, the project is closely related to **SDG 8**, as well as **SDGs 9** and **10**. It is being implemented in partner-ship with China (Nanjing) Software Park, Tsing Hua Academy of Continuing Education, and Industrial Cooperative Society of China.

In **Indonesia**, the Saujana Indonesia Enterprise has developed the project Kerjabilitas, Job Portal for Persons with Disabilities. Kerjabilitas is the first and the biggest job portal for persons with disabilities, started in March 2015. Its goal is to alleviate poverty by promoting accessible, decent and equal job opportunities for persons with disabilities in Indonesia, which comprises of 12.5 per cent of the population. This project supports **SDGs 1, 8** and **10.** Since it started, Kerjabilitas has gained a positive response from the disabled community, the Government of Indonesia and the private sector. Not only does it provide accessible, equal job information, this service also helps companies to comply with the 1 per cent employee with disability quota law. As a result, this model provides business opportunities for our organization, while continuously creating social impact from each job placement it makes.

In **Indonesia** , the *Computerized System for Migrant Workers (Sistem Komputerisasi Tenaga Kerja Luar Negeri - SISKOTKLN)* is a data collection system for Indonesian migrant workers which integrates stakeholders associated with the placement of migrant workers, including the district government, placement company, health facility, insurance, psychological assessment, competency testing agency, financial institutions and Indonesian missions abroad (**SDG 8**).

SISKOTKLN uses the latest technology in the implementation process. Biometric technology is used to ensure compliance in regard to attendance and duration for a migrant worker's training in accordance with the regulations of the receiving country.

Indonesia's website *kios3in1.net* is an online platform for job seekers who wish to participate in job training, certification and placement. The service and information are jointly provided through co-operation with the "Balai Latihan Kerja Industri" (local vocational training centre for industrial jobs), widely spread across 34 provinces of Indonesia, and with the Ministry of Manpower. There is also information concerning job offers and opportunities to apply for a job through the website.

Thus, the website relates to employment for Indonesians, contributing to the economic growth of the country (**SDG 8**).

In the **Philippines**, the *Technology for Education, Employment, Entrepreneurs and Economic Development (Tech4ED)* project seeks to provide access to different aggregated, existing and proven ICT-enabled services and relevant content in one single platform. The platform, which offers content on education, literacy for special sectors, market, agriculture, industry assessment and government services, is accessible through the established Tech4ED centres in the country, which serve as a conduit for the efficient delivery of government and other services, and a potent tool for the empowerment and participation of unserved and underserved communities. The project aims to harness technology to deliver public services, thereby empowering and transforming society, and creating an inclusive, integrated and equitable countryside, combating poverty, and fostering education and equality, to advance **SDGs 1, 4, 5** and **8**. It is carried out in partnership with INTEL Philippines, Asus Foundation Inc., the Department of Science and Technology, Telecentre.org Foundation and the Department of Education.

In **Thailand,** Advanced Info Services (AIS), in partnership with the Thai Ministry of Public Health, has launched the *Social Network for Health Promoting Hospitals*. This is a working mobile application developed by AIS, under the concept of Thailand 4.0, for Village Health Volunteers (VHVs) to work collaboratively with Tambon Health Promoting Hospitals (HPHs). The app, which will be a key transformative feature of digital Thailand, converts a manual work process into a digital process. Information in the app is referenced by HPHs. This project aims to create sustainability in business, society and the environment, and thus distinctively focuses on **SDGs 3**, **4**, **8**, **10** and **12**.

Inefficient working processes, the inaccessibility of validated data from outside the company and differing perspectives on the part of colleagues are the most problematic issues of advanced information

services (AISs) in **Thailand.** With the mobile application, the *AIS GO NEXT* project can boost productivity and create strong bonds between staff. The person in charge accesses the company's system anywhere and at any time. The app encourages employee engagement, suggesting colleagues who share the same approach or interest. The application is integrated with the achievement system. It provides connectivity between officers and company.

The project deals with such issues as gender equality, economic development and sustainable industrialization (**SDGs 5, 8** and **9**).

E-environment

Relating to the **Africa, Asia and Pacific regions**, the international *Mobilizing Arab-Wide Action for Reliable Environmental Data (MAWARED)* is an online platform that allows users at any time and location to upload their environmental observations to a central server using smartphones. The system also provides information about environmental observations around the user's current location. The users can upload observations through a user-friendly interface by selecting the type of observation and status. The app directly identifies the location (latitude and longitude) and the time, then sends it to the server to be stored. The user can also take a photo of the observation using the phone's camera and upload it to the server. All observations are shown directly on an interactive web mapping system.

Relating to global partnership, the application promotes well-being and contributes to safety of cities, sustainable use of oceans as well as the fight against desertification, etc. (**SDGs 3, 11, 13, 14, 15** and **17**).

In **Bangladesh**, the Climate Change Adaptation, Mitigation Experiment and Training Park initiated a project to promote climate-resilient agriculture along the coastal belt of Bangladesh through ICT. Bangladesh is vulnerable to different types of climate-induced disasters. The major such disasters are floods, water stagnancy, droughts, cyclones, tidal surge, river erosion, salinity, extreme temperature and low light intensity, among others. These catastrophic events significantly hinder the agriculture production systems, and the economic and social development of the country, firstly through damaging the crops, livestock, fisheries and agroforestry, natural resources, establishments and infrastructures; and secondly through pulling back the ongoing developments, business and trade at local, regional and even global levels. Usually, the coastal belt is flooded from May to December. Salinity also restricts agriculture in the coastal areas. In the coastal zone, crops are lost due to water stagnancy or tidal surge during the wet seasons from July to December. On the other hand, during winter, salinity is the major threat to agriculture. During the summer season, due to lack of irrigation availability, farmers cannot produce crops on their lands. The aim of the project is to ensure food

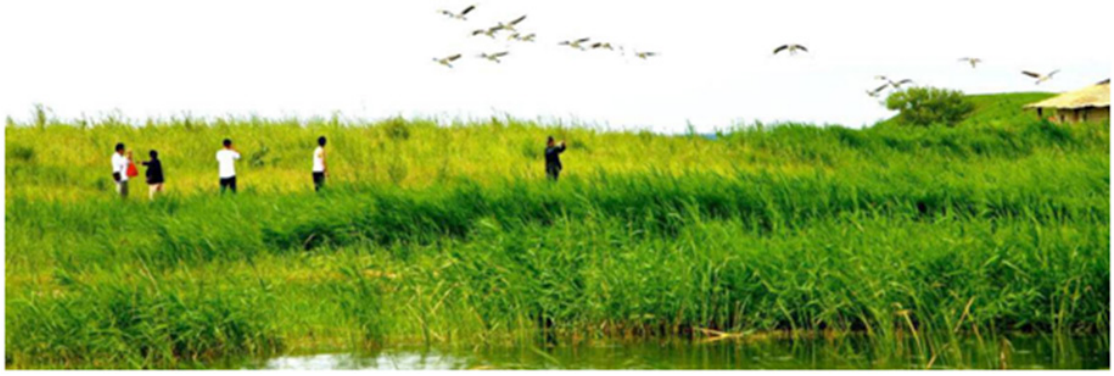
security of ultra-poor climate-vulnerable farmers promoting climate-smart agricultural systems using ICT in the coastal belt. Poor farmers gain fruitful access to ICTs through shared facilities in their own languages. The project is being implemented in the saline-prone areas establishing a climate-smart agricultural information and investment centre; developing and regularly updating customized software; disseminating seasonal agro-meteorological, soil and hydrological information relating to crop suitability using cellular phones and mobile Internet; and educating farmers on ICT and climate-resilient agricultural systems, soil health, and flood and saline-tolerant crop varieties. This programme is in line with **SDG 13**.

In **China**, the Jiangsu Posts and Telecommunications Planning and Designing Institute Company Limited developed the project Digital Wolong System – Post-disaster Reconstruction Project of Wolong Nature Reserve. This programme is based on the opportunity of post-disaster reconstruction, integrating the existing information systems and fully activating historical scientific research data. With the most advanced information construction concepts and technologies, the project constructs a complete set of information systems to realize the three-dimensional layout of front monitoring, intelligent support of infrastructure and intelligent services of application systems. It aims to achieve the goals of rebuilding and upgrading information infrastructure; comprehensively monitoring and analysing the ecological environment; disaster emergency response; and protection and research of the life cycle of the giant panda, as well as the cultural transmission of the giant panda, through the use of advanced information technology. In addition, the project can comprehensively improve the sustainable development capacity of the reserve, halt and reverse environmental degradation and stop the loss of biodiversity. It also provides useful exploration and practice for the informatization construction of other national reserves. This project has achieved good social, economic and ecological benefits.

China Mobile has developed the project research and development, and massive deployment of China Mobile Green Wireless Network. In recent years, energy consumption in China has increased continuously. In 2016, the total energy consumption in China accounted for more than 20 per cent of the global energy consumption. According to statistics, the overall energy consumption of the ICT industry accounts for more than 2.3 per cent of the total social energy consumption. In order to meet the growing demand of wireless broadband, the total number of base stations constructed by China Mobile has increased to nearly 3 million, from 920 000, in the past six years. Only by reducing the energy consumption of the wireless network can we effectively solve the high-energy consumption

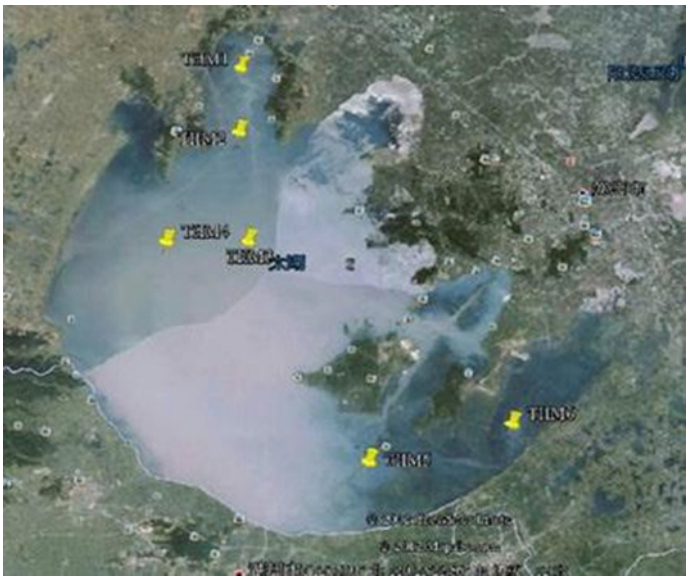
problem caused by the conventional ultra-high-speed network construction (**SDGs 7, 12** and **13**). Facing the complexity of a wireless network, our project team set up the energy-saving research framework of energy consumption modelling and measurement, from device level to equipment level to network level. In the meantime, systematized research has been carried out on the main technologies of energy-saving in wireless networks. The results of the project have been implemented into 2G, 3G, 4G and wireless local area networks. Through the wide application of integrated technologies such as software/hardware and network deployment, the 2G/3G/4G network saved more than 1.2 billion degrees of electricity annually at the end of 2016, which effectively reduces energy consumption. China Mobile also actively participates in the setting of international standards and contributes to international standardization organizations such as the Third Generation Partnership Project (3GPP) by sharing valuable technical experience that forms international standards to drive the green development of the global industry.

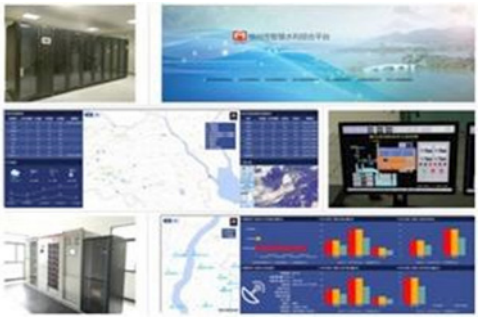
The **China** Mobile Quantong System Integration Co., Ltd./China Mobile Communications Group Heilongjiang Co., Ltd. developed the programme Intelligent Supervision System of Heilongjiang Wetland. This system provides an integrated application platform for wetland industry protection, including browsing, querying, statistics and analysis. The system is built to alleviate environmental problems and to actively respond to the national strategy. The project is also a great attempt to combine ICT technology with traditional natural resources to achieve the balance. The project aims to provide full time, full service integrated management and standard service interface for wetlands-related forestry business application system functions and services; help the rapid establishment of standardized and efficient information sharing; and provide the application platform of comprehensive display browsing, queries, statistics and analysis in the wetland industry data for wetland protection industry before 2020, through the integrated use of geographic information services, integration technology and wetland resources data on all elements. In order to achieve real-time and dynamic monitoring and management of forestry resources, the project monitors the ecological environment in order to contain the ecological crisis (**SDGs 3, 6, 11, 13** and **15**). We should further monitor early warning events, support ecological actions and prevent ecological disasters. The model of this project can be migrated to other fields to better protect the environment.



In **China**, China Mobile has undertaken the development and application of *sensor networks for cyanobacterial outbreak monitoring in Taihu*. The project is carried out in eutrophic waters, with the aim of setting up monitoring and early warning technology to address outbreaks of eutrophic water bloom. It has established a eutrophic lake (reservoir) water- quality prediction and early warning system. The technology can also be applied in many eutrophic water sources in Wuxi and elsewhere to prevent similar outbreaks, in order to protect drinking water and hence the safety of residents. It enables China to fulfil its governance and protection role, and advances **SDGs 3**, **6** and **14**.

The project is carried out with a number of partners: China Mobile Group Jiangsu Co., Ltd.; Wuxi Internet of Things Industry Research Institute; Nanjing Institute of Geography Limnology, Chinese Academy of Sciences (CAS); Institute of Computing Technology, CAS; Beijing University of Posts and Telecommunications; China Agricultural University; Zte Corp; Shanghai Wireless Communication Research Centre; Wuxi Municipal Environmental Protection Bureau**.**





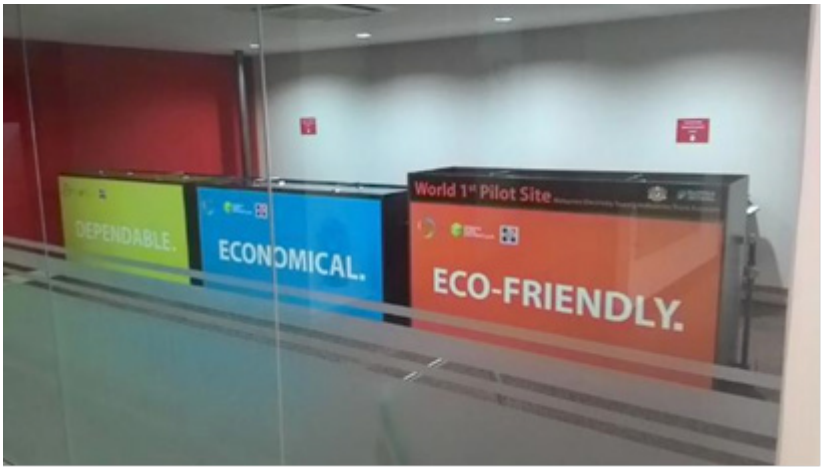
In **China**, Jiangsu Post and Telecommunication Planning Design Institute Co. has launched the *Xuzhou Smart Water Conservation* project. The roll-out of this project will contribute to building a sustainable city, in line with **SDG 11**, by enhancing water information sharing with urban management, and hence public security; improving reliability and availability of city water tracking, monitoring of water pollution events, early warning and emergency scheduling; and enabling systematic control of urban water and drainage for the efficient use of water resources. The project outputs such as the data-sharing platform, application-integration platform, and general command and dispatching platform are replicable and can thus be popularized in other cities in China.

In **Indonesia**, Iman Abdurrahman has set up the *Backpack Radio Station*, a radio station in a backpack made out of lightweight waterproof and fireproof materials and powered by long-lasting batteries and mini solar panels. The backpack will contain a mini radio station as well as a mini database, thus making accessible the data necessary to predict upcoming disasters such as tsunamis or volcano eruptions. The Backpack Radio Station can be a lifesaver for people living in one of the remote communities on the over 17 000 islands of Indonesia, who have no access to information and communication through ICT.

Implemented in partnership with members of the Indonesian Community Radio Network, the Combine Resource Institution, Radio FMYY, AgeofWonderland (Hivos & Baltan Laboratories) and Joris de Groot, the Backpack Radio Station is of interest to **SDGs 3** and **13**.

In **Malaysia**, the *Asia Pacific Green Data Center Farm* was launched as an alternative to normal data centres that globally pose a major environmental threat. Data centres contributed 3.3 per cent of the world's carbon emissions in 2014. The Asia Pacific Green Data Center Farm is a next-generation green data centre park utilizing super energy efficient cooling equipment and ICT equipment. The Eco2 technology submerses servers, switches and routers in a revolutionary coolant. This reduces carbon emissions and energy consumption by 50 per cent. The cost of deployment is also 70 per cent less.

Thus, the project meets certain SDGs related to WSIS Action Lines in regard to affordable, reliable, sustainable and modern energy, promoting sustainable industrialization, making cities inclusive and safe, and taking urgent action to combat climate change by revitalizing the global partnership for sustainable development (**SDGs 7, 9, 11, 12, 13** and **17**).

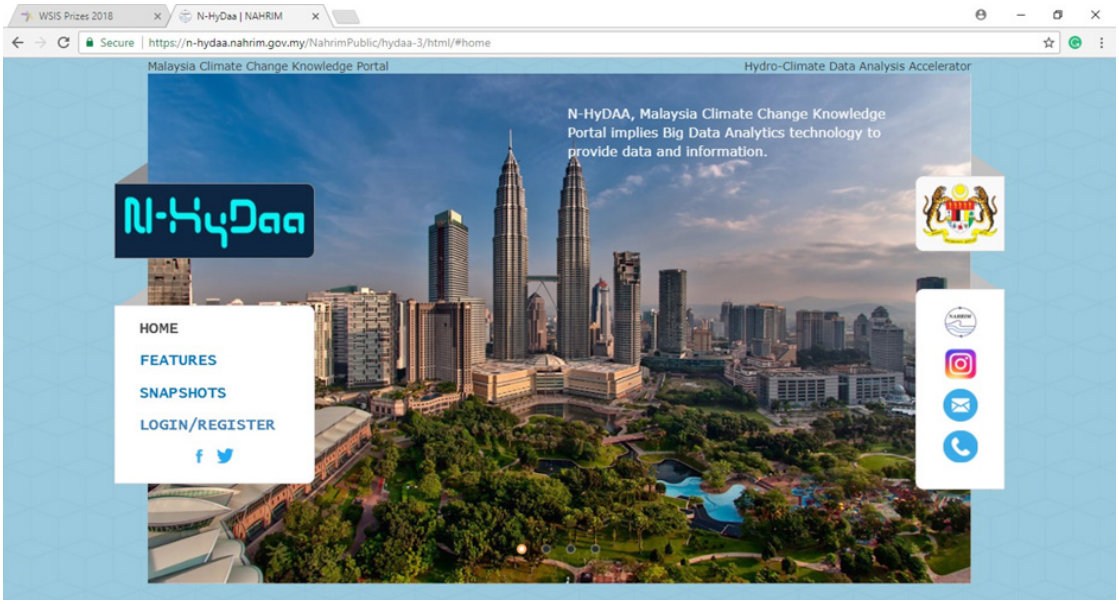


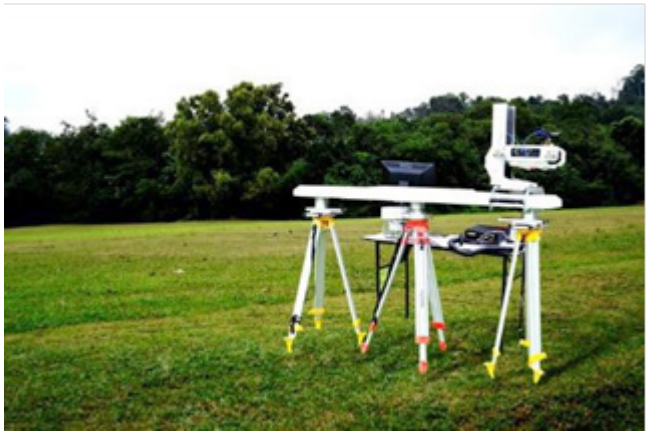
In the **Islamic Republic of Iran**, the Monenco Iran Consulting Engineers developed Iran's Smart Metering Project, which was initiated nine years earlier, by placing the implementation of the Iranian national advanced metering infrastructure plan on the agenda of the country's Government and Ministry of Power. The specific project goal was to transform the meters from a simple measuring and counting device to one element of an integrated system of hardware, software and people that can be used to better manage the electric services that customers find essential to their lives. Economic benefits are as follows: reducing non-technical losses; demand management (tariff management); improving consumption patterns through the information shared with the customer; improving the payment system; preparation for electricity retail markets' social benefits; no need for periodic trips to each physical location to read the meters; establishment of appropriate services for developing the electronic government; increasing electricity sale options with different prices; power delivery with higher quality and reliability; reducing cost of electricity due to reduced operating costs; increasing billing accuracy and speed by eliminating the human error factor; providing better customer service; creating customers' participation in consumption management and cost reduction; environmental benefits; reducing polluted gas and CO_2 emissions (won Energy Globe Award 2015–2016); reducing consumption through energy management and reducing network losses; and demanding management through sharing the information with customers, in line with **SDGs 1, 3, 7, 8, 9, 11, 12, 13, 14** and **17.**

In **Malaysia**, the National Hydraulic Research Institute recently launched the project Malaysia Climate Change Knowledge Portal. Climate change is real and happening now. A catastrophe caused by climate change is seen as the biggest potential threat to the global economy (WEF, 2016). Climate change knowledge is of paramount importance for government, the private sector and industry in tackling social, environmental and economic issues exacerbated by global warming through climate change impact at the regional and local levels. The knowledge is primarily created through voluminous data and information produced from climate change modelling and impact study. It is comprehensive modelling, analysis and processes, for transforming and bridging the said data and information to accomplish an acceptable and detailed knowledge of climate change for a faster and holistic action plan. Therefore, Malaysia Climate Change Knowledge Portal, known as N-HYDAA, which is the only climate change knowledge portal in Malaysia, is primarily developed for providing climate change and water-related information and technology. Climate change knowledge is crucial for present and future water-related business activities, engineering practices and the environment, particularly for sustainable development. N-HYDAA has eight hydroclimate-environment modules, which among others are rainfall, floods, droughts and water stress conditions for optimizing insight and foresight of future climate resilience (proofing) using Big Data Analytics technology. Furthermore, N-HYDAA has leveraged ICT as an enabler for climate change knowledge for achieving **SDGs 6, 9, 11** and **13**. N-HYDAA has definitely strengthened the required climate change platform and mechanism for assisting business entities, water operators, engineers, planners and decision-makers in designing, planning and developing water-related programmes, as well as risk and disaster management.

Another project from **Malaysia** is the *Portable Environmental Monitoring System,* a portable instrument for the remote monitoring of physical geographical environments (such as landslides, terrain subsidence, glaciers, avalanches, volcanoes). This innovative solution is designed to serve as an early warning system for life saving. It has the advantages of wide area coverage and simple and quick installation, and can provide continuous monitoring of high-risk areas under all weather conditions. The detection accuracy is in the order of sub-millimetres and the sensing distance is about 1-4 km. It can operate day and night and provide a series of temporal change detection maps through an online portal for real-time analysis.

The project achieves **SDGs 13** and **15**, combating climate change and desertification, and halting and reversing land degradation.

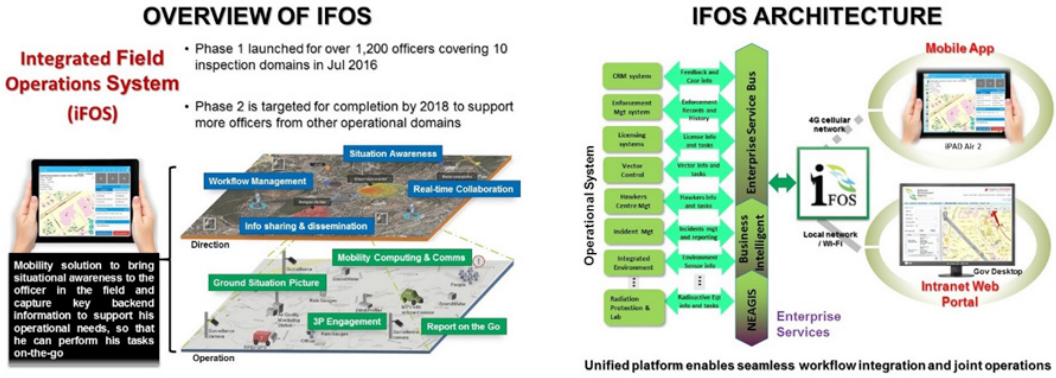




In **Pakistan**, the Hussaini Organization for Local Development, a community-based organization working in Hussaini, Gojal Valley in Norther Pakistan, successfully resolved a decades-long water crisis there by utilizing the available limited resources. So far, the organization has successfully executed two major water projects, both for irrigation and drinking, with the help of the global positioning system tool, thus contributing to **SDGs 2, 3, 4, 6, 9, 12, 13** and **15**.

In **Singapore**, the National Environment Agency developed the project Leveraging Technology to Safeguard Public Health and the Environment – Integrated Field Operations System (iFOS), which is a mobile workforce solution developed to support the National Environment Agency's (NEA's)

operational needs, so that NEA officers can remain fully mobile and perform their tasks on-the-go, and respond swiftly and effectively to environmental and public health incidents. The unified platform enables seamless workflow integration and joint operations, and supports community engagement in an integrated manner, allowing NEA officers to access information and resources at their fingertips, through a single platform on their mobile devices. Through integration of data from sensors and operations, iFOS enables NEA to achieve a more efficient allocation of resources and adapt to the needs of citizens and businesses. It also harnesses information from relevant systems to provide officers with timely, relevant information on-the-go, so they can better understand and engage their customers. With the availability of more granular near-real-time data, coupled with the use of data analytics, insights can be derived to support decision-making and augment NEA's services to the public. Leveraging ICT, NEA is better positioned to overcome its challenges and sustain a clean and green environment in Singapore, while facilitating more collaboration and enhancing transparency, accountability and efficiency. Moving forward, iFOS could be scaled up through development of mobility capabilities and linked up with external systems, where required, to enable a more integrated and pre-emptive mode of operation and incident and crisis management. This project supports **SDGs 3, 9** and **11.**



In **Thailand**, the *Low Power Wide Area Network (LPWAN)* is a type of telecommunication network designed to allow long-range low bit-rate communications among things (connected objects), such as sensors operated on a battery. The Internet of Things (IoT) is the network of physical objects or "things" embedded with electronics, software, sensors and network connectivity that enables these objects to collect and exchange data. The Internet of Things allows objects to be sensed and controlled remotely across existing network infrastructure. In terms of the smart city, an urban area needs to be developed that would create sustainable economic development and high quality of life by excelling in multiple key areas – the economy, mobility, environment, people, living, and government (**SDGs 9** and **11**). Low Power therefore constitutes one of the best ways to deploy the smart city ecosystem. The project's objectives are to:

- Promote the LPWAN network provider under the CAT Telecom (public limited company) network infrastructure
  - a) Data communication and Internet network existing
  - b) 3G/4G mobile network existing
- Deploy LoRa gateway in CAT Telecom network infrastructure
- Build e-environment application at CAT Telecom for smart city
- Smart weather data retrieved in the cities around Thailand
- Integrated API (application programming interface) module for more sensor development.

E-agriculture

In **Bangladesh**, the Bangladesh Rice Research Institute developed the programme Rice Knowledge Bank, in line with **SDGs 2, 3, 5** and **8**. This is a dynamic source of knowledge that will be updated regularly to keep consistent with the latest innovations and users' feedback. The Bank contains rice knowledge to address the regional as well as national issues associated with rice production and training. It started with rice but extends its promise to be expanded to non-rice technologies in the future. Most of the contents, materials and training manuals were prepared in Bangla, so they are understandable to farmers and extension workers. The extension service providers are the immediate beneficiaries of the Rice Knowledge Bank. However, ultimately farmers will benefit from it. Everyone can freely download Rice Knowledge Bank apps from Google Play Store. The main sections of the Bank include: rice cultivation methods; Boro rice varieties and production methods; Aman rice varieties and production methods; Aus rice varieties and production methods; soil and fertilizer management; rice insects and their management; rice diseases and their management; quality rice seed production and preservation methods; irrigation and water management; training; and photo gallery.

Also in **Bangladesh**, the mPower initiative developed the Geodata System to Control Potato Late Blight. To combat the disease, mPower has developed a decision support service, which uses precision agriculture technology to warn farmers of a potential attack before the disease hits, and also prescribe appropriate preventive and curative interventions. The decision support service takes in variables such as farmer registration data, satellite imagery and data from Automated Weather Stations. The system uses these resources to continuously measure weather forecasts and satellite imagery, and evaluates this information against crop models in relation to the disease cycle of the pathogen. The decision support service then provides farmers with preventive spray advice when a late blight infection period is predicted to occur. It also assesses past sprays and evaluates if an infection is likely to have occurred in the past few days, which may result in curative spray advice. The resulting outcome saw a yield increase of 8.4 per cent and income increase of 10.4 per cent. MPower anticipates that the increased income plays a significant part in achieving **SDG 1** and eliminating poverty, specifically in underdeveloped farming communities. The boosted productivity will support **SDGs 1** and **2**.

In **Bangladesh,** the Bangladesh Institute of ICT in Development (BIID) has introduced the *Zero-Cost Extension and Advisory Services* (EAS) model to address multi-layer challenges in eco-system extension. The model consists of three major components – engagement of input supplier, integration of ICT solutions, and intense communication and awareness building. EAS is a potentially sustainable model with a win-win business proposition for all the stakeholders. Currently, BIID is implementing the model in Bangladesh in collaboration with the Bangladesh Seed Association (BSA) and its members (BRAC Seed, ACI Seed, Mallika Seed and Kishan Agro Services), with support from Katalyst. Soon the model will be scaled up with the financial institutions and other input service providers. The model is relevant to **SDGs 1**, **2** and **8**.

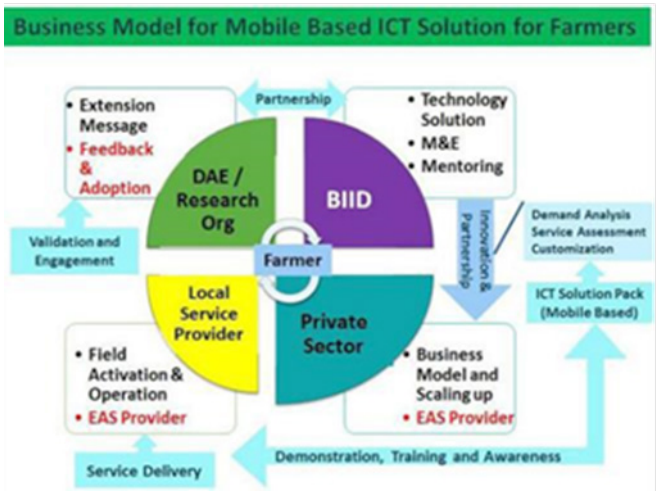
Grameen Intel Social Business Limited (GISB)'s *e-Agriculture* venture is an ICT solution to improve the incomes of smallholder farmers through higher yields and lower costs in **Bangladesh**. A suite of mobile-phone and PC-based applications provides expert agricultural advice in critical areas: fertilizer, soil-nutrient analysis, crop/seed recommendations, pest/disease control, harvest management and commercialization. Working successfully in four countries, in partnership with the International Fund for Agriculture Development (IFAD); Ministry of Agriculture Forestry and Fisheries, Cambodia; International Development Enterprise (iDE); and Netherlands Development Organization (SNV), GISB is achieving yield increases of 20 to 30 per cent and potential income increases of up to 50 per cent. Through public-private partnership programmes, it is overcoming major barriers such as literacy, accessibility and affordability by applying leading-edge mobile and cloud technologies, thus contributing to SDGs around food security, nutrition, poverty alleviation, ICT-literacy and employment creation (**SDGs 1**, **2**, **4**, **5**, **8**, **13** and **17**).

The next projects from **Bangladesh** relate to such problematic issues as poverty, hunger, healthy lives, gender equality, climate change, and green ecosystem (**SDGs 1, 2, 3, 8, 10, 13** and **15**). They also contribute to the revitalization of global partnership (**SDG 17**). The Prime Minister's Office of **Bangladesh** launched the *Krishoker Janala (Farmer's Window)* project, an inexpensive-to-build and inexpensive-to-operate, user-centric, indigenous innovation, in order to combat certain challenges in the agricultural domain. The main problems of this sector are:

- Unequal knowledge about the problems any farmer might face during the various stages of pre-production, production and post-production
- Lack of confidence when suggesting solutions to the affected farming communities
- Absence of up-to-date and timely information on ways to identify and treat plant diseases
- Lack of formal education
- Use of crude and inaccurate terms to identify plant diseases.

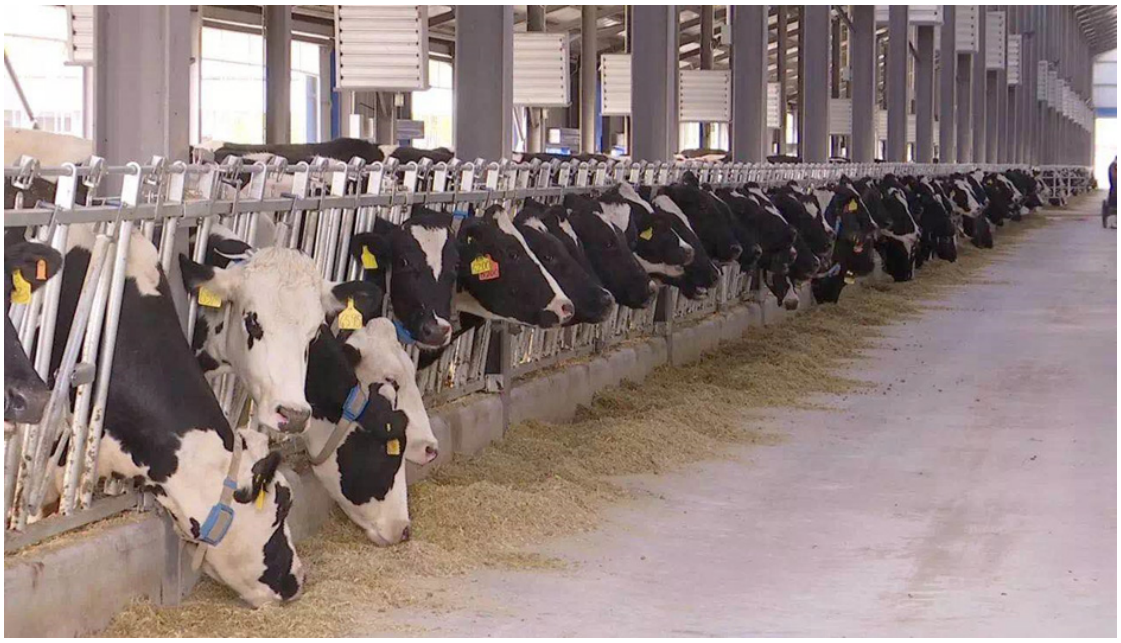
The Krishoker Janala project aims to combat all these challenges.

The *'Zero Cost' extension model & Advisory Service* is developed by the **Bangladesh** Institute of ICT in Development (BIID), as a business model for extension and advisory services (EASs) to serve smallholder farmers through private sector partners powered by ICT. It is a model which will facilitate free extension-related information and advisory services for the clients (farmers) bundled with input packages. Every farmer who buys an input package will be entitled to receive an information service package whose value will depend on the value of products. As such this model provides a sustainable business case to the private sector which plays a major role in the agricultural extension ecosystem. The Bangladesh Seed Association (BSA) expressed its interest in collaborating with BIID on the new EAS model. BIID is also in collaboration with development partners to pilot and implement the model in the field.



In **China**, the Beijing Nxin Internet Technology Co. Ltd. initiated the project Internet of the Pig Industry. Nxin is a high-tech enterprise in "Internet+Agriculture" technologies. Nxin has built a full-chain Internet service platform with three key platforms as core business: "Data + E-commerce + Finance", or pig service, pig trading and pig finance. By making use of mobile Internet, IoT, cloud computing, big data and other technology, the Internet of the Pig Industry forms a business model of "management digitization, business e-commerce, financial development and industrial ecology", which has been extended to agriculture, including oranges, donkeys, aquatic products, egg poultry, etc. The Internet of the Pig Industry realizes the cross-border integration of "Internet + Modern Agriculture" and data-driven transformation and upgrading of the whole pig industry chain. Besides, the platform provides data support for the macro-control and sustainable development of China's pig industry. This project serves **SDGs 2** and **12**.

Also in **China**, the China Telecommunications Corporation created the project NB-IoT Application: The Shepherd Boy. Milk is regarded as a source of daily essential nutrients for all nations throughout the world. Since reform and the opening up of China, milk has also occupied an increasingly important position in Chinese consumers' daily lives. In order to alleviate the demand gap of milk, China Telecom has developed a cow oestrus monitoring system, The Shepherd Boy, based on the NB-IoT network to perform real-time monitoring on cow oestrus through information technology, and to reduce the non-pregnancy period and increase milk yield, in the meantime monitoring the health condition of cows and guaranteeing milk quality. At present, The Shepherd Boy has been promoted and used in 13 provinces across the country, the accuracy rate of oestrus has reached 95 per cent, and the average annual output per cow has increased to six tons. There are about 14 million dairy cows in China and there will be a huge opportunity for the large-scale promotion of this application. This is cruel and it should not exist. The development of The Shepherd Boy business will drive the whole industry chain and will cover different links from the industrial chain such as chips, modules, terminals, application integration and platform services.



Also in **China**, the Jiangsu Post and Telecommunications Planning and Designing Institute Co., Ltd. released the Hushu Smart Agricultural Centre IoT project, in line with **SDGs 2** and **3.** Through the comprehensive use of sensing, transmission and information technology, the project seeks to form an integrated comprehensive agricultural management platform with environmental perception, management automation and food safety supervision, to improve the information level of agricultural management. The Hushu Smart Agricultural Centre IoT project has increased the level of the precisely measured scientific approach to provision of the agricultural resource and strengthened food safety supervision, which is in accordance with the SDGs having to do with resources, economy and human life. The project has brought social efficiency and economic benefit for the local administration department and farmers. It is also in accord with the core WSIS values and the SDGs of the 2030 Agenda for Sustainable Development, such as achieving food security and improved nutrition, and promoting sustainable agriculture.

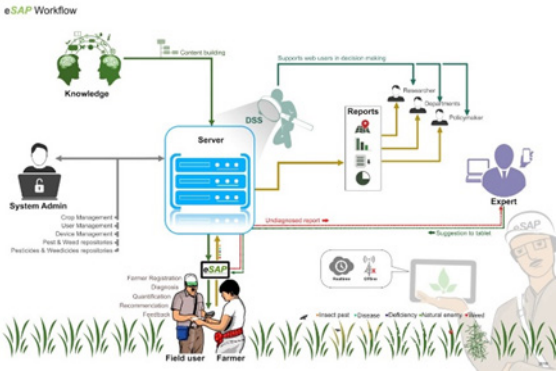
India launched a number of projects that also contribute to certain SDGs in regard to sustainable agriculture, economic development, gender equality, climate change, etc. (**SDGs 2, 5, 8** and **13**).

In **India**, the Rashtriya eMarket Services Pvt. Ltd. developed the project Online Trading Platform for Agri-Markets of Karnataka. Agriculture is dependent on monsoons and markets; inefficient markets lead to ineffective price discovery mechanisms, making the farming profession unattractive. Better prices and market information availability encourage farmers to continue farming, ensuring food security. Improved market infrastructure and use of technology create employment for the rural workforce. The online trading platform creates opportunities for all to trade, creating an inclusive and growth-oriented sustainable environment (**SDGs 1, 2, 4, 8, 9** and **12)**. Rashtriya e-Market Services – with a vision of "bringing in efficiency and transparency in the agricultural marketing system for efficient price discovery to benefit farmers and other market participants" – has provided a modern electronic online platform, also known as the Unified Market Platform, that connects all primary agri-markets in the Indian State of Karnataka. The online trading system for agri-markets in Karnataka boosts competition and facilitates transparent price discovery, which increases farmers' income through a raise in farmers' share of consumers' rupees. The trading platform combines technological efficiency and market-friendly trading features in a transparent atmosphere to make trading a rich and rewarding experience. By 2017, 95 lakh lots, valued at Rs 75 696 crore, having the quantity of 367 lakh MT have been transacted. Even after four years of implementation, it's just a beginning.

Also in **India**, the Centre for Development of Advanced Computing and National Medicinal Plants Board created the programme e-Channel for Herbs, Aromatic Raw Material and Knowledge. This project is a virtual marketplace that aims to connect diverse players in the medicinal and aromatic plants supply chain in India. It seeks to be a one-stop virtual showcase for the medicinal and aromatic plants sector, displaying related goods and services, thereby connecting prospective buyers and sellers. The multilingual web-based application with a supporting mobile app provides anytime–anywhere access to the service. The users of the platform include collectors, small farmers, cooperatives, producer companies, service providers, experts, input agencies, processing centres, small traders, etc. The demonstrated utility of the platform includes improved efficiency and transparency of the supply chain, acts as a digital repository for stakeholders and medicinal plants-related information resources and leads to better benefits to the farmers and collectors in terms of making informed choices. This project intersects with **SDGs 1, 2, 3, 8, 12** and **16**.

The **Indian** company EasyKrishi Pvt. Ltd., in partnership with the Department of Horticulture, Government of Karnataka launched the project EasyKrishi – Agriculture made easy. EasyKrishi is a four-year old technology start-up working in the field of agriculture in India. Ever since our inception in 2013, we have been serving as an effective platform for Indian farmers, in order for them to directly engage with buyers and sellers (**SDGs 2, 12** and **17**). Our tech-enabled app serves as a direct communication and marketing channel, which eases farmer-to-farmer and farmer-to-stakeholder communication and provides a remedy to uncertain market conditions. We have been instrumental in driving social impact, enabling farmers to create solidarity groups, thereby increasing efficiency and creating an outlet to escape debt trap and suicide. Our organization uses technology-based interventions in order to aggregate demand from the farmers and streamline the required supply back to them. Thus, we are creating a digital workforce within the farming sector, in perfect alignment with government schemes such as Digital India. As of today, our work benefits 8 000 farmers, whom we reach through Farmer Produce Organizations, each with 1 000 to 1 500 stakeholders and around 2 000 other farmer members. As a recognition of our social impact, we have been declared a Technology partner of Karnataka Agricultural Price Commission, incubated by the Government of Karnataka and identified as a NABARD Partner for Farmer Producers Organizations. Currently, we are working with GIZ on their Green Logistics Project, in coordination with the Department of Horticulture, Government of Karnataka.

The University of Agricultural Sciences in **India** has designed the project eSAP: a complete ICT Solution for Crop Health Management. The product, addressing **SDGs 1, 2, 3, 5, 8, 10, 13, 15** and **16**, is an ICT solution in the field of agricultural extension. It is a dedicated system that effectively integrates mobile communications, tablet-based technologies and cloud solutions to bring different players of the agricultural ecosystem – including farmers, agricultural universities and policy-makers – to interact on a single platform in real time, enabling two-way dissemination of real-time information, strengthening the agricultural sector of a nation. The eSAP uniquely addresses the crop health management issue structured with multimedia-based presentation of information in the field devices, transcending language and literacy barriers. It is the first solution to enable on-field identification and quantification of pest problems along with instant solutions. It also generates and synthesizes real-time data of pest situations of a region (country) and makes it available over its web solution to other players in the agriculture sector. The product also contributes to rural employment and entrepreneurship in local youth.



Shekru is a smartphone-based free application in **India**, operating in both English and Marathi that provides agricultural information as it relates specifically to events and schemes in Maharashtra and beyond. It lists more than 25 types of relevant items, ranging from training courses to field demonstrations. An organizer can also add a document or an audio recording describing the event. Events can be submitted by anyone, and users can express an interest in attending events and thus provide an RSVP to the organizer. The Shekru app also lists all schemes (insurance, subsidies, financial assistance, loans, etc.) of various stakeholders that involve the Ministry of Agriculture. The app will help in addressing **SDGs 1**, **2**, **4**, **5**, **12** and **16.**

The University of Agricultural Sciences, Raichur, **India**, in partnership with Tene Agriculture Solutions Pvt. Ltd., Bangalore, has initiated *Electronic Solutions against Agricultural Pests* (e-SAP): a complete ICT solution for crop-health management, which will help in attaining **SDG 2**. The e-SAP product is an

ICT solution in the field of agricultural extension. It is a dedicated system that effectively integrates mobile communications, tablet-based technologies and cloud solutions to allow different players of the agricultural ecosystem, including farmers, agricultural universities and policy-makers, to interact on a single platform in real time, enabling two-way dissemination of real-time information that will strengthen the nation's agricultural sector. The e-SAP system uniquely addresses crop-health management issues. It is structured with multimedia-based presentation of information in field devices transcending language and literacy barriers. It is the first solution to enable in-field identification and quantification of pest problems along with instant solutions. It also generates and synthesizes real-time data on pest situations in a region (country) and makes it available over its web solution to other players in the agriculture sector. The product also con-tributes to rural employment and entrepreneurship in local youth.

In **India**, Lablinks Biotech Private Limited has launched a game changing-innovation that makes *biofertilizer production* very simple. Biofertilizers in agriculture need no introduction: live bacteria that colonize plant roots and provide a cheap source of nitrogen and solubilized phosphorous and potassium are symbiotic to plants and offer an alternative to chemical fertilizers. Production of biofertilizers conventionally requires expensive infrastructure and skilled operators to ensure contamination-free batches. Torocell technology using disposable plastic bags is a low-cost, easy-to-use process producing concentrated bacterial cultures. A 30-litre bag can produce the equivalent of a 1 000 litre SS vessel. Farmers can produce fertilizer to meet their own requirements. Villagers and women can be gainfully employed. This project, carried out in collaboration with Dr Prasadarao Gandlur and Anupam Das, addresses **SDGs 1**, **2**, **8** and **15**.

Also in **India**, eKutir is a social business that leverages an ICT platform to progressively build a self-sustaining ecosystem to address multiple facets of smallholder farmer poverty. The *ICT-enabled Ecosystem for Poverty Alleviation* project lies in designing a holistic yet highly personalized approach to the needs of the farmers. The strategy is to leverage technology to harness and analyse the complex factors that affect the agricultural cycle and make them actionable. A logic tree maps different elements that impact the agricultural output of a farmer, factors their influence over each other, and analyses them to provide personalized advisory services.

The University of Agricultural Sciences, Raichur, **India**, initiated *eSAP - a new ICT application for pest management in agriculture* project. It represents the first dedicated system that enables the two-way dissemination of information in real time and relieves Indian agricultural extension from piggybacking mass media. It is the first to integrate tablet-based technologies and cloud solutions to create this dedicated channel that strengthens the agricultural sector of the nation. It brings different players of the agricultural ecosystem to interact on a single platform in real time, thus promoting well-being for all (**SDG 3**). So far, it has made a direct difference to more than a 100 000 farmers, the entire state administrative machinery, four agricultural universities and many other organizations.

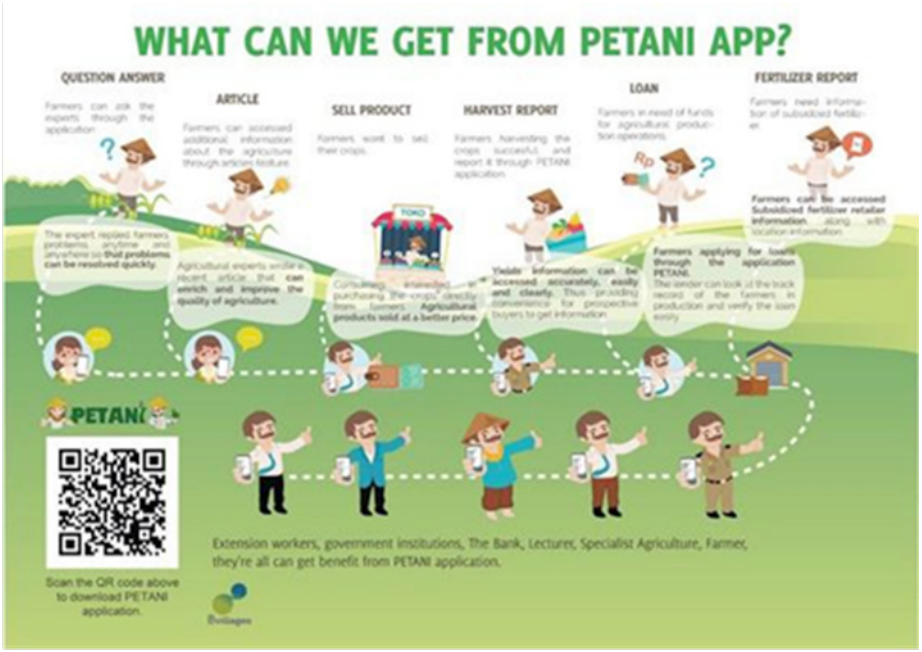
The *Harmonized Information of Agriculture, Revenue and Irrigation for a Transformation Agenda*

- *Precision Technology for Agriculture (HARITA-PRIYA)* is a pilot project assigned to the Centre for Development of Advanced Computing (C-DAC), **India**, for the purpose of acquiring microclimate information from farmers' fields using wireless sensor networks (WSNs), thereby enabling the dissemination of location-specific advisories to farmers. "Decision Support Models" are based on the data received from the field and alerts are generated for pest/disease forewarning and irrigation scheduling. Based on the alerts generated by the system, agricultural officers of the state government send personalized crop advisories to the farmers in the regional language, Telugu, via SMS.

In **Indonesia**, the Serikat Pekerja Telkomsel initiated the programme Baktiku Negeriku. Baktiku Negeriku Apps provide easy access to information for rural communities. The communities can share information and answer questions in real time with pictures attached, effectively enabling connection to experts in the field and to each other. It also bridges the gap in commerce of rural products, providing articles/videos about rural empowerment, and information about daily weather and the price of staple foods. It is thus in line with **SDGs 1, 2, 3, 4** and **5.**

In **Indonesia**, iGrow has developed the *iGrow My Own Food* platform. iGrow helps underemployed farmers and under-utilized land to produce scalable and efficient organic farming outputs, funded by urban people around the world. The goal is to connect farmers, landowners, investors and crop buyers together to create a complete farming supply chain. We start by identifying crops with stable demand, prices and prospective characteristics. After that we secure the demand with the customers and look for arable land and farmers to grow such crops. We then raise capital for seeds from urban people on the platform and invest it in the chosen crops and farms. We provide a "Farmville" experience to investors. The project is relevant to **SDGs 1**, **2**, **3**, **8**, **12** and **13**.

In **Indonesia, '** 8Villages Indonesia PT' has launched the *Information System for Farmers* (LISA), an education and communication application that focuses on empowering rural communities, starting with farmers but also including other micro businesses, too. It helps farmers to increase yields and micro businesses to improve and connect rural communities across Indonesia. It ultimately connects communities with MNCs, turning CSR into value. The project is carried out in partnership with Mercy Corps Indonesia, the US Agency for International Development (USAID), the German International Cooperation Agency (GIZ), Naha, CropLife International and the Government of Indonesia, and relates to **SDGs 1**, **2**, **3**, **4** and **5**.



The Government of **Indonesia** has mandated the Ministry to utilize ICT in the context of agriculture-based development, namely E-Planning. Hence, the *Guidelines on Agriculture-Based Development Planning* is a platform for the implementation of e-government to support the acceleration of bureaucratic reform. E-planning allows the regional government agency to submit a programme from a local farmers' group association on an online platform through a "top-down policy and bottom-up planning" approach. E-Planning is equipped with supplementing apps in the form of e-Proposal, to support the planning and budgeting process, and these are transparent, effective and efficient, in the Ministry of Agriculture.

The platform contributes to various SDGs promoting inclusive industrialization and economic development and reducing inequality within the country (**SDGs 8, 9** and **10**).

Indonesia's agribusiness e-hub, named *e-Petani or e-Farmers*, is a system designed to allow agribusiness stakeholders, especially farmers and agricultural trainers, traders and government, to obtain any information related to agribusiness activity. This platform also facilitates the distribution of income in the agribusiness supply chain, and maintains demand-supply activities to enhance the quality and added value of Indonesian farming products, thus promoting sustainable agriculture (**SDG 2**).

In **New Zealand**, Fairtrade Australia New Zealand (Fairtrade ANZ) has launched *Linking farmers to Fairtrade markets in Papua New Guinea*, under the project 'Technology as a Development Solution: Use of ICT to Improve Livelihoods of the Poorest in Remote Rural Areas'. Farmers and cooperatives in **Papua New Guinea** are challenged by isolation, compounded by poor telecommunication infrastructure and access to power, and are often unaware of the services available to businesses from telecommunication providers. Fairtrade ANZ has been supporting farmers in Papua New Guinea since 2008 to help them access the fairtrade market through Fairtrade certification. This project seeks to capitalize on ICT as a catalyst for development in Papua New Guinea, by partnering with cooperatives as well as public and private service providers to increase access to information and market opportunities through ICT. It is carried out in partnership with the University of Technology (UNITECH), Papua New Guinea, the International Finance Corporation (IFC) and the Papua New Guinea Coffee Industry Corporation (CIC), and serves **SDGs 1**, **2**, **5**, **8**, **12** and **17**.

In **Pakistan**, COMSATS University Islamabad launched the project Smart Farmer. Technological advancements are increasing day by day and with the passage of each day it has become necessary to introduce technology to the agricultural field. Launching of technology in agriculture not only gives efficient output, but also makes agriculture a more productive field. And keeping these points in mind, we are making Smart Farmer, an automated robot. This robot uses the latest technology to measure the aspects of soil. Smart Farmer detects the potential hydrogen of soil, humidity of leaves, and also measures the temperature of soil and air. After collecting all this important information about the plant, it then sends the information to the user, who is sitting far away from his or her farm.

The user can simply access the robot by a specific web address and can easily move the robot to the desired area. This robot not only tackles various tasks, but can also livestream the whole area in a closer way. Smart Farmer is prominent in its own way due to its synchronization with the basic necessities, i.e. Android-based mobile phones. By introducing this technology in the field of agricultural, we can make the lives of farmers easier by saving their money and time; moreover, they can get better production and yields. In the future, large and heavy machinery can be replaced by these kinds of small, smart robots. In short, we can introduce to the world a smart, fully-automated no-complaining and hardworking gardener. With an increase in the world's population, we need to increase the productivity and the only real option to overcome this factor requires the use of better and established agricultural technology. Our aim is to develop a robot that can tackle a wide variety of tasks.

Our robot Smart Farmer is set to improve production yield, while reducing required resources and making farming an exciting profession. It also allows farmers to reduce their environmental impact, increase precision and efficiency, and manage individual plants in novel ways. Our work proposes a different type of mobile robot to measure environment. It supposes a low environmental impact system to acquire air temperature, soil temperature and environmental humidity data continuously. It would maximize growing speed and crop health in general. This project is aiding the advancement of **SDGs 1, 2, 3, 8, 9, 12, 13, 14** and **15.**

Also in **Pakistan**, Telenor Pakistan is implementing *Mobile Agriculture*, in line with its vision of "Empowering Societies" and working towards the United Nations' Sustainable Development Goals.

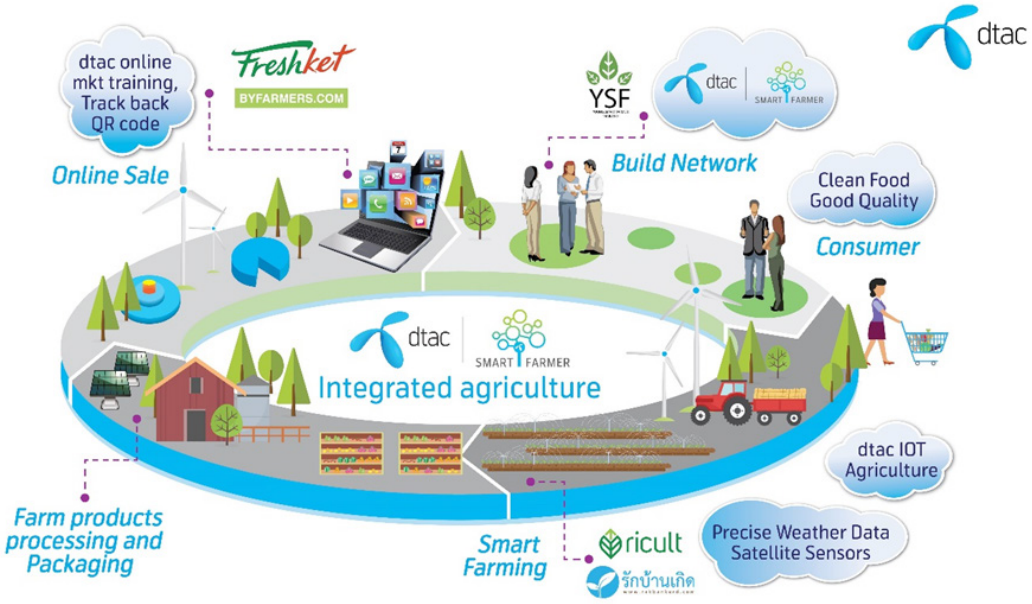
In this context, it launched its *Khush'haal Zamindar* (Prosperous Farmer) service for smallholder farmers, who make up 89 per cent of Pakistan's 30 million farmer base as at December 2015. The service provides localized, contextualized and customized information, including weather forecasts and timely agronomic and livestock advice, through text messages and outbound voice calls, to help increase crop yield, reduce post-harvest losses, safeguard nutrition and better manage adverse climatic effects and natural resources. Some 2 million farmers are currently benefiting from this free-of-charge service, which covers a range of cash crops, fruits and vegetables, fodders and livestock, in three different languages.

Project partners include the Centre for Agriculture and Bioscience International (CABI), Pakistan (primary content partners); International Livestock Research Institute (ILRI) (global content partner); GSMA (GSM Association) Mobile for Development (key project facilitator acting as the liaison between Telenor Pakistan and content partners); Scaling Up Nutrition (SUN), Planet Beyond Pakistan (technology platform providers and secondary content partners); FROG Design (consulting partners for product UX and UI); Telenor Digital, Market Development Facility (MDF) and LAUNCH food. The project relates to **SDGs 1**, **2**, **3**, **5**, **13** and **15**.

In **Thailand**, the company Total Access Communication PLC developed the dtac Smart Farmer project. At dtac, we believe that for the disempowered, mobile Internet can be a way out of poverty and the means to better education, health, economic development and security. It is, however, not enough to simply provide Internet access but to leverage the full benefits of meaningful digital solutions to address social, economic and environmental problems, close the inequality gap, and empower societies, which have been undergoing the transformation into Thailand 4.0.

In Thailand, about 40 per cent of the population works in the agricultural sector. Only 10 per cent of the country's gross domestic product is produced by this same sector, reflecting low productivity and inequities that can be improved with access to mobile farming information services. Younger generations (under 25 years of age) represent less than 1 per cent of the total farming population (approximately 13 million). The poor representation of younger generations is threatening the sustainable future of Thailand's major economic sector. With the vision of empowering Thai society, we want to strengthen productivity and competitiveness with our expertise and resources through the breadth of partnership schemes. Our commitment to the dtac Smart Farmer programme is set to deliver on the SDGs, particularly **SDG 10**.

This is a part of our business strategy, with the principle of sustainability at its core – dtac Smart Farmer will contribute to positive economic and social impact. Since 2013, dtac, together with the Sam Nuek Rak Ban Kerd Foundation, introduced the first-ever application specifically designed for farmers to increase productivity and enhance sale opportunities, with insights on market and consumers. The application becomes a platform of knowledge – wisdom sharing and management among farmers in different generations and regions. Thai farmers can gain and share knowledge on the integrated platform, e.g. produce prices, weather conditions, prevention and control of epidemics, tools and techniques for the improvement of the quality and quantity of products, and marketing. It has been downloaded 200 000 times so far.



In 2016–2017, dtac carried out several initiatives to generate groundbreaking impacts to young farmers' lives on the farm. Details of each initiative are:

- Agriculture Online Marketing Training Course: Among top pain points mentioned by smart farmers is how to capitalize on opportunities online. In partnership with the Ministry of Agriculture and cooperatives, dtac organizes the training courses nationwide to train farmers to successfully present and sell their products online.
    - Background and importance of ICT to farmers.
    - Online marketing for agricultural products: Workshop on how to build online stores.
    - Components needed for e-commerce: Product recommendation techniques, e.g. writing product description, developing sales promotion, and writing post/reviewing product on the online store.
    - Value added product development and packaging.
    - Financial scams.
    - Trust protocols.
    - Workshop on how to develop sales promotion for agricultural products.
    - Techniques for taking product photos with smartphones.
    - Techniques for making product video clips with smartphones.
    - Workshop on how to take and retouch product photos with smartphones so as to boost sales.
    - Advertising on Facebook and ad targeting: Increasing Facebook reach without paying.
    - Online shopping scams prevention.
- IoT solutions for agriculture (precision farming): In 2016–2017, dtac partnered with Thailand's National Electronics and Computer Technology Centre and Department of Agricultural Extension, inventing an IoT solution for agriculture. The device, a sensor based on the capability to monitor five parameters (light, soil humidity, temperature, water, wind), is linked to a router with dtac's SIM card relaying the information to the cloud. This solution will eventually enable the system to send targeted advisory information to farmers based on farm-level granular data. Overall,

dtac hopes to help smallholder farmers benefit from productivity gains by making the farming process more time-efficient. For example, the solution would help monitor and automatically adjust the temperature in a storing room depending on the crop's specificity. In early 2017, 30 sets of devices were installed and tried by farmers across the country. Both dtac and NECTEC continue working to enhance other automatic features to make it a complete precision farming solution.

- Precise, customized weather forecast and satellite imagery dashboard: In 2017, dtac partnered with Ricult, which has innovative localized and customized solutions to address farmers' problems by using satellites to help analyse yield potential and advise them on how to improve their productivity. Working together, dtac and Ricult initiated a pilot project that integrates Ricult's precise weather data and satellite imagery technology into the existing Farmer Info app. In addition to agricultural news and useful information now available on the app, these additional features will provide Thai farmers with accurate weather data and customized satellite imagery, which allow them to improve their farm management practices, leading to higher productivity and profitability. The project will be divided into two phases: phase 1, testing the solution with farmers, will be completed by February 2018; and phase 2, solution, will launch in June 2018.
- Annual Smart Farmer Award: dtac, the Ministry of Agriculture and Cooperatives and the Rak Baan Kerd Foundation present the award to recognize outstanding efforts of 10 young and smart farmers who applied digital technology to improve farming productivity and promote value proposition. This year, the excellence award goes to a young lady farmer, Ms. Jirawan Khamsour, a cultivator of organic golden Cordyceps from Chiang Mai Province. She shows her great ability to use innovation and research in agricultural planning, covering a whole ecosystem from upstream to downstream. She differentiates traditional farming with a market-led strategy, while traditional farmers stuck with supply side. Her product is traceable by using a quick response code, ensuring customers will get genuine products. She also joined forces with members in her community for wealth distribution. This project is in line with **SDGs 1, 2, 4, 8, 10** and **17**.

Launched by Advanced Info Services (AIS) of **Thailand**, the *City-to-Farm Agriculture Assisting (CFAA*) project is a service designed to create a sustainable agriculture economy through collaboration between agriculturists, consumers and governments using appropriate technologies. CFAA implements a win-win solution that allows consumers to invest capital in selected agriculturists so that the latter plant the products and deliver them to the consumers in return. This solution eradicates problems on both sides. The agriculturists are not forced to sell their products at low prices, but earn directly from consumers who are willing to pay for healthy products.

The project thus contributes to **SDGs 2, 3** and **12**, on the promotion of sustainable agriculture, well-being for all, and sustainable consumption and production patterns.

King Mongkut's University of Technology in North Bangkok, **Thailand**, created the *Drought Analysis by Using Ground Information Technique (GIT) for Farmers in Remote Areas* project. Using photos taken by smartphone and an application to analyse soil data, GIT is an essential component in remote-sensing data analysis for drought forecasting. An Android-based application will be developed for drought prediction in the future using data provided by smartphone. The method is based on a bottom-up segmentation algorithm that takes into consideration both the colour and texture properties of the image. The risk of drought is defined by threshold values at three levels: normal, risk and damage. The utility of this technique consists in its ease of access, using a smartphone to take photos of surface soil and processing the images via online networks.

The project meets several SDGs relating to agricultural productivity, climate change and the use of terrestrial ecosystems (**SDGs 2, 13** and **15**).

E-science

In **China**, the Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences initiated the project Global Change Research Data Publishing, Repository and Sharing. The project is a data publishing and sharing platform on global environment change at either global, regional, national or local scales. It was established in June 2014 by the Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, the Geographical Society of China and partners from the Jomo Kenyatta University of Agriculture and Technology, Kenya; South African University; and 36 professional journals. More than 340 datasets from 500+ scientists and data providers from 11 countries were published. All of these datasets are openly available to be downloaded. More than 250 000 IP users and almost 700 000 visitors from more than 74 countries downloaded the data (updated on 26 December 2017). The Global Change Research Data Publishing, Repository and Sharing project was awarded the special contribution award by the Big Data Stalinization Committee of China and one of the Top 50 Big Data Cases of China in 2016 (the only one in education and academics); Best Practice in the first United Nations World Data Forum (2017, Cape Town); and Best Practice in the Global Earth Observation System of Systems (2017, Washington, D.C.). It is recognized as the new milestone of research data sharing in China. This project is advancing **SDGs 1, 13, 14** and **15.**

The Government of **Indonesia** created the *National Science and Technology Library,* which represents a collective subscription to international scientific journals and management of the digital library. It is available to and easily accessed by researchers, engineers and lecturers working on research and scientific writing.

The National Science and Technology Library targets **SDG 4,** providing lifelong learning opportunities, etc.

Pajoohyar is the first citation organization software in the **Islamic Republic of Iran**. This software assists researchers in research and documentation. Pajoohyar is a research tool that helps users in gathering, organizing and analysing scientific sources. It also documents the results of the research according to citation styles in the form of a book, a thesis or an article. This software has many facilities, including saving and classifying data, noting, using different labels, searching in saved data and so forth. In addition, Pajoohyar is connected to online sources in such a way that the user can automatically save the sources in the software and then cite them using different citation methods. It was designed by

the Islamic Computer Research Center (Noor) and works with three different languages – Persian, English and Arabic – according to the user's requirements.

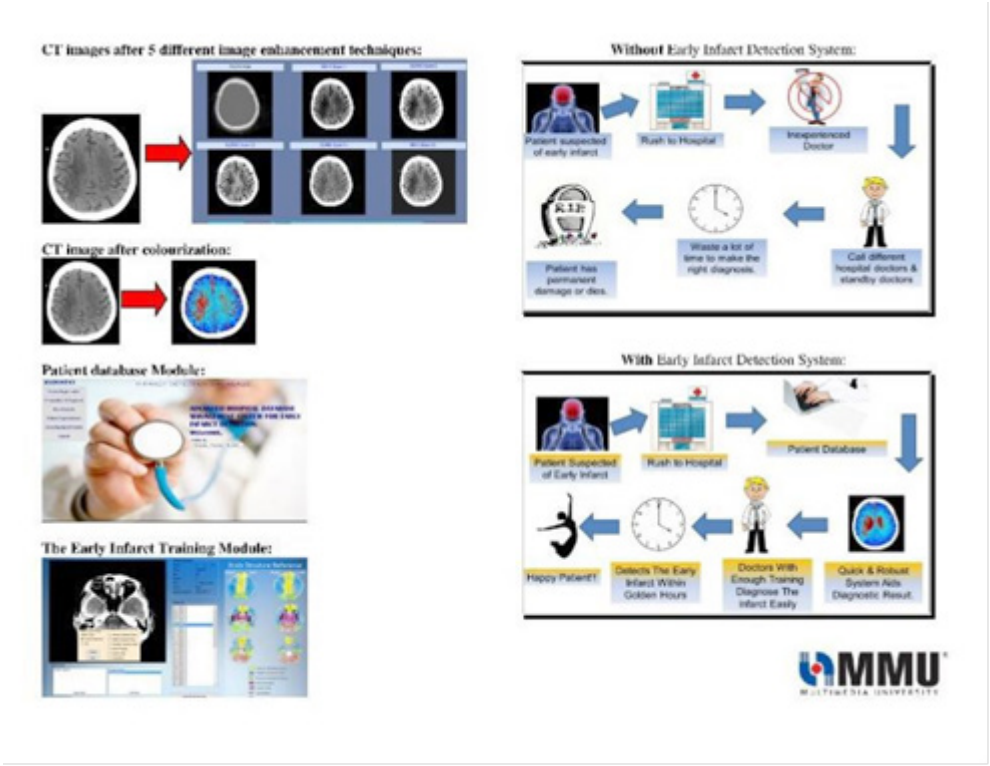
The project fully contributes to **SDG 4,** providing quality education and promoting lifelong learning opportunities for the country.

The Information Technology Management Center of Women's Seminaries of the **Islamic Republic of Iran** boosted the *Kowsar-Net: Scientific Intelligent Network for Women* project that started in 2014 with the purpose of establishing safe and pure scientific and social relationships among women, especially women scholars, graduates and professors. This project prepares a new, safe social network experience and has changed the negative views of women regarding the negative impact of social networks.

It aims to increase the empowerment of women by increasing women's IT involvement, thus promoting gender equality, equal public access to information and a peaceful and inclusive society for sustainable development (**SDGs 5** and **16**).

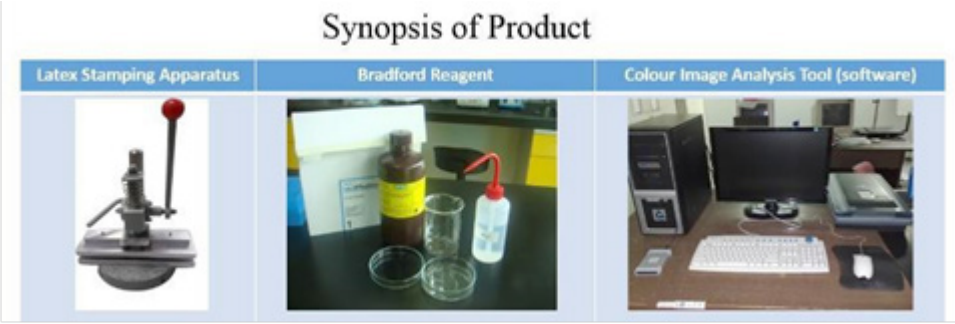
A number of projects from the Multimedia University of **Malaysia** aim to meet several SDGs by promoting healthy lives for the Malaysian population, reduction of inequalities, and so on (**SDGs 3** and **10**). They also promote the achievement of higher levels of economic productivity through innovation in the country (**SDG 8**).

The first project represents a computer-aided diagnosis system designed to assist doctors and radiologists in early ischemic stroke detection. The system consists of three modules. The intelligent early infarct detection for brain images module improves the diagnosis time and also the accuracy of the infarct detection process, while the patient database module consists of the details on patient registration, patient diagnosis, and also a statistical analysis tool on the brain infarct patient. Finally,



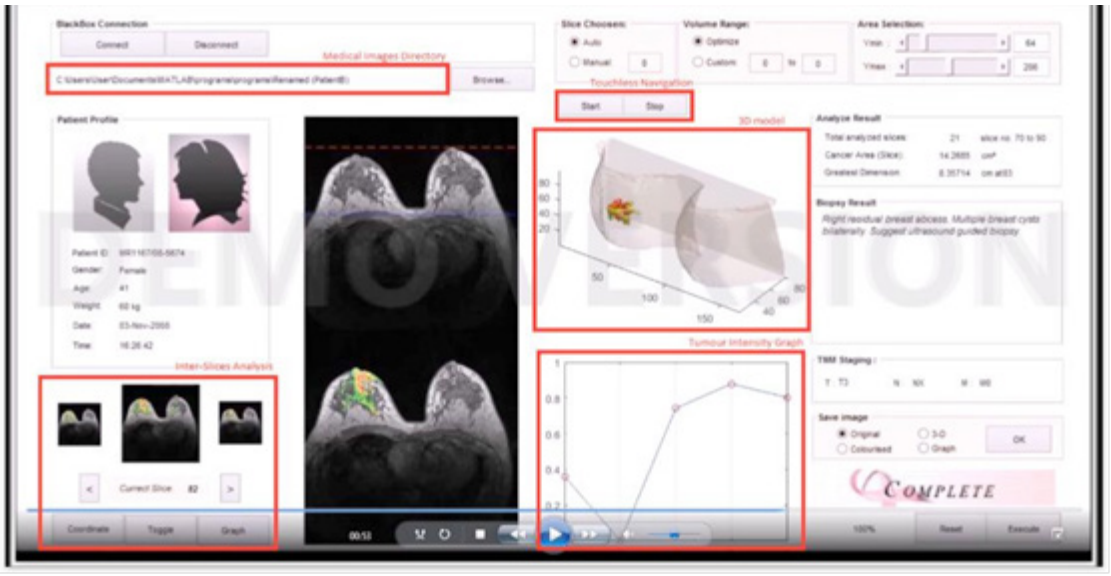
the early infarct training module is a platform for training junior doctors or any doctors lacking experience in early infarct detection.

The *Glove Sample Cutting and Biocompatibility Test Platform*, **Malaysia's** second project within this category, aims to build a latex glove sample cutting device with specific size, and to develop a biocompatibility test platform. For the cutting device, its machine prototype is designed to cut the sample from the latex glove with emphasis on the accuracy of the targeted area by preserving the density of the protein powders per unit area. The biocompatibility test platform is a digital image analysis software. It is designed to determine the concentration of protein by comparing the dominance of colour difference between the stained image and raw image of the latex sample.

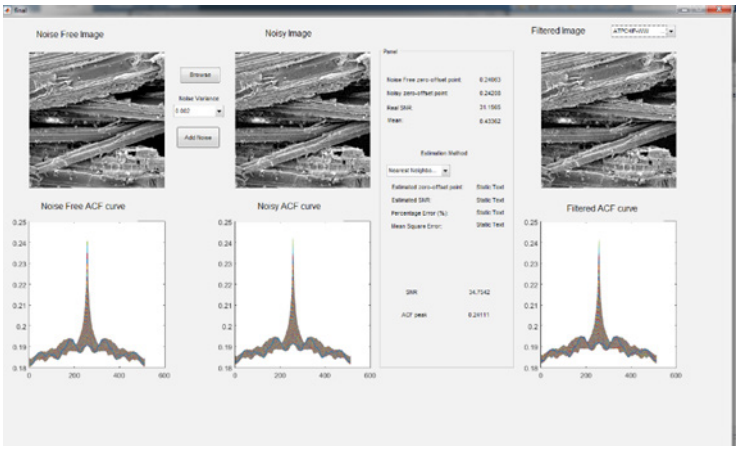


The *Spatial Based Dynamic Contrast Enhanced Magnetic Resonance Imaging 3Dimensional (3D) Visualization* project represents the last project from **Malaysia** related to the WSIS e-science action line. A computer-aided diagnosis system is designed to assist doctors and radiologists in detecting breast cancer through analysis of magnetic resonance imaging (MRI) screening. It comprises features such as an autoprobing system for lesion detection, 3D modeling of the region of interest, lesion colour classification and automated parameter computation (lesion dimensions), and deploys a three-dimensional webcam-based navigator with surface interpolation with interfacing hermite surface (SIHE) methodology. The standalone CAD-x system improves noise elimination, refines the breast region

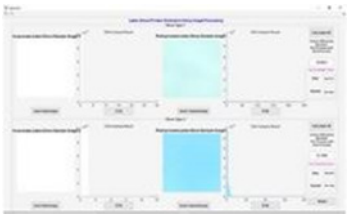
of interest (ROI) and detects the breast lesion with minimal false positive detection. The system is designed to be used in parallel with the MRI machine and not to replace it entirely.



In **Malaysia**, the Multimedia University created the project Development of PC-based Colour Code System, in line with SDG 9. This project describes the development of multi-coloured code. The main objective is to develop a code that has higher data capacity than the current QR code. The multi-coloured code employs the Reed Solomon correction algorithm and colour multiplexing technique. The colours involved are red, green, blue, cyan, magenta, yellow, white and black. Few image processing techniques involved in the decoder application are also designed to process and decode the captured multi-coloured code. As a result, the developed code has three times the data capacity, more than QR code with similar module size.



Also in **Malaysia**, the Multimedia University launched the Multi-modal Platform for Image Noise Filtering Using Single Image Signal-to-Noise Ratio Estimation, an innovation multi-modal platform for image noise filter using single image signal-to-noise ratio estimation (**SDG 3**). In this innovative approach, an estimation technique is needed to estimate noise-free peak in order to measure signal-to-noise ratio in terms of signal and noise energy. Since 2002, more than 20 techniques have been published. Noise filters are applied to remove noise. This innovation has filed two patents and nine copyrights. Many journal and conference papers have been published. It is useful for greyscale images such as electron microscope images, which can be captured up to micro scale, camera and Photostat images.



In **Malaysia**, Multimedia University has developed a *biocompatibility platform for protein detection in latexgloves*. Malaysia is the world largest latex glove manufacturer. To ensure glove quality in order to prevent latex sensitization, skin allergy reactions and such like, a high-performance liquid chromatography (HPLC) test is performed, which takes between six and eight hours to complete. To reduce the set-up cost and time for reading protein concentration, we have designed a biocompatibility platform for protein detection that enhances sampling efficiency through automated chemical tests with image acquisition and image processing. Overall, this innovation has reduced the test duration to 30 minutes. It is the subject of two filed patents and several copyrights and accepted journal and conference papers, and has received national and international awards. The platform is developed in partnership with Top Gloves Sdn Bhd, Koon Sheng Sdn Bhd and IAC Technology Venture Sdn Bhd, and serves **SDG 3**.

C8. Cultural diversity and identity, linguistic diversity and local content

In **Bangladesh**, the NGOs Network for Radio and Communication initiated the programme Capacity Building, Lobby and Advocacy to Contribute to Community Media Development and Fellowship for Women Journalists. The project's activities were concerned with fulfilling the objectives of contributing to a more diverse and pluralistic media environment. Increasing access to information for citizens in the rural areas of Bangladesh, with a special focus on marginalized communities (women and Dalits) was also a main focus to achieve these goals. The specific and expected outcomes for the programme during this period (January–June 2017): Improved enabling environment for the community media in terms of legislation and towards access to information and the right to information. The access, participation and voice of women and marginalized groups in public media have increased community radio's ability to fulfil a watchdog role and hold local authorities accountable in achieving the SDGs, through monitoring their actions (**SDGs 1, 2, 3, 4, 6, 8, 12** and **16**). The above concerns would contribute to achieving the common objective of a strategic partnership project, i.e. media and journalists, as independent players in civil society constitute a diverse and professional information landscape and function as catalysts for change.

The **Bangladesh** NGO Network for Radio and Communication also initiated the programme Fellowship for Youth and Women in Community Media and Journalism. Bangladesh's population is overwhelmingly rural. Yet stories in the national news revolve around the urban areas that represent only one tenth of the area. Such bias against rural areas is also reflected in the limited women's access to rural media. Very little attention has been given to the role of the news media in presenting issues related to rural areas in general and participation of women in rural media in particular. Objectives of the project: To facilitate in creating an enabling environment for the young women to be enrolled in the media and journalism to develop as professional community media journalists, and to encourage skilled young women to be enrolled in the media to work for the development of rural communities (**SDGs 1, 10** and **16**). Expected result/output: The number of young women professionals will be increased in community media, which eventually contribute in braking the social discrimination and women's empowerment process. Issues of rural women and children will be reflected in journalism, which will contribute to drawing attention of the policy and decision-makers of the State.

Also in **Bangladesh**, the BRIDGE Foundation has developed the project Magical Art of Silence: An Initiative from BRIDGE Foundation, to create a space for the differently-abled deaf and mute artists. We do believe that some people are "differently-abled" and this terminology brings the positive vibe. Disability is in our mindsets, and an exclusion-free society is important through more engagement and employment, but people are still struggling for inclusion. We successfully ended the year 2015 with participation in Social Enterprise Day, 29 December, powered by the British Council and facilitated by the "Better Stories" at their official venue. From that venture, we felt more motivated to engage with them while creating a space for their upcoming generation. After that, we initiated further activities

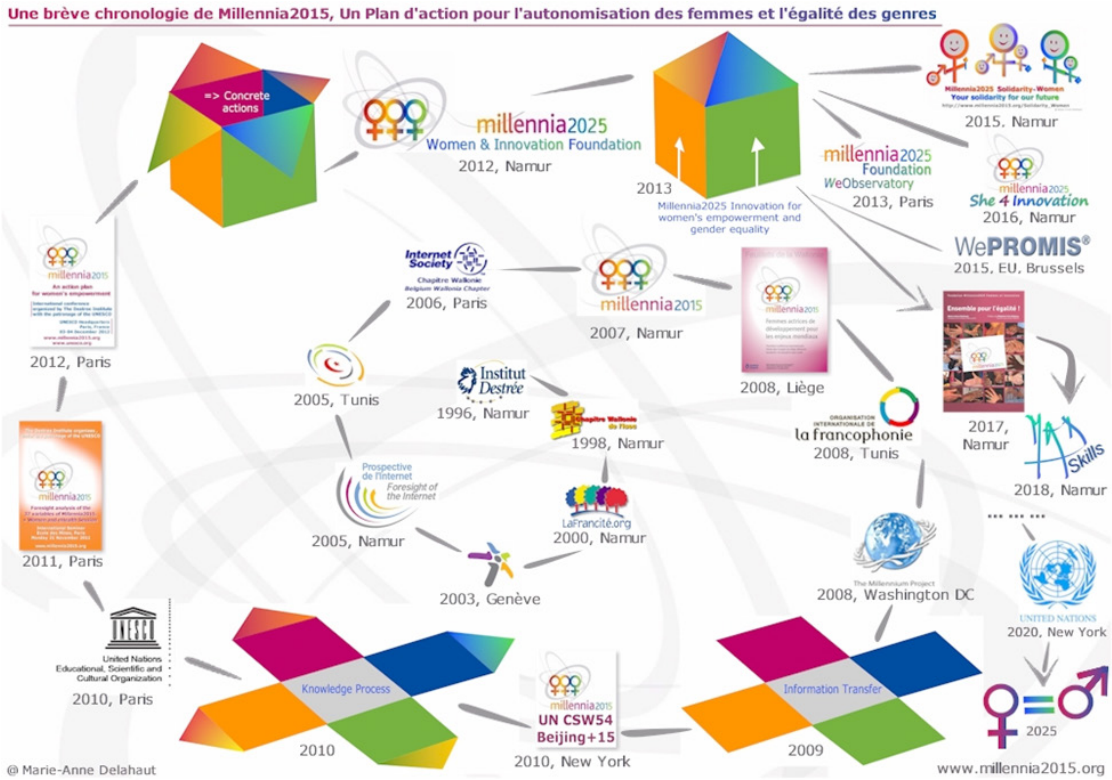
toward arts and crafts, with a successful art exhibition at the residence in the Embassy of the Embassy of the Netherlands in May 2016. We got more opportunities to interact with creative people and one of our artists, Muhammad Sohel Ahmed, got the opportunity to start his career as graphics designer at Red and Orange communication. Before him it was another deaf and mute youth – Shafayth Hossain Asif, aged 23 – who bagged a job in a local advertising company, DOT3PRD, as a graphics designer in advertising. Jannatul Ferdous Srity, aged 23, another deaf and mute female artist, worked as an intern with a national NGO, Democracy Watch. This project is in line with **SDG 16.**

The **Bangladesh** NGOs Network for Radio and Communication has been implementing the project Empowering Third Gender through Community Radio in Bangladesh, having partnerships with 16 community radio stations in Bangladesh. The objective of the project is to create awareness on third gender issues towards establishing their human dignity in society. The project activities include production and an on-air radio programme on Empowering Third Gender through Community Radio in Bangladesh covering the issues of accessing health care, education, jobs, public transportation and constitutional rights. This project contributed to better understanding using community radio on third-gender issues and facilitated access to public services and other facilitates through a community radio programme. This programme serves **SDG 10.**

In **China**, for the celebration of the first 50 years of the Internet, CyberLabs has launched the Oral History of the Internet (OHI), recording and preserving the personal narratives of global Internet pioneers' extraordinary contributions to Internet development. By 2019, OHI should have interviewed 500 Internet pioneers around the world. A 50-episode television series, documentaries and books will be produced based on the video interviews. OHI, which first started in China in 2007, has interviewed nearly 200 Internet pioneers, who mostly come from Asia, Europe and the United States. OHI will also go to interview those from Africa, the Middle East and Oceania. The mission of OHI is "Recording the first 50 years of the Internet to embrace its next 50 years". OHI will thus build a virtual monument that is committed to documenting personal narratives from the Internet pioneers who have made extraordinary contributions to the development of the Internet around the world. OHI was launched by CyberLabs, a think tank devoted to recording and preserving the Internet's history, which first started the project in China in 2007. As the Internet is facilitating unprecedented, multi-faceted interactions around the world, OHI goes global by video recording oral testimonies from the worldwide Internet

pioneers about their extraordinary contributions to the development of the Internet in their own countries or fields. Furthermore, the project intends to build a website for ordinary people around the world to upload and share their own oral histories about the Internet. This project contributes to **SDGs 16** and **17.**

In **China**, Jiangsu Post and Telecommunication Planning Design Institute Co. set up the *Main Operation Centre Information System* for the second summer Youth Olympic Games, to meet the requirements of "real-time, on-the-spot, dynamic, visualized, converged and dispatch-responding" provision, focusing on guaranteeing the success of the Games. By fully integrating data relating to events and the city by means of a combination of state-of-the-art technologies, including broadband multimedia digital



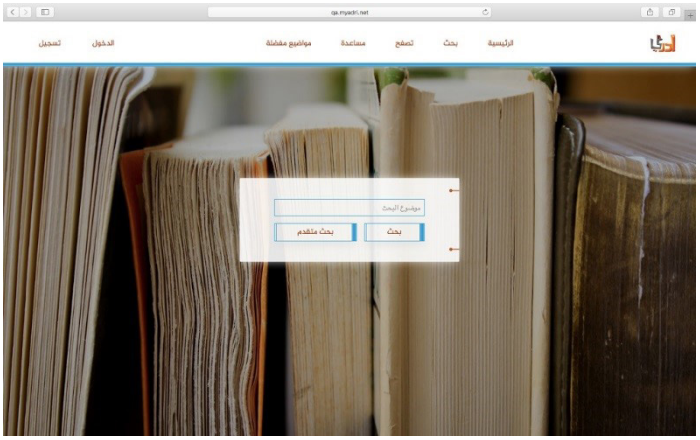
trunking, the system is designed to provide customized command services for the main operation centre of the Games in order to guarantee the smooth running of the Games and the city. The project is in line with **SDGs 3** and **16**.

The *Cultural Property National Registration System*, initiated by the Government of **Indonesia**, is a platform for the community's discovery of cultural objects (objects, buildings, structures, locations and/ or units of geographical space) to be proposed as a cultural property to the district/city government or representatives of Indonesia abroad. There are currently 4 387 heritages registered across Indonesia from Aceh to Papua, and 26 of them have been designated as national cultural heritages.

Indonesia's *Cultural Website* is an online platform created by the Government of Indonesia that contains a list and cultural map of Indonesia, news, and articles about Indonesian culture and the activities carried out by the Directorate-General of Culture.

The website provides the Indonesian population with public access to information, protecting fundamental freedoms and promoting economic development (**SDGs 8** and **16**).

Samimnoor in the **Islamic Republic of Iran** is a kind of similarity-checking module that focuses on Farsi-language documents. Its main goal is to provide text similarity checking services for Farsi-language journal staff (editors, reviewers, executive managers, etc.), educators (school and university teachers), scientific boards of conferences, and all researchers interested in ethical writing and academic integrity. Samimnoor receives the text from the user and compares it with the database (over 400 000 articles, books, thesis abstracts and other textual materials in the field of humanities and Islamic sciences. It then presents similarity percentages for the user's text and marks the similar sections. Samimnoor is an educational-cultural tool supporting all Farsi-language enterprises and researches in order to generate and publish more ethical research works, thus ensuring that all acquire the knowledge and skills needed to promote sustainable development – **target 4.7** under **SDG 4**.



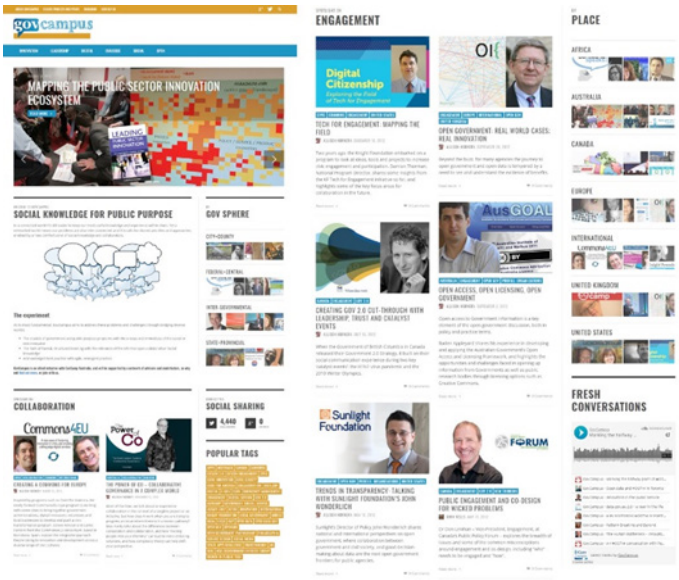
In **New Zealand**, the Arabic Digital Reform Institute (ADRI) is a social enterprise start-up company that aspires to revolutionize the current means of supplying academic content in the Arabic language. Using innovative technologies, ADRI is

aiming to facilitate effective ways of publishing and accessing Arabic academic content worldwide. In doing so, ADRI aims to address the social issue of the limited availability of Arabic academic content. As the majority of Arabic research is found in hard copy rather than online, this considerably restricts the accessibility of such content to be read, utilized or cited. The dilemma in the LDCs is even more pronounced. While academic content is often produced in Arabic, the poor ICT infrastructure in these societies ensures that it is never published or shared with others for use or scrutiny. This therefore has an impact on education, which then filters down to produce societal issues. ADRI's foremost project is a digital academic repository. This is designed to host a shared platform for providing access to Arabic content, with full search capabilities in Arabic. This digital platform will allow global academics, researchers, business personnel and media institutions to access Arabic content at the touch of a button. This is a level of publishing that strives to fully utilize the latest developments in technology. ADRI therefore seeks to introduce guidelines for the handling of Arabic academic content, and also to facilitate a robust communication framework between both Arab universities and universities globally. As such, this project supports **SDGs 4, 9, 10** and **17.**

In **Pakistan**, Crevo Technologies initiated the project Tell Me, eyes for the blind. Tell Me is a product that makes use of a mobile app and assisting hardware device to enable visually impaired people to move around and work independently. It helps them to know who is in front of them, what is happening in front of them, what is written there, whether there is any obstacle nearby and how is the mood of the person they are talking to. Users can hear all this via headphones attached to the mobile phone and assisting hardware collectively. All this is packaged inside the virtual reality headset and can take on other shapes as well. This project is in line with **SDGs 1, 3, 4, 8** and **16**.

C9. Media

In **Australia**, the GovCampus is a new type of public-purpose platform for "connected government and public innovation", providing an integrated learning channel based around podcast interviews and participatory events. It's built upon the legacy of the successful United States-based Gov 2.0 Radio podcast, together with over five years of journeys by the Cofluence team and its public innovation networks in North America, Europe, the Middle East and Africa, and Asia and the Pacific, as well as among international multilateral agencies and civic networks.



In collaboration with academia, public sector leaders and practitioners, the GovCampus mission is to enable a more mindful, strategic and collaborative approach to open, social knowledge sharing. It will support policy-makers and public service practitioners in:

- communicating their priorities and learnings in fresh, engaging ways;
- more easily contributing to – as well as consuming – collective knowledge;
- leveraging the "public value" of their work through accessing case studies of best practice as well as emergent practice.

With over 1.7 million podcast downloads, it reaches government practitioners, civic leaders and public innovators across the world, discussing how to leverage their knowledge, skills and resources for a more connected public sphere. This project is in line with **SDGs 9** and **17**.

In **Bangladesh**, the NGO Network for Radio and Communication launched the Social Dialogue for Achieving Sustainable Development Goals through Community Radio. This project is organizing dialogues through community radio across the country during the project period for sensitizing the disadvantaged communities about their participation in line with the SDGs (this project is contributing to the advancement of **all the SDGs**), localization and give-voice-no-one-left-behind in Bangladesh. The project interventions made the community more conscious of getting access to public resources such as health, education and social protection. In particular, the project contributed towards institutional relationships between local government bodies and the community. As outcomes of the project, the community was sensitized on local development issues. The knowledge and awareness transmitted to the community will help it to act as responsible citizens, which will help improve the status of life and livelihood through the community radio participatory programme.

In **Bangladesh**, the Bangladesh NGOs Network for Radio and Communication (BNNRC), in partnership with the 17 community radio stations and the Ministry of Information, has developed proposals to *Strengthen capacity building, lobbying and advocacy to contribute to community media development*, taking into account the overall growth and achievements in the community media sector, and the challenges faced and lessons it has learnt throughout the implementation of earlier phases of the project in long-term partnership with Free Press Unlimited since 2007.

Community radio can inform and educate civil society at large on media issues and make key stake-holders (governments, legislators, media, opinion-makers and decision-makers) aware of media aspects with the aim of securing public interest. Despite the proven positive growth of the media sector in rural areas, however, the voice of rural citizens is still not reflected in mainstream media, they have less opportunity to participate in the development process of their respective locality, and they remain isolated. This is an important obstacle to participation and governance, where an active and efficient media could make a difference. The stakeholders concerned are not yet aware of how wide the gap is. Moreover, it is evident from the project's primary findings that civil society organizations (CSOs) are fragmented and politically polarized In Bangladesh. There is a huge lack of coordination and harmonization among CSOs working on different issues.

Although the government, through its Information Commission, is trying hard, the Right to Information Act (RTI) is still far from being properly implemented. There is too little awareness among the media and journalists on how to use this particular legislation to seek information, especially for investigative reporting. The general public also lacks awareness on how to use this law to request transparency of government decisions. Thus, a genuine effort needs to be made to bring together all the existing CSOs and build up coordination and communication among them for addressing crucial and critical social issues. BNNRC and community radios, as the citizens' media, can work in this area in 2017.

This project will address **SDGs 1**, **4**, **10** and **16.**

Also in **Bangladesh**, the Bangladesh NGOs Network for Radio and Communication (BNNRC) has launched the *Online community broadcasting library for access to information and knowledge in Bangladesh*. BNNRC has set up an online community broadcasting library (OCBL) in all 16 community radio stations in Bangladesh. Around 1 000 rural broadcasters are directly benefiting from the online library. Under the initiative, BNNRC has provided book shelves, a set of books/CDs, and ICT equipment/technical cooperation to each of the stations. It is found that the online library becomes a centre of excellence for community radio practitioners, civil society actors, human rights defenders, government officials and local media practitioners that provides them with appropriate knowledge, tools and support to respond to issues relating to the freedom of expression, right to information, safety and protection of community journalists. The effectiveness of the project, which advances **SDGs 1**, **2**, **4**, **10** and **16**, stems from the strong partnership among the direct partners, the 16 community radio stations

Again, in **Bangladesh**, the Bangladesh NGOs Network for Radio and Communication (BNNRC) has launched a campaign through community radio on *Improving the real situation of overcrowding in prisons in Bangladesh* (IRSOP). BNNRC has implemented this information and motivation campaign project through seven community radios, as an alternative medium for upholding access to information for grassroots people in our society (cf. Action line **C3**), in partnership with the German International Cooperation Agency (GIZ Bangladesh). The main objective was to make the community aware of the services provided by the government and NGOs for accessing the justice system and restorative justice through alternative resolution. The project produced and broadcast a radio magazine programme entitled "Khola Janala'' (open window) that included a dialogue involving guests representing different sectors, like members of the Jail Inspection Committee, advocates, representatives of Social Welfare Department and local government, etc. The project is relevant to **SDGs 10** and **16**.

In **Bangladesh**, the Bangladesh NGOs Network for Radio and Communication (BNNRC) has launched the *Building capacity to produce interactive, audience-led governance programmes through community radio*. BNNRC and BBC Media Action jointly implemented a pilot project in two community radio stations (Chilmary and Sagargiri) aimed at building broadcasters' capacity to produce interactive, audience-led governance programmes. The broadcasters received training and produced two programmes on the performance of local governance in Union Parishad local government structures. Finally, guidelineshave been developed on producing people-led content which are now being used by all community radio broadcasters in the country. The project links WSIS Action line **C4** and **SDG 4 Targets 4.4** and **4.7** by striving to develop the skills of the young radio broadcasters who are take up the future leadership of the sector, and is of relevance to **SDGs 1**, **4**, **10** and **16**.

The **Bangladesh** NGOs Network for Radio and Communication (BNNRC), under the banner of "Voices of the rural people", is working on the project *Youth Women in Community Media and Journalism - the beginning of a new era in rural broadcasting journalism of Bangladesh*. Since 2000, the organization has played a leading role in bringing media focus to bear on rural areas. Community Radio, being the only broadcasting media in rural Bangladesh, created a platform for women journalists at grass-roots level to raise their voices to be heard in the community. The majority of the programmes of the women-friendly community radio stations are designed for the most marginalized people in society: women. Bangladesh currently has 16 community radio stations on air, bringing empowerment and the right to information to rural communities. They are broadcasting a total of 125 hours of programmes per day on information, education, local entertainment and development motivation activities. Around 5.6 million people tune in to the programmes.

Meeting several SDGs, the organization creates equality among people in Bangladesh, contributes to ensuring quality education for all, and fosters economic development and an inclusive and peaceful society (**SDGs 3, 8, 10, 11** and **16**).

In **China**, the Nanjing University of Posts and Telecommunications developed the project Intelligent Processing Technology of Multimedia Signal in Complex Network Environments. The project proposes a complex heterogeneous wireless network framework integrating environment perception, cooperative communication and network convergence, which breaks down the bottleneck of the service capability of ubiquitous complex networks. The representation of environmental information and modelling methods is explored and a new environment information-integrated reasoning algorithm and environmental information integration and reasoning decision-making model were designed, which enhance multimedia information transmission capability in a complex environment. Furthermore, a ubiquitous mobile multimedia service platform was established based on users' behaviour analysis technology. The project has the characteristics of fairly good portability and sustainability, and it can help solve the common problems existing in the field of telecommunications. Moreover, the project properly fits into the WSIS Action Lines and can be replicated to other countries to help the realization of **SDGs 7, 8, 9** and **11** in the mobile era.

In **Indonesia**, the Jaringan Radio Komunitas Indonesia developed a project for the enhancement of disaster risk reduction capacities utilizing community radio on the basis of government–residents collaboration. Indonesia has been known as a country where various disasters often occur. Lessons of disaster management have been frequently applied and already have shown progress. However, public awareness of disaster risk reduction should be raised continuously. Among many factors which contribute to disaster management, community radio is one of the tools to raise public awareness. Mount Kelud, Mount Merapi and Mount Sinabung are highly hazardous volcanos in Indonesia. The three volcanos have erupted in the last several years and have caused great damage to the surrounding communities. A large amount of pyroclastic materials piled up on the mountain slope and they have caused secondary disasters, such as cold lava flows and floods. Mount Sinabung especially continues to erupt intermittently, and both Mount Merapi and Mount Kelud are likely to cause other large-scale eruptions in the near future, according to the eruption frequency in the past. The Steering Committee of the RADAR TANGGUH programme has conducted various projects with some community radio stations in three volcano areas (Mount Kelud, Mount Merapi and Mount Sinabung) in order to improve the communities' disaster management abilities. Combining the knowledge, skill and experiences of these organizations, and available resources in the communities, it is believed to be possible for the local communities to greatly improve their disaster risk reduction capacities. To protect the local communities from disasters, it is important to enhance their coping abilities as soon as possible. There are almost 1 000 community radio stations in Indonesia. It is also important to construct a model of community-based disaster management utilizing community radio and demonstrate it to other communities in Indonesia. Through its pioneering work, this programme is advancing **SDGs 1, 4** and **9**.

Also in **Indonesia**, the Ministry of Communication and Information Technology launched the IndonesiaBaik.id government Portal for Viral-able Public Policy Communication. Usually, the Government has delivered information in a way that is rigid and less current. Unless governments effectively catch the attention of the people, government communication will be buried in the flood of all other information. That's why the IndonesiaBaik.id programme from the Ministry of Communication and Information Technology has a presence to answer the challenges. Indonesiabaik.id is not an ordinary portal; its ecosystem has been designed by the Ministry of Communication and Information Technology as a medium for developing capacity of young people 20–34 years of age on creating positive content with attractive packaging. It does not just provide one-way information to the public, but also conducts some interaction and conversation through its social media, as well as providing trainings and workshop collaboration for netizens, bloggers and citizen journalists, and collaboration with multistakeholders under the joined-activity name #FIRAL. The portal is managed directly by the Ministry of Communication and Information Technology Directorate of Information Processing and Provision, Directorate General of Public Information and Communication. It is intended to provide alternative information that is viral-able and easy to understand, so people can have better alternative information based on their needs and usefulness. The portal and its product, mainly infographic and motion graphics, is also utilized to deliver messages about the policy, programme and achievement of the Government, public service information, and any other government programmes that currently serve the people. This project is in line with **SDGs 1, 5, 12** and **16.**

The PT. Selasar **Indonesia** Baru initiative developed the platform selasar.com. Basically, selasar.com is a sharing knowledge platform which facilitates public opinion on various perspectives through question answering and making a journal. As we know today, information and its distribution have a very important role to play in our world, especially in terms of any decision-making, whether in economic, business, political and even household decisions. Unfortunately, over the past dozen years, only several elite people have the opportunity to perform in (conventional) media. Information has been monopolized. This is what we're trying to prevent. We addressed the fact that the problem is not only in the availability of constructive social media as a medium of public participation, but that the problem we identify is also the absence of digital incentives for users to participate actively for their ideas in a fun way. Netizen usually just shows where to go and eat. That's the problem. For that reason, selasar.com gives a solution for giving the stage to scholars, encouraging people to provide credible and relevant information via social media **(SDG 16).**

Another news initiative, Tambo **Indonesia**, developed the project Tambo: News Media Using Intelligent Positive Content Generator. Tambo is a news media platform with positive stories across the world for Indonesian citizens. Words such as "Tambo" are based on local language dictionaries and they often refer to history. Chronicling sagas and ancient history, Tambo can be expanded into a more positive story. The Tambo website covers news about traveling, cuisine, fashion and entertainment. It also explores things related to innovative products and creativity. Tambo wants to educate the youths with the news Tambo creates. News on Tambo is based on an intelligent system called Tambo News Generator, which automatically catches and compiles information from any digital sources (social media, government websites, academia and others). All information is filtered based on Tambo standards. Tambo standards are positive, viral and new. Based on those standards, the information shown on the Tambo website not only contains positive stories, but also contains informative and new information to the readers. This project is in line with **SDGs 4, 5, 9** and **16**.

In the **Republic of Nepal**, the Digital Broadcast Initiative Equal Access launched the project Suaahara II. The project addresses problems in line with the SDGs, as 41 per cent of children suffer from stunting or chronic malnutrition. The consequences of stunting are serious, lifelong and irreversible. Chronic malnutrition accounts for at least one third of deaths in children aged less than 5 years of age. Children who survive malnutrition are at increased risk of morbidity and decreased cognitive function, resulting in lower academic performance, low economic productivity and increased risk of degenerative diseases, such as diabetes and obesity, later in life. Besides the high cost for the country, the high incidence of chronic malnutrition affects many international commitments on socio-economic development in Nepal. Malnutrition of the mother before and during pregnancy is causing stunting and in the child during the first two years of life. Therefore, this project has identified ten key behaviours. With a wide discussion among the stakeholders of this issue in Nepal, Digital Broadcast Initiative Equal Access has developed 47 messages with from 3 to 7 of those messages in the identified ten key behaviours. The ever-growing community-based FM stations are utilized to disseminate SBCC messages focused in 40 districts of Nepal. SMS and interactive voice response platform are deployed as additional ICT tools to advance the radio programme. This enhancement in media technology has given a clear increase in listenership to radio programmes from 24 per cent (during the first phase) to 31 per cent (currently in the second phase). This project is aiding the advancement of **SDGs 1, 2, 3, 4, 5** and **6**.

In **Thailand**, the Advanced Info Services developed the project Sarnrak – Good Kids, Great Heart: The Influence of ICT, Media, and Contents for Inspiring Ethics. This is a project using digital content based on true stories to inspire people in changing their destinies. We shift from terrestrial television platform to digital television platform – such as the social network, broadband platform, and mobile television application – from pre-production to production, post-production, broadcasting, promoting, monitoring and analysing measurements. The changing and developing digital television platform has a tremendous impact on Advanced Info Services and the kids in our project because Advanced Info Services' cost of broadcasting dropped by half, the donation increased tripled and the target reach has quintupled. The contents are made from the kids whose families are poor but they present diligent ethical behaviour. Advanced Info Services provides full financing for education, from grade school to undergraduate. This project mainly aims to eradicate poverty and bring equality to society by providing opportunity in education. During on-air programming through all channels, the kids receive a donation from the public. Many alumni have a better job than they had and some of them return to their hometown to redevelop and provide opportunity for those children (**SDGs 1, 4, 8, 10** and **16**). Also, this content is used to teach ethics and morals in many schools, as the report has shown that many delinquent students become good students because they want to be like their idols on the programmes. Advanced Info Services is forming a partnership with other companies and the Government to create sustainable and continuous growth of the ecosystem to help these kids to change their fates.

C10. Ethics

In **India**, Kanyashree Prakalpa seeks to improve the status and well-being of girls, specifically those from socio-economically disadvantaged families, through the *conditional cash transfers* scheme, by:

- encouraging them to continue in education for a longer period of time and complete secondary or higher secondary education, or equivalent in technical or vocational steams, thereby giving them a better footing in both the economic and social spheres;
- discouraging marriage before at least age 18, the legal age of marriage, thereby reducing the risks of early pregnancies and the associated risks of maternal and child mortality and other debilitating health conditions, including malnutrition.

It was also decided that the scheme should confer more than just monetary support, and should be a means of financial inclusion and a tool for empowerment for adolescent girls. Benefits under the scheme are therefore paid directly to bank accounts in the girls' names, leaving the decision of how to use the money in their hands.

To reinforce the positive impact of increased education and delayed marriages, the scheme also works to enhance the social power and self-esteem of girls through a targeted behavior-change communication strategy. The communication strategy not only builds awareness of the scheme, but includes adolescent-friendly approaches like events, competitions and Kanyashree clubs, and the endorsement of strong women figures as role models to promote social and psychological empowerment.

As more and more girls remain in school, it is envisaged that they will use the opportunity to gain skills and knowledge that will help them become economically independent. Even if girls do get married soon after they turn 18, it is expected that their education and enhanced social and emotional development will give them a better foundation for their adult lives. And, over time, as entire generations of women enter marriages only after they have some degree of economic independence, it is anticipated that the practice of child marriage may be completely eradicated, and women will attain their right to health, education and socio-economic equality.

The scheme contributes to the achievement of **SDGs 3**, **4** and **5**.

ICT Watch is firmly committed to freedom of information and is keenly aware of the emerging challenges to online freedom of expression in **Indonesia**. It creates the conditions for responsible Internet use and high-quality online content, and involves multiple stakeholders as partners in the proliferation of its programmes. Through its multistakeholder *Internet Sehat* (Healthy Internet) digital literacy programme for the Indonesian information society, ICT Watch is endeavouring to show that people can take responsibility for their online activities.

To this end, it has released high-quality Indonesian content under a creative commons licence, such as a series of social media for social movement documentary videos (http://lenteramaya.ictwatch.id) for public screening/discussion and an updated presentation kit and how-to modules/leaflets (http://internetsehat.id/literasi) for public education/advocacy, and has endorsed several publicly-available comic books for children/youngsters containing basic knowledge about Internet safety. ICT Watch also participates in various offline activities such as workshops, as well as roadshows visiting schools, campuses and local communities, thereby simultaneously facilitating multistakeholder engagement and developing capacity of local actors/communities.

Internet Sehat is carried out in cooperation with a range of partners: Indonesian Ministry of Communication and Information Technology (MCIT/KEMKOMINFO); Indonesian Ministry of Youth and Sports (KEMENPORA); Indonesian Ministry of Foreign Affairs (MOFA/KEMENLU); Indonesian Ministry of Education and Culture (KEMENDIKBUD); Indonesian Child Protection Commission (KPAI); Indonesian Internet Service Providers Association (APJII); Indonesian Domain Name Registry (PANDI); Indonesia Infocomm Society (MASTEL); Alliance of Independence Journalists (AJI); Hivos International; Ford Foundation; Citizen Lab- Toronto University; Global Partners Digital (GPD), UK; Cyber Law Centre

Padjajaran University; Communications Research Centre - University of Indonesia; Google; Twitter; Facebook; Indonesia Internet Governance Forum (ID-IGF); Indonesian Child Online Protection (ID-COP); Indonesian ICT Volunteers (RTIK); Village Development Movement (GDM); Southeast Asia Freedom of Expression Network (SAFEnet); Digital Democracy Forum (FDD); Indonesian CSOs Network for Internet Governance (ID-CONFIG); Indonesian Internet Society (ISOC-ID); Nawala Nusantara Foundation; Internet Baik Taskforce (Kakatu, Yayasan Kita dan Buah Hati, ICT Watch, Telkomsel); Indonesian netizen/blogger local communities; WatchdoC Documentary Maker; and several Indonesian telecommunication operators.

With 73 000 Facebook and 697 000 Twitter followers, and being active on Blog, YouTube, Flickr and Slideshare, the programme provides Indonesian society with equitable quality education, promotes gender equality and fosters an inclusive and peaceful society (**SDGs 4, 5** and **16**).

In **Japan**, the Ministry of Justice, in partnership with the National Federation of Associations of Human Rights Volunteers, instituted the measures to be taken by its human rights bodies against *harmful information on the Internet which violates human rights*. When the ministry's human rights bodies receive a complaint of violation of human rights, such as invasion of privacy via the Internet, or when the bodies consider it appropriate to begin investigations based on reports and information from relevant administrative organizations or other sources, they undertake prompt investigation as a human rights violation case, and if facts are found confirming that it is indeed a case of human rights violation, the necessary measures are taken to give relief to the victim, such as requesting the provider to delete the harmful information.

In **Malaysia**, the Malaysian Administrative Modernization and Management Planning Unit developed the Malaysian Public Sector Business Process Digital Tools project. The Information Security Management System (ISMS), referring to the compliance requirements of International Standard ISO/IEC27001:2013, is a systematic approach to protect the information assets of organizations. ISMS implementation provides a good impression to stakeholders and users that the information stored, processed or provided is protected from threats and misuse. Compliance with ISMS also reduces risks while ensuring the continuity of services. As the lead agency for digital transformation, the Malaysian Administrative Modernization and Management Planning Unit is promoting 700 public sector agencies to implement ISMS to face the ever-changing and evolving information security threats. The challenges in ISMS implementation include (a) meeting all the requirements for certification; (b) obtaining continuous support from top management; (c) reliance on third parties or consultants to assist the implementation of specific provisions; and (d) on behalf of the Government, to monitor the status of ISMS implementation in public sector agencies. MyISMS is a web-based application that provides step-by-step guidance on the implementation of ISMS to ensure that agencies are prepared for ISO/

IEC27001:2013 certification. The application has complete guidance, including tutorials, a checklist of ISMS requirements, downloadable document templates and a dedicated forum for community discussion. MyISMS can be accessed via public Internet, including mobile devices. As such, this project supports the advancement of **SDGs 4** and **17**.

C11. International and regional cooperation

In **Indonesia**, the goal of the *Indonesia ICT Volunteer (IICTV*) programme is to empower Indonesian communities towards the country's information society through the provision of ICT knowledge and skills. The programme works to improve community livelihoods and enhance national competitiveness through socialization, education and ICT training by excellent and skillful volunteers (**SDGs 4, 5, 10** and **16**). To achieve the goals of Indonesia's information society, IICTV conducted four main programmes, namely:

1) Community education and development in the ICT sector
2) Community advocacy on ICT technology and infrastructure development
3) Application development and content
4) Creating partnership and public relations.

These programmes were designed to be executed up to 2019 in all of Indonesia's 34 provinces, and to be replicated in almost 50 per cent of the country's regencies and cities. The added value of the project lies in the fact that IICTV is a community-based organization which increases community participation and ownership sustainability. The organization's membership is open to high school and college students, employees and ICT experts who voluntarily participate in this activity. The project focuses on efforts to bridge the digital divide in Indonesia so that ICTs can bring benefit to the community. It is widely recognized that ICT implementation has to be accompanied by appropriate capacity building within the community so that people appreciate the benefits of ICTs and are able to make active use of them to improve their quality of life.

In **Malaysia**, *Computer Emergency Response Teams (CERTs)* are entities which work to ensure the safety of cyberspace by resolving computer security incidents or cyberincidents in their respective constituencies. In addition to mitigating cyberincidents, they also provide training in cybersecurity and awareness. Since the Internet does not respect a country's physical boundaries, cybercrimes can easily be committed across borders and beyond the jurisdiction of any given law enforcement agency. As the point of contact for cyberincidents, CERTs therefore find it beneficial to form international collaborative partnerships beyond their respective constituencies in the interests of resolving incidents, this being in line with **SDG 17** on the global partnership for sustainable development.

Conclusion

The International Telecommunication Union (ITU) remains committed to the World Summit on the Information Society (WSIS) process, and to implementation of the WSIS goals beyond 2018. ITU recognizes and highly appreciates the extremely valuable contributions made by stakeholders to enable the continuation of WSIS monitoring and reporting. There can be no doubt whatsoever that, in today's fast-moving world, innovation and efficiency are vital to success. Accordingly, the WSIS Stocktaking Report in the Asia and Pacific Region 2016-2018 shares with you the most recent updates and success stories in the WSIS stocktaking process of this region.

The Web 2.0 WSIS Stocktaking Platform continues to foster implementation of the WSIS outcomes and to facilitate exchange of information among 350.000 members representing governments, the private sector, international organizations, civil society and other stakeholders. As the Web 2.0 platform continues to flourish, so does the promotion of social development and economic growth through ICTs. We continue to maintain and improve the WSIS Stocktaking Database, which contains around 10,000 entries this year. This encouraging outcome reinforces stakeholders' belief in and commitment to the WSIS Stocktaking process and their desire to share best practices.

In addition, the WSIS Overall Review called for close alignment between the WSIS process and the 2030 Agenda for Sustainable Development, highlighting the crosscutting contribution of ICTs to the SDGs. In this context too, WSIS Stocktaking is evolving to become the unique global process for the collection of information on actions carried out within the framework of WSIS, while underlining their contribution to implementation of the 2030 Agenda for Sustainable Development.

We are also pleased to announce the launch and official WSIS Stocktaking 2019 call for updates and new entries relating to new ICT-related projects, via our WSIS Stocktaking platform. All stakeholders benefit from the sharing of interesting case studies, as this undoubtedly facilitates the transfer of knowledge, experiences and models for project implementation. The WSIS Platform helps to create partnerships and to provide greater visibility and add value to ICT projects all around the world. The many and varied stakeholders who have implemented innovative projects and contributed to the success of the WSIS Stocktaking process deserve our sincere gratitude. We urge all stakeholders, along with all Member States, international organizations, the private sector and civil society, to continue submitting such contributions in the future as WSIS pursues the ongoing stocktaking process and prizes contest.

We trust that readers will find this report on the ICT developments in the Asia and Pacific Region insightful, and sincerely hope that it will inspire them to participate in the construction of a broader and more inclusive information society for all.

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ISBN: 978-92-61-26721-6

Published in Switzerland
Geneva, 2018

Photo credits: Shutterstock