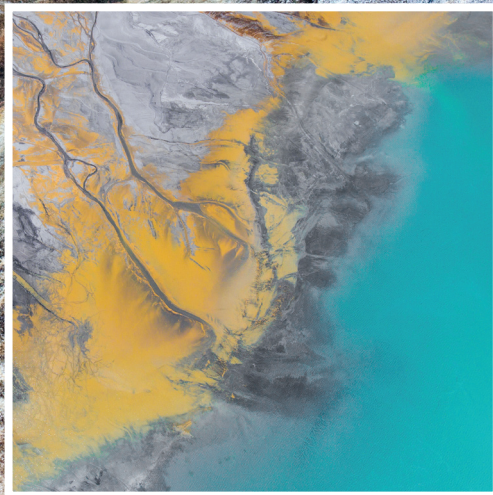


**UNECE**

# Standards for the Sustainable Development Goals



**UNITED NATIONS**

UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

## **Standards for the Sustainable Development Goals**



United Nations,  
New York and Geneva, 2018

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## ABSTRACT

This publication provides an overview of how international standards are used by policymakers to support sustainability and the achievement of the Global Goals. It is based on case studies that illustrate the use of standards for: SDG 6 Clean Water and Sanitation; SDG 7 Affordable and Clean Energy; SDG 11 Sustainable Cities and Communities; and SDG 13 Climate Action.

The publication documents the practical experience of regulatory authorities, governments and local administrations, as well as regional groups of countries, in using standards towards the implementation of the 2030 Agenda. With examples ranging from the subnational and national to the global levels, and from all regions, we hope this reading will inspire you to consider your local context and how you may apply standards to best realise the Global Goals in your constituency.

## ACKNOWLEDGEMENTS

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The contributions of ASTM International, the Institute of Electrical and Electronics Engineers (IEEE) and the Physikalisch-Technische Bundesanstalt (PTB) in support of the UNECE project on “Standards for the SDGs” are gratefully acknowledged.



## ABBREVIATIONS

<b>ACT</b>	Assessing Low-Carbon Transition
<b>AHP</b>	Analytic Hierarchy Process
<b>ARSO</b>	African Organization for Standardization
<b>BNPB</b>	Indonesian National Authority for Disaster Management
<b>BPBD</b>	Regional Disaster Management Agency
<b>CAP</b>	Common Alerting Protocol
<b>CDP</b>	Carbon Disclosure Project
<b>CFL</b>	Compact Fluorescent Light
<b>CPC</b>	Cleaner Production Centre
<b>DNP</b>	National Planning Department
<b>DRR</b>	Disaster Risk Reduction
<b>DWR</b>	Department of Water Resources
<b>DWS</b>	Department of Water and Sanitation
<b>EER</b>	Energy Efficiency Ratio
<b>EMA</b>	Eco Mark Africa
<b>EPE</b>	Empresa de Pesquisa Energética
<b>ERM</b>	Radio Spectrum Matters
<b>EU</b>	European Union
<b>FEMA</b>	Federal Emergency Management Agency - United States of America
<b>FIWARE</b>	Open Source Platform for Our Smart Digital Future
<b>GAMA-InaTEK</b>	Centre for Disaster Mitigation and Technological Innovation
<b>GHG</b>	Greenhouse Gas
<b>GHS</b>	General Household Survey
<b>HDFS</b>	Hadoop Distributed File System
<b>ICT</b>	Information and Communications Technology
<b>IEA</b>	International Energy Agency
<b>IEC</b>	International Electrotechnical Commission
<b>IEEE</b>	Institute of Electrical and Electronics Engineers
<b>IoT</b>	Internet of Things
<b>IPAWS</b>	Integrated Public Alert and Warning System
<b>ISO</b>	International Organization for Standardization
<b>ITS</b>	Intelligent Transportation Systems
<b>ITU</b>	International Telecommunication Union
<b>IUCN</b>	International Union for Conservation of Nature
<b>IWS</b>	Independent Water Schemes
<b>JSON</b>	JavaScript Object Notation
<b>KEMENDES</b>	Ministry of Village, Development of Disadvantaged Regions and Transmigration of Indonesia
<b>KPI</b>	Key Performance Indicator
<b>LAO</b>	Local administration organization
<b>MDG</b>	Millennium Development Goals
<b>MEPS</b>	Minimum Energy Performance Standards
<b>MOH</b>	Ministry of Health
<b>NGCC</b>	Next Generation Core Competencies
<b>NGO</b>	Non-Governmental Organization

<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>NTCIP</b>	National Transportation Communications for Intelligent Transportation System Protocol
<b>OCIT</b>	Open Communication Interface for Road Traffic Control Systems
<b>PPP</b>	Public-Private Partnership
<b>PV</b>	Photovoltaic
<b>QSVS</b>	Quality Standard on Assessing Village Water Supply Systems
<b>R&amp;D</b>	Research and development
<b>RFID</b>	Radio frequency identification
<b>RSS</b>	Rich Site Summary
<b>SCATS</b>	Sydney Coordinated Adaptive Traffic System
<b>SCOOT</b>	Split Cycle Offset Optimization Technique
<b>SDG</b>	Sustainable Development Goals
<b>SIDS</b>	Small Island Development States
<b>SMEs</b>	Small and Medium Enterprises
<b>SNDWS</b>	Samoa National Drinking Water Standards
<b>SOP</b>	Standard Operation Procedure
<b>SRD</b>	Short Range Devices
<b>SSC</b>	Smart Sustainable Cities
<b>SV</b>	Spontaneous Volunteers
<b>SWA</b>	Samoa Water Authority
<b>TAREA</b>	Tanzania Renewable Energy Association
<b>TCO</b>	Total Cost of Ownership
<b>U4SSC</b>	United for Smart Sustainable Cities
<b>UGM</b>	Universitas Gadjah Mada
<b>UK</b>	United Kingdom
<b>UN</b>	United Nations
<b>UNDP</b>	United Nations Development Programme
<b>UNFC</b>	United Nations Framework Classification for Resources
<b>US</b>	United States
<b>VLCi</b>	València Smart City Platform Project
<b>VNR</b>	Voluntary National Reviews
<b>WHO</b>	World Health Organization
<b>WMO</b>	World Meteorological Organisation
<b>WSP</b>	Water Safety plan
<b>XML</b>	Extensible Markup Language
<b>ZABS</b>	Zambia Bureau of Standards

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# Introduction

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## Standards for the SDGs

Voluntary national and international standards support the achievement of the 2030 Agenda in different ways. Some standards are cross cutting and provide guidance to all types of organizations, regardless of their size or location. They support the integration of socially and environmentally responsible behaviour in the management of plants and workplaces. Examples include standards that reduce and monitor emissions or energy use, and standards that help close the gender pay gap and curb discrimination against female workers.

A number of standards have target-specific and goal-specific relevance. For example, standards on electrotechnical materials are indispensable for the attainment of Goal 7, as they ensure: (i) the safety and dependability of core infrastructure projects (e.g. wind farms and smart grids), and (ii) promote energy efficiency and the transition to modern energy services.

Standards support companies and communities in conceiving and bringing to the market cleaner and more energy-efficient products, helping protect and conserve environmental resources.

Standards enable all three dimensions of sustainability and play a key role in supporting a distributed governance model. This model empowers people to take action in their respective fields of influence and promotes the social, economic and political inclusion of all; irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status (Goal 10.2 and 10.3). Relying on standards developed in consultation with the industry affords policy-makers, confronted with shrinking public budgets, the possibility of lowering the costs of developing and enforcing regulations, without compromising on the safe management of their country's resources and the well-being of their populations (Goal 16). This helps to advance several elements of Agenda 2030's social dimension.

Finally, and as regards the economic dimension of the 2030 Agenda, standards implementation increases access to international markets, as large multinational corporations base their contracts to first and second-tier suppliers on product standards, and frequently, on their adherence to common process standards. International standards contribute to reduce technical and procedural barriers to trade and

minimize transaction costs by helping the transition from country-specific specifications to globally applicable ones. Standards – as a key foundation of international trade – play a key role in supporting targets 17.10: “promote a universal, rules-based, open, non-discriminatory and equitable multilateral trading system”, and 17.11: “increase the exports of developing countries, in particular with a view to doubling the least developed countries’ share of global exports by 2020”. They also contribute to the transfer of technology supporting the achievement of targets 17.6 and 17.7.

## The Working Party on Regulatory Cooperation and Standardisation Policies (WP6)

The UNECE acts as a convening platform to support partnerships among standards agencies, and between standards bodies and decision-makers in business, administrations, donor agencies and local communities.

The UNECE Working Party on Regulatory Cooperation & Standardization Policies (WP6) works to lower costs, facilitate trade and improve access to critical technologies, while protecting the health and safety of consumers and workers, while also preserving our natural environment. It also works to:

- Promote the use of standards by policy-makers and businesses as a tool for them to reduce technical barriers to trade, promote increased resilience to disasters, foster innovation and good governance.
- Advance the use of standards in the implementation of UN-wide goals, including the implementation of the Agenda 2030 and the Sendai framework for action.

The Working Party meets annually, and during the year activities take place through its subsidiary bodies. These work to:

- Develop guidance and best practice for an improved management of hazards that have the potential to affect the quality of products and services, and/or cause harm or damage to people, the environment, property and immaterial assets” (the Group of Experts on Risk Management in Regulatory Systems (UNECE GRM)).

- Share best practice on risk-based market surveillance, inspections and regulatory enforcement (The Group of Experts on Market Surveillance or MARS Group).
- Promote the uptake by national authorities - of common regulatory frameworks in specific sectors, such as, workplaces where explosions may occur (SIEE initiative).
- Develop training materials on standards and standards-related issues, and promote education on standards and standards related issues (Initiative on Education on Standards and Standards Related Issues).
- Enhance the contribution of standards to Gender Equality and to the achievement of SDG 5 on Empowering Women & Girls (Initiative on Gender-Responsive Standards).

## The present research

The objective of this ongoing research is to document the practical experience of regulatory authorities, governments and local administrations, as well as regional groups of countries, in using standards towards sustainable development and the implementation of the 2030 Agenda. While the uptake of standards by the industry is relatively well researched, the use of standards in public administrations, policymaking and the development of laws and by-laws is poorly understood.

Much of the research has concentrated on a rather narrow set of standards, including voluntary sustainability standards, that broadly assist companies in developing and maintaining their presence on international markets. The focus of the present volume is, instead, to look at standards that are geared at securing the basic needs of communities: (i) access to drinking water and sanitation and the provision of affordable and reliable energy services, and (ii) safe housing within resilient cities and communities, in the greater context of safety from threats related to environmental and climatic hazards. The SDGs that were chosen demonstrate both how standards help manage materiality aspects (related to energy and water use) and support the collective aspirations to more resilient and sustainable cities and communities.

The case studies presented in this publication were collected by a team of consultants working

under the umbrella of the UNECE WP. 6, thanks to a research project financed by the German Metrology Institute (Physikalisch-Technischen Bundesanstalt, PTB) and two standards-setting organisations: ASTM International and IEEE.

The case studies were compiled by policymakers that responded to a call that was distributed through two distinct channels. The first was the participation in the activities of the WP .6 or other intergovernmental bodies of the UNECE. The second was through contacts with standards organizations. In these cases, the contact with the policymaking community was facilitated by the secretariats of standards-setting bodies that reached out to their respective communities.

The UNECE Secretariat expresses its gratitude to the following organizations for facilitating these conversations: ASTM International, International Electrotechnical Commission (IEC), Institute of Electrical and Electronics Engineers (IEEE), the International Organization for Standardization (ISO), the International Union for Conservation of Nature (IUCN), the Global Reporting Initiative (GRI), the International Telecommunication Union (ITU), the United Nations Framework Convention on Climate Change, UN/WATER, the World Health Organization (WHO) among others.

The case study template that the UNECE Secretariat developed and distributed aimed at documenting:

- The challenge that the policymakers or administrations were addressing.
- The standards that they used to address the situation.
- How standards were useful in addressing the specific concern identified.
- Lessons learned and the potential for replication.

This simple structure allowed for applicability in different sectors, and for drawing broad conclusions.

## Preliminary findings

The research effort is ongoing and will be concluded in late 2019. These preliminary findings were compiled for presentation at the event “Standards for the SDGs” held as part of the ISO General Assembly (26/9/2018).

A first finding is the difficulty that the consultants encountered in the administration of the template.

Many of the policymakers were not sufficiently aware of the voluntary nature of standards, and many submitted case studies that could not be taken into consideration because they related to compulsory technical regulations.

In other cases, it was evident that the respondents were not sufficiently informed on the specific goals and targets of Agenda 2030. Many respondents could not identify linkages between their actions and the achievement of related indicators.

Other case studies were perfectly valid but fell outside of the scope of the research as they pertained to the activities of companies rather than administrations or were submitted by international organisations or standards bodies. Given the objective of the research, it was important to preserve a direct link with the authorities in charge of the policy actions.

Despite these difficulties, and of the short time frame at the disposal of the research team, the total number of accepted case studies is quite significant with a total of 26 case studies collected: respectively 5 for SDG 6, 6 under SDG 7, 8 under SDG 11 and 7 under SDG 13.

Overall, the case studies support the premise that administrations use international standards with adaptations to their specific local situations. Standards appear to work best when this adaptation is undertaken in consultation with a large range of stakeholders.

Successful uptake is the result of a complex process of collaboration and sustained dialogue between standardisation and policy making bodies, as well as local communities.

Looking at SDG 6, standards play a key role in both developing and developed countries alike. They are used in the assessment of the quality of drinking water, and in ensuring a reliable supply at an affordable price. The case studies in this volume also show how standards have been used in the wastewater treatment and in coping with issue of water scarcity.

Under SDG 7, the case studies illustrate the use of standards for: (i) energy efficiency (in the former Yugoslav Republic of Macedonia); (ii) increased use of renewable energy (Egypt, Peru, Ukraine, United States of America and Zimbabwe); and (iii) better institutional processes and technology upgrade (in

Brazil and Mexico). These are all different facets of supporting a country's transition to clean energy.

The case studies pertaining to SDG 11 fall under two broad categories. The first are those that relate to smart systems (specifically, Smart Cities and Intelligent Transportation Systems). Complex, multi-dimensional systems of systems need a high level of interoperability of structures and services. To meet this demand, administrations that submitted case studies (from Egypt, Switzerland and Spain) used international standards to: (i) identify city strengths, opportunities for development and challenges; (ii) develop key performance indicators (KPIs) and share them on open platforms and dashboards; (iii) enhance transport safety, security and mobility.

The second category of case studies relate to the development and implementation – in line with the Sendai Framework for Disaster Risk Reduction 2015-2030 – of holistic disaster risk management, across all levels. Standards have been used to strengthen communities' resilience to disaster by supporting early warning systems and emergency alerts, by successfully involving volunteers in disaster response, and by increasing communities' awareness of natural hazards.

For SDG 13, policymakers primarily reported using standards to mitigate the effects of climate change. Mitigation broadly refers to the steps we take to slow down the rate of climate change through reductions of greenhouse gases in our atmosphere. Climate action-related standards were used to reduce the negative impact of operations on the environment, implement effective environmental management systems, communicate on environmental performances, as well as to finance climate change initiatives.

As the impact of energy sources and associated emissions are among the main causes of climate change, many of the case studies support the priority of ensuring a larger share of renewable energy in the global energy mix (as was the case of Chile, installing photovoltaic systems resilient to desert conditions) or promoting energy conservation (through retrofitting household appliances).

## A few snapshots

The standards that were most often used by the administrations contacted for the research on Goal 6, "Safe water and Sanitation" were the WHO Global Guidelines for Drinking Water Quality. For example,

South Africa and Thailand used these guidelines in very different ways. In South Africa, they were used to develop revised indicators that allow for the effective tracking of both the provision of infrastructure and the sustainability of the services for the provision of water supply. In Thailand they supported the creation of the Thai Quality Standard on assessing village water supply systems (QSVS), from which a self-assessment tool was created. All efforts are leading to the achievement of SDG 6.1: "Achieve universal and equitable access to safe and affordable drinking water for all".

The National Hydrocarbons Commission of Mexico reported on how it had used the United Nations Framework Classification for Resources (UNFC) in order to sustainably develop natural gas deposits, so as to ensure that the national energy policy is well aligned with the SDGs. Further, they showed how using this tool: (i) strengthens policy consistency and coherence and (ii) allows for improved planning and the accelerated adoption of new technologies and business models. This will support the achievement of SDG 7b: "Expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all", among others.

The Energy Planning Authority of Brazil had successfully implemented standards to improve the system of energy auctions. This allowed a substantial increase in the number of compliant projects submitted and a better management of submission, analysis and approvals. This example shows how standards in the energy sector are evolving from technical to complex managerial and institution-building tools that support complex decision-making involving several different stakeholders.

Zambia, the United States of America and 20 other countries had used the ASTM International Standards on Concrete and Concrete Aggregates. This initiative increased the potential for recycling building materials and in particular concrete, reducing the amount of these materials that end in landfills. In parallel they codified practices for adding water, notably allowing for the use of recycled water, to concrete at job sites. The Centre for Disaster Mitigation and Technological Innovation (GAMA-InaTEK) of Indonesia reported on an initial trial – by 98 districts throughout 28 provinces of Indonesia – of the new International Standard ISO 22327 on "Security and resilience - Emergency management - Guidelines for implementation of a community-based landslide early warning system" to strengthen community resilience to landslide

disasters. The standard – which has just been approved and is in the process of being published – has already demonstrated its ability to save lives when the disaster occurs. This directly contributes to the achievement of SDG 11.b: "Develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels".

Showing again the important contribution standards make to institution-building, the Italian Accreditation Body highlighted the potential of a regulatory model based on voluntary international standards, which is expected to be conducive to greater responsibility and environmentally-friendly behaviour from companies.

### Next steps

This compendium offers readers an opportunity to consider the potential of standards as powerful tools for achieving sustainable development. With examples ranging from the subnational, national and global levels, and from all regions, we hope this will inspire you to consider your local context and how you may apply standards to best realise the global goals in your constituencies.

How we take this priority forward depends on you. The UN Community in Geneva is committed to doing its part to support partnerships among standards bodies, decision-makers in businesses and administrations, donor agencies and local communities.

# Case Studies

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**6** CLEAN WATER  
AND SANITATION



## Standards for Clean Water and Sanitation





## Introduction

More than 2 billion people globally are living in countries with excess water stress, whilst an estimated 946 million people lack adequate sanitation facilities and continue to practise open defecation. The unsafe management of faecal waste and wastewater presents a major risk to public health and the environment. International standards are created for agencies that are accountable for developing, implementing and enforcing national or subnational policies on clean water and sanitation. They are instruments that have influenced the revision of national policies to improve clean water and sanitation.

Access to safe water is a global issue that needs to be addressed using standards on water quality and supply systems. Innovative technology has enabled the evolution of international standards, which propose methods for assessing water quality.

In the case of Thailand, they have developed a quality standard for the assessment of village water supply systems. The standard was modified to make it suitable for the local community to understand and implement the inspection of water quality and supply practices.

Wastewater treatment and reuse has proven to be a vital aspect in achieving SDG 6, especially due to the adverse effect of population growth and environmental degradation. ISO and IEC standards have developed guidelines on sampling and management of wastewater and Botswana has been able to benefit when treating wastewater for non-potable uses.

In Italy, the application of ISO Standards on Environmental Management has enabled the national ministry to develop national regulations for mandatory Water Safety Plans, with a view to improving prevention and response to water quality and quantity issues.

The achievement of this goal will involve a pool of resources, partnerships and cooperation of institutions as well as the behavioural change of the population.



## Case study n°1

### Wastewater Treatment and Reuse using a Constructed Wetland System at Institutional Level

**Country:** Botswana

**Level:** National and Local

**SDG Addressed:** SDG 6 – Clean Water and Sanitation



#### Summary

The objective of this case study is to demonstrate how standards can be used for wastewater treatment and reuse. This supports the achievement of the SDG target 6.3 on improving water quality by reducing pollution, eliminating dumping and minimising the release of hazardous chemicals and materials. The government of Botswana involved the Department of Water Affairs, which uses national standards based on international standards to treat wastewater discharged from its own headquarters.

Wastewater reuse promotes water conservation and demand management, which is one of Botswana's priorities for additional water resources. The project on wastewater treatment and reuse supports improved wastewater reuse by various stakeholders. This includes public knowledge on safety and hygiene on handling wastewater.

Wastewater reuse at the institutional level closes the water cycle loop. This reduces pressure on fresh water usage as well as wastewater discharge into natural water resources, increasing water efficiency and preventing pollution.

#### Background

Botswana is faced with water shortages due to its limited water resources. The situation is exacerbated by low rainfalls, high evaporation rates, poor water quality, and water wastage especially in institutions such as schools. The country has reached its full

potential in terms of surface water infrastructure development (e.g. construction of dams). All Botswana's perennial rivers (i.e. Okavango, Zambezi, Orange-Senque and Shashe Limpopo) are shared with neighbouring countries. As an economy in transition, Botswana requires water for economic growth in energy, agriculture, tourism, manufacturing and the mining sectors.

#### Strategy

Effluent produced by the constructed wetland system is assessed for quality in accordance with the national water quality standards. These are the drinking water quality specifications (BOS32: 2015), wastewater discharge requirements (BOS 93: 2012) and the water quality for irrigation specifications (BOS 463:2011). These standards were developed in Botswana by the Water Quality Technical Committee through the Botswana Bureau of Standards.

The collection of samples from the wetland system is carried out in accordance with water quality sampling standards (BOS ISO 5667) which provide guidance on sampling wastewaters, sampling techniques, sample handling and preservation and guidance on the design of sampling programmes. Sampling, handling of samples in the field, their preservation and transportation to the laboratory for testing are also guided by the standard BOS ISO/IEC 17025 for the Competence of Testing and Calibration Laboratories.

The first trial diverted wastewater into a constructed wetland ecosystem for treatment. This is a process

where solids are removed from wastewater using septic tanks and the liquid is passed through a reed bed system that consists of four beds running in parallel and receiving the same load. Three of the beds contain different types of reeds that remove nutrients such as phosphates and nitrates while the fourth contains only sand and is used as a control.

### Results and impact

The constructed wetland system was found to be effective in treating wastewater for non-potable uses such as irrigation, construction and dust suppression. It was highlighted that different plant species in the reed beds have different affinities for nutrients in wastewater. The constructed wetland system was not found to be effective in pathogen removal in wastewater. However, when coupled with disinfectants, the system reduced the microorganisms to acceptable levels, suitable in non-potable reuse options. In conclusion, the system when combined with membrane filtration can treat wastewater to the acceptable water quality standards.

### Challenges and lessons learned

The operation and maintenance of the constructed wetland system requires funding and skilled manpower. These are necessary to avoid malfunctions and blockages due to lack of preventive maintenance plans. Constant breakdowns and blockages of the system disrupts water flows, and this affects the systematic effluent sampling and quality monitoring. Low up-take of wastewater re-use by the various stakeholders due to social, cultural and religious beliefs is a challenge. Extensive research is required on wastewater re-use to determine technologies that can improve wastewater quality for the intended use, establish the consequences on cumulative pollution over extended use, as well as energy and nutrient recovery.

### Potential for Replication

Treatment of wastewater using a constructed wetland can be replicated by various institutions in Botswana to treat wastewater on site for reuse for non-potable uses.

---

**Contact Name:** Kene Carol Dick

**Organisation:** Department of Water Affairs, Botswana

## Case study n°2

### **Moving from the MDG Water Supply Infrastructure Service Delivery Indicator to a Sustainable Water Supply Delivery Indicator in Support of the SDG process**

**Country:** South Africa

**Level:** National

**SDG Addressed:** SDG 6 – Clean Water and Sanitation



---

#### Summary

The objective of the case study is to show how South African standards – (SABS 241) based on the WHO Guidelines for drinking water quality – have been used to develop revised indicators that track both the delivery of infrastructure and the sustainability of the services for the provision of water supply. This allowed the shift from indicators supporting the Millennium Development Goals to indicators supporting the Sustainable Development Goals. This is directly in support of SDG 6: “Achieve universal and equitable access to safe and affordable drinking water for all”. The agencies involved were Department of Water and Sanitation (DWS) and the South African Department for Statistics.

The approach chosen by the Department of Water and Sanitation was to critically review their monitoring and evaluation processes. This was done specifically with regards to distinguishing between monitoring water services facility implementation (the infrastructure provided) and the sustainable operation of the facility. This is based on the stipulated basic service delivery supply standard of a minimum flow rate of 10 litres per minute and available when needed at 98% assurance of supply. A new indicator was developed known as “Stability of Supply”, which involved the Statistics South Africa General Household Survey (GHSs) instrument (2009) that monitored the impact.

#### Background

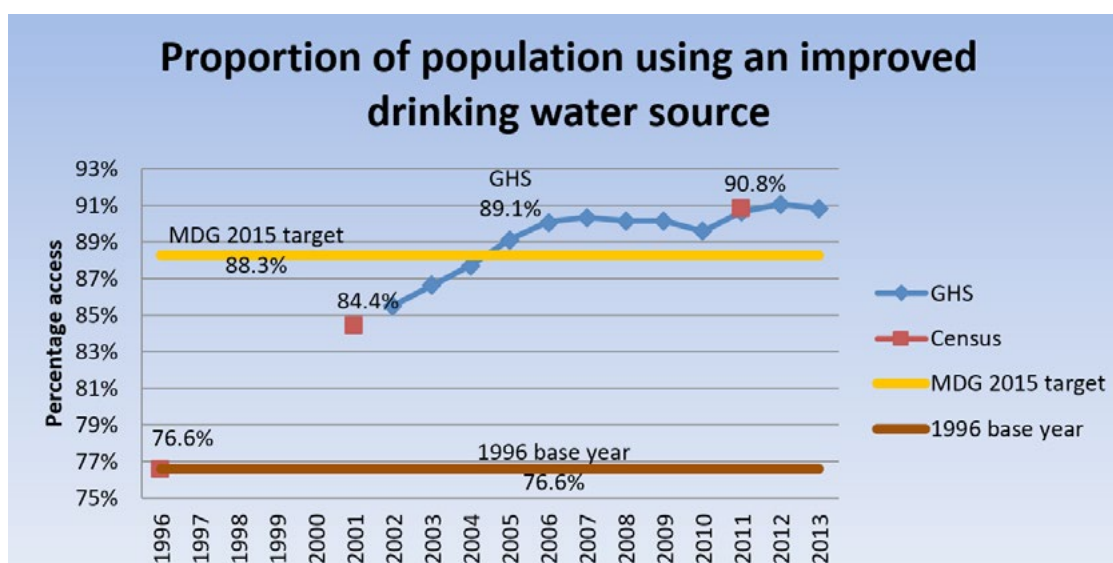
Water service delivery in South Africa started to “flat line” in 2006 – 2007. To better understand why no progress was being made in addressing the backlogs, improved service delivery indicators had to be developed. The full suite of revised indicators would effectively track both the provision of infrastructure and sustainability of the service.

#### Strategy

Measures to conserve water, such as the Water Services Act 1997 and the Strategic Framework for Water Services 2003, set out standards (i.e. SABS 241) in accordance with the WHO, Guidelines for drinking water quality, fourth edition. One of the main principles was to ensure that water services would be available at least 350 days of the year without interruptions of longer than 48 hours per incident.

To address the sustainable operation of the infrastructure, DWS developed the new “Stability of Supply” indicator, which consisted of questions based on delivery of water services. Once the responses were received they were analysed and trends were monitored in subsequent GHS surveys (post 2009). The GHS survey instrument covers 30,000 households. To obtain a more accurate benchmark the questions were also included in the 2011 National Census.

See drinking service delivery trend graph:



## Results and impact

The percentage of households which had stable municipal water supply was 76.3% and access to a basic tap water supply (within 200m of household) was 83.8%. Based on the results, the DWS developed a new composite indicator called “Reliability of Supply” with regards to access to basic water services provision. The method of computation was to multiply “Stability of Supply” (76.3%) by “Access to Basic Water Supply” (83.8%). The “Reliability of Supply” indicator for South Africa was 64%. The “Access to Basic Water Supply” indicator correlates directly with the SDG definition of Access to Basic Water Supply (with a distance filter of 200m, not 100m). This implies that although 95% of the infrastructure for basic services had been provided, only 64% was operational. It seemed that 10% of the schemes had become dysfunctional and most of the financial expenditure continued to be directed to new schemes and not the rehabilitation and upkeep of existing schemes, which explained the flat lining trend in the graph.

Results of the service delivery trends were presented to Government, explaining the dynamics of why service delivery had slowed to virtually zero. In 2014 a national election took place and these results directly influenced government policy. The latest Government Medium Term Strategic Framework (2014 to 2019) has 12 key outcomes, and outcome 9, states that “90% of all households must have access to a sustainable and reliable water supply by 2019”.

## Challenges and lessons learned

Proving the necessity of incorporating the new indicators into the national framework was a challenge. This was especially true while using a survey instrument to refine and measure the correct indicators in order to explain virtually zero service delivery, which made an impact on the Government policy.

## Potential for Replication

This methodology is replicable in all environments and other contexts (electricity for example).

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 Water Services and Macro Planning South Africa

### Case study n°3

## Quality Standard and Assessment for Village Water Supply Systems (QSVS)

**Country:** Thailand

**Level:** National

**SDG Addressed:** SDG 6 – Clean Water and Sanitation

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### Summary

The objective of the case study is to show how the Thai Quality Standard on assessing village water supply systems (QSVS) - based on WHO Drinking Water Quality Guidelines – were used to develop a self-assessment tool.

The new tool allows for the collection of structural and non-structural components of village water supply systems that address problems and causes of water supply system functioning and performance. By ensuring that the people of Thailand receive quality and safe water for consumption, this instrument directly supports the achievement of SDG target 6.1: “Achieve universal and equitable access to safe and affordable drinking water for all”.

The agencies involved were the Department of Health and Department of Groundwater Resources, in collaboration with Provincial Water Work Authorities and others. This new tool identifies problems and causes to find proper solutions to improve water supply efficiency and performance in a community. As a result, people in the rural areas can have good water quality and supply systems for an affordable price.

The self-assessment tool allows Local Administrative Organizations (LAO) to understand the impact level of quality standards in water supply systems. These guidelines improve the quality of each component to provide clean water to customers.

### Background

Thailand has a population of 66 million, more than 60% of whom rely on village water supply systems which are operated by communities or local governments. More than fifteen years ago, the Department of Water Resources decentralized village water supply systems to local administrative organisations. The first strategy of the National Water Resources Strategy Plan is to improve village water supply systems which corresponds to SDG 6.1 target of achieving universal and equitable access to safe and affordable drinking water for all.

### Strategy

To address the problems, the Department has established a working group comprised of representatives from water supply agencies such as: Department of Health, Department of Groundwater Resources and Provincial Water Work Authority. They drafted the QSVS on assessing village water supply systems.

By consensus, the final draft was presented at a workshop on 23rd August 2018. There were more than 120 participants, representing government and non-governmental organisations: Department of Local Administration, Department of Health, Public Works Department, Water Supply Association of Thailand, local government.

## Results and impact

The village water supply system assessment form comprised of 86 questions designed to collect information on five major categories: (i) raw water source, (ii) water treatment unit and water distribution, (iii) operation and maintenance, (iv) water supply quantity pressure and quality and (v) management.

There are two types of evaluation forms:

- water supply from surface water
- water supply from ground water

Each category was weighted by experts using the Analytic Hierarchy process (AHP) method. The calculation uses a weighting score method for all categories and evaluates the scoring on an excel sheet. The results showed the categories and their overall scores. Finally, the outcomes were expressed in five levels: A (very good), B (good), C (moderate), D (poor) and E (very poor).

The QSVS can be used by more than 7,500 LAOs, comprising 75,000 villages in Thailand.

## Challenges and lessons learned

The self-assessment tool should be simple for local community personnel to understand and use in a context of nationwide application. The draft assessment form for village water supply systems was tested in 220 villages across 42 provinces throughout Thailand. The draft was later edited for the ease of understanding by local communities.

The final draft will be submitted for the approval by Director General of DWR in September 2018. The QSVS will then be distributed to local governments.

The lesson learned is that it is important to create partnerships and welcome technical and practical knowledge from local communities and national ministries in the creation of standards. Their comments and suggestions are valuable.

## Potential for Replication

The quality standard and self-assessment approach can be replicated in other locations by adjusting the evaluation form related to their water supply system needs.

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**Contact Name:** Janya Trairat

**Organisation:** Department of Water Resources, Thailand

## Case study n°4

### National Implementation Of Wsps: A Regulatory Tool Strengthening Water Resource Management And Surveying Water Quality

**Country:** Italy

**Level:** National

**SDG Addressed:** SDG 6 – Clean Water and Sanitation

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#### Summary

The objective of the case study is to demonstrate how standards such as EN 15975-2 standard (Safety of drinking water supply - Guidelines for risk management and critical events) and ISO 14000 have been used to develop national regulations for mandatory Water Safety Plans to improve response to water quality and quantity issues.

This new approach is built on a previous voluntary approach that had proven ineffective to concretely facilitate the achievement of SDG 6. The national adoption of Water Safety Plans (WSPs) represent a fundamental tool to reach SDG 6 (Clean Water and Sanitation).

Risk analysis in the water and sanitation sector, including the WSPs approach, is a key strategy to strengthen environmental health, with a focus on access and quality of drinking water. The actual Italian policy on WSP implementation started in 2014, when the first pilot project led to the publication of the first national guidelines for WSPs implementation.

The Ministerial Decree of 14th June 2017, EU Directive 2015/1787, introduced the implementation of WSPs based on general principles established according to international standards such as the EN 15975-2 standard (Safety of drinking water supply - Guidelines

for risk management and critical events) and specifically on National Implementation Guidelines of WSPs.

The WSP implementation is mandatory for water suppliers through a seven-year regulatory process. The first phase (already started) is focused on training activities and the definition of procedures for WSP implementation and approval. The second five-year phase concerns application and approval of WSPs to Regional and National Authorities.

#### Background

The availability of quality water resources is a fragile issue due to the ongoing effects of climate change and post-industrial developments in Italy. In the summer of 2017, 6/20 regions called for a “state of emergency” due to water scarcity, and health issues related to water quality in different regions (e.g. thallium in Tuscany, perfluoroalkyl compounds in Veneto).

To cope with this scenario, Italy has strengthened and integrated strategic solutions for the water sector, including the compulsory implementation of WSPs.

## Strategy

The following standards were used to address the problem:

- The EN 15975-2 standard supports the integrated prevention and control approach, extended to the entire drinking water supply chain, proposed by the WHO with the introduction of WSPs. It includes 5 basic phases: (i) description of the drinking water system, (ii) identification of all potential hazards and hazard events that affect the system, (iii) assessment of related risks, (iv) risk control and (v) verification of the approach.
- The ISO 14000 series of standards are adopted as a basis for the management of environmental systems. It is important to identify the common points of the environmental and health risk assessment processes, to best optimize the application of the WSP approach to water systems.

## Results and impact

Until now, the development of water safety plans in Italy have been a voluntary choice of water suppliers. The experimental application on national territory demonstrated the efficacy of WSP as the most effective tool, assuring safe and clean drinking water distribution as well as the better management of water catchment and supply. The mandatory application of WSPs results in:

- A higher level of health protection through the prevention of water contamination and increase of tap water usage by consumers due to the increased level of assurance.
- Greater efficacy of climate change adaptation initiatives effects availability, quality of water resources and supply due to strengthening the resilience of water systems to extreme weather events – droughts and flooding.
- An improvement in long term tap water access due to rationalization of resources and interventions driven by risk assessment results.

## Challenges and lessons learned

There are many small businesses, to whom the application of water safety plans is a challenge in terms of human and economic resources. By voluntary application, the following lessons were learned:

- Systematise and integrate existing practices, experiences, procedures, because most of the WSP elements are already in place.
- The WSP must be system-specific to be effective.
- The implementation of WSP is a continuous, dynamic and incremental process.
- Risk analysis must be based on evidence.
- The WSP should be accepted and shared by all representatives of the management board and by all team members.

## Potential for Replication

Due to the flexibility of the WSP model, we feel it is a universal approach for prevention and response to water quality and quantity issues. Indeed, WSP implementation has already spread worldwide, and its diffusion can concretely facilitate the achievement of SDG 6.

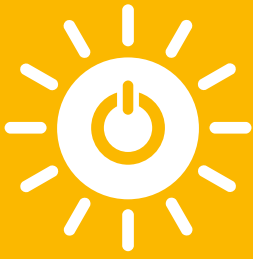
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**Contact Name:** Valentina Fuscoletti  
**Organisation:** Dept. of Environmental Health, Section of Water Quality and Health

# Case Studies

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**7** AFFORDABLE AND  
CLEAN ENERGY



## Standards for Affordable and Clean Energy





## Introduction

Sustainable Development Goal 7 calls for universal access to affordable, reliable, sustainable and modern energy, and its achievement represents a keystone for communities around the world to function smoothly and thrive equitably.

As of today, 14 per cent of the global population lives without electricity, while 3 billion people worldwide lack access to clean fuels and technologies for cooking. While progress has been made with regards both to the share of renewables in the global energy mix and to energy efficiency, greater efforts are required from all stakeholders to achieve all the targets of SDG 7. In the coming years, the rise in population will result in an increased demand for energy, while fossil fuels will continue to take the lion's share in the energy sector.

Against this backdrop, policymakers should seize upon the potential international standards could express to successfully advance the implementation of SDG 7, tackle regions-specific needs, and contribute to a transition towards a more sustainable and just energy future. A number of standards have already been designed by international standardisation bodies, to address energy efficiency in buildings,

vehicles and appliances, as well as supporting the establishment of solar and wind energy systems. Furthermore, international standards provide the technical foundation necessary to tackle rural electrification and micro-grids in remote areas of low-income countries, whose development has historically been hindered by lack of access to modern and reliable energy services.

The case studies outlined in the following section will present successful examples of fruitful collaboration and sustained dialogues between the standardization and policymaking communities in supporting the global energy transition. More specifically, standards proved essential to improve energy efficiency in the former Yugoslav Republic of Macedonia, to encourage the use of renewable energy sources in Egypt, Peru, Ukraine, the United States and Zimbabwe, as well as to expand infrastructure and upgrade energy-related technology in Brazil and Mexico.



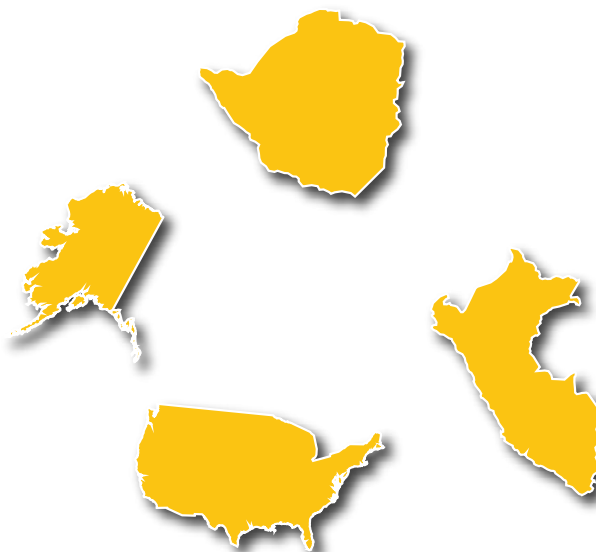
## Case study n°1

### Applying ASTM International Standards in Support of Environmentally Friendly Fuels

**Countries:** Peru, United States of America, Zimbabwe

**Level:** National, Subnational and Local

**SDG Addressed:** SDG7 – Affordable and Clean Energy



#### Summary

The objective of this case study is to demonstrate how ASTM standards, regarding alternative and renewable fuels (e.g. ethanol and biodiesel for road vehicle use), are used in Peru, the United States of America and Zimbabwe to reduce the use of fossil fuels). Standards were critical in evaluating the safety of alternative fuels, promoting commercial success and encouraging regulator and public acceptance. Their adoption by the regulator resulted in an increase in the use of local forms of energy and helped reduce energy imports. The government agencies involved were national regulatory and standardisation authorities. This directly contributed to the achievement of SDG 7.2: "Increase substantially the share of renewable energy in the global energy mix".

#### Background

Regulatory and market momentum continue to build for alternative and renewable fuels, such as ethanol and biodiesel for road vehicle use. Both support the use of local forms of energy and help reduce energy imports. For example, ethanol is widely used as a gasoline extender and octane number enhancer; biodiesel is an alternative fuel derived from vegetable oils and animal fats. Standards are critical to evaluate the safety of alternative fuels.

#### Strategy

The five standards work together to reduce the use of petroleum-based fuels:

- D4806 for Denatured Fuel Ethanol for Blending with Gasoline for Use as Automotive Spark Ignition Engine Fuel;
- D5798 for Ethanol Fuel Blend for Flexible-Fuel Automotive Spark-Ignition Engines;
- D6751 for Biodiesel Fuel Blend Stock for Middle Distillate Fuels;
- D975 for Diesel Fuel Oils;
- D7467 for Diesel Fuel Oil Biodiesel Blend.

#### Results and Impact

According to the United States of America's Environmental Protection Agency, "greenhouse gas emissions from the transportation sector primarily involve fossil fuels burned for road, rail, air, and marine transportation". Ethanol fuel produces less greenhouse gas emissions than gasoline or diesel. "Biodiesel... usually produces less air pollutants than petroleum-based diesel."

Energy use policy citing alternative fuels must be backed by technical specifications to facilitate acceptance in the public and private sectors. These technical standards are critical to the activities carried

out by those regulating, selling, purchasing, operating with, and testing the fuel.

## Challenges and Lessons Learned

### The challenges included:

- Modifying the requirements of long-standing fuel compositions calls for broad stakeholder engagement (regulators, producers, equipment manufacturers of end-use products).
- The range of laboratory equipment needed to adequately confirm the achieved specifications may not be available in all countries due to varying levels of economic development.
- Taking a balanced approach, when prescribing fuel composition that represents performance-based property limits and remains flexible enough to accommodate geographical, seasonal and regulatory requirements.

Standards represent an effective, time tested tool for transferring innovative information pertaining to fuel additives and alternatives to practical application. For Zimbabwe, the denatured ethanol standard (D4806) was adopted to check the quality of ethanol being used for mandatory blending. The denatured ethanol standard is referenced in the Statutory Instrument 17 of 2013. Zimbabwe produces biofuels mainly for energy security, reduction of fuel import bills and environmental protection. The country is currently facing acute foreign exchange shortages and the use of biofuels assists in reducing the fuel import bill.

For the United States of America, the commitment to a strong, sustainable agricultural and industrial economy includes usage of both traditional petroleum-based fuels and biofuels. The Tennessee law, for example, directs the adoption of ASTM International standards for engine fuels which has resulted in a remarkable improvement in the uniformity of fuels supplied in the state, with 97 % compliance on all fuels analysed.

For Peru, the ASTM standard D4814 helped the government to establish new specifications of motor use gasolines to address national requirements for lower levels of lead and sulphur. Peru also referred to the ASTM International standard D6751 in the Supreme Decree DS 021-2007-EM, Regulation for Biofuels Commercialization, because a suitable national standard did not exist. When the Peruvian Technical Standard NTP 321.125:2008 was eventually developed and approved, it was based on ASTM D6751, with modifications for conditions that are specific to Peru.

## Potential for Replication

The ASTM standards are feedstock neutral enabling the universal application of the specifications. Diesel fuel is used globally for a wide range of automotive and heavy equipment diesel engines. Recognising the impact of fossil fuels on climate change, stakeholders are motivated to consider, accept and support options that lessen the environmental impact of petroleum fuels. ASTM International voluntary consensus standards make such changes possible.

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**Organisation:** Zimbabwe Energy Regulatory Authority

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**Contact Name:** Jose Carlos Flores  
**Organisation:** Instituto Para la Calidad

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**Contact Name:** Sara Gobbi, Teresa Cendrowska  
**Organisation:** ASTM International

## Case study n°2

### Requirements For Technical Acceptance Of Wind And Solar Projects For Energy Auctions In Brazil

**Country:** Brazil

**Level:** National

**SDG Addressed:** SDG7 – Affordable and Clean Energy

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#### Summary

The objective of this case study is to demonstrate how standards – in particular, those based on IEC international standards - were used to improve the system of energy auctions. The implementation of the revised standards-based instructions must be followed by auction participants. This allowed for a substantial increase in the number of compliant projects submitted and a better management of submission, analysis and approvals by the Energy Planning Authority of Brazil. This directly supports the achievement of Goal 7b: “Expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all”.

#### Background

Electricity auctions for the regulated market in Brazil are held 3 to 6 years before the energy delivery. The anticipation, associated with long-term power purchase agreements, ensures the bankability of projects. However, the uncertainty associated with the construction of new power plants, requires a qualification stage, to guarantee that candidate projects accomplish the necessary requirements. For this qualification, the Energy Planning Authority of Brazil set the requirements of feasible projects, which will contribute to increasing the share of renewables in the energy matrix.

#### Strategy

Instructions for project developers were published addressing the technical requirements that must be followed for acceptance of projects for energy auctions. The requirements are frequently revised due to technological evolution, influencing the critical points for the success of new power plants. Eventually, the developers are consulted to improve the instructions. For example, there is no clear definition for power capacity of photovoltaics inverters, as it depends on the local temperature (for solar panels, for instance, international standards set the conditions to measure its parameters). Due to the lack of proper standards for inverters, the Energy Planning Authority held a public consultation and, with the technical contributions received, set a consensus. Regarding the on-site measurements (solar and wind resource), the instructions also specify the requirements – e.g. maximum distance from measurement station to project site, campaign duration, necessary instruments, quality of sensors and minimum height - considering the international standards (e.g. IEC 61400, ISO/IEC 17025 and ISO/IEC Guide 98-3). The standardised parameters help the developers when installing the stations and allow for the comparison of measured data.

#### Results and Impact

The standardisation of requirements for qualifying wind and solar projects result in an increasing number

of accepted projects and contracted power plants. Some of the impacts achieved include:

- Since 2009, the percentage of approved projects is between 55% and 65%, demonstrating the importance of technical qualification.
- In 2017, auctions registered more than 900 wind projects and 600 photovoltaic projects, representing more than 46 GW in proposals from renewable sources.
- This process resulted in the recent contraction of more than 500 (12 GW) wind and 140 (3.8 GW) PV power plants.
- Greater than 600 wind measurement stations and 100 solar radiation stations fulfilled the requirements, reducing uncertainty in available primary resource and energy production estimation. This also contributed to improving the knowledge on the available resources in the territory.
- The qualification process is valid for energy auctions on the regulated market, but nowadays, even the free market uses it: some independent companies ask the developer for the technical approval by the Energy Planning Authority before buying energy.
- Banks also require Energy Planning Authority's technical approval when financing new projects, placing more confidence on its feasibility.

### Challenges and Lessons Learned

The main purpose of these requirements is to avoid future problems with new power plants, which could expose electricity consumers to risks. When writing the requirements, the Energy Planning Authority tries to identify the potential risks, aiming to enhance security in energy supply. At the same time, it is important to keep in mind that strict requirements can lead to more expensive projects. For example, wind measurements must be carried out for at least 3 years, using high-quality instruments, which takes time and investment. Complicated rules can also reduce a number of candidate projects, reducing the competition for lower energy prices.

Since 2007, many improvements have been introduced to the instructions of the Energy Planning Authority considering the lessons learned during the period. The main lessons learned include:

- Some projects from different developers were discovered that would result in problems if both sell in the auction. Thus, some additional requirements were introduced regarding the right of using the land.
- With the development of wind energy, some projects were very close to one another, especially in regions with good wind, which would result in turbulence and wake effects, reducing the energy production. To face this problem, a geodatabase was developed to analyse "shadowing" between wind farms. This determined that energy production reports should consider the effect of all neighbour projects, even those from other developers, despite its phase (planned, in construction or operating).
- Due to a large number of candidate projects, a system of managements of submission, analysis and approval was developed. This web-based system is accessed by developers, who fill in the project datasheet, and analysts from the Energy Planning Authority, who check the registered projects and ask for documents and extra data without personal identification.

### Potential for Replication

Among the available mechanisms to buy energy, auctions have been considered by many countries, as they encourage competition for lower energy prices and can be used with new and existing power plants. The Energy Planning Authority published a series of Instructions to be followed by project developers in auctions. The similar process and requirements can be used in other countries that wish to buy energy through the auctions.

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(Energy Research Office)

### Case study n°3

## Energy Reform in México - Upstream Regulation that Promotes the Sustainable Development of the Oil and Gas Resources

**Country:** Mexico

**Level:** National

**SDG Addressed:** SDG7 – Affordable and Clean Energy

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### Summary

The objective of the case study is to show how the United Nations Framework Classification for Resources (UNFC) is being used by the National Hydrocarbons Commission of Mexico to sustainably develop natural gas deposits, so as to ensure that the national energy policy is effectively aligned with the SDGs. This will improve consistency and coherence in the capture of social and economic value, including tangible and intangible aspects of diverse resources; allowing for (i) a better integration of conventional and unconventional resource management; (ii) enhanced planning for the strategic development of the resources at different government levels; and (iii) faster adoption of new technologies and business models. This will support the achievement of SDG 7b: “Expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all”.

### Background

The Energy Reform initiated in Mexico (2013) has the primary objective of developing a more affordable clean source of energy. In Mexico, the main sources of this type of energy are in unconventional deposits that need to be developed sustainably. The Energy Reform has the additional objective of strengthening energy regulation and ensuring the correct regulations of oil and gas activities - including the technical evaluation of the country's economic resources.

### Strategy

The United Nations Framework Classification for Resources (UNFC) provides an analytical framework for studies on energy, mineral and renewable energy resources, which considers the analysis of: (i) government policies; (ii) the classification and management of resources; (iii) the planning of processes; and (iv) the allocation of capital in an efficient manner.

Additionally, the UNFC represents a standardised system that helps to link and analyse the Sustainable Development Goals. This will serve as a basis for an effective platform to make decisions on energy policy and regulatory actions and will facilitate the interaction with other government institutions and stakeholders.

### Results and Impact

The adoption of the UNFC linked with the Sustainable Development Goals will be especially relevant for the government institutions responsible for managing energy resources (i.e. Energy Ministry, Regulatory bodies, National Oil Companies). This adoption will be important to achieve:

- Greater support for energy policy to be aligned to the Sustainable Development Goals;

- Increased support for the fine tuning of regulatory aspects so they may be well aligned to the energy policy.
- Consistency and coherence in the capture of social and economic value, including tangible and intangible aspects of diverse resources.
- Integration of conventional and unconventional resource management.
- Planning for strategic development of the resources at different government levels.
- Faster adoption of new technologies and business models.

Additionally, the consistent use of the specifications of the United Nations Framework Classification of Resources will allow the easy collection and assimilation of information for: (i) external reports (for example: stakeholder communications, sustainability reporting etc.); (ii) financing (for example: stock exchange reporting; investment raising from the banks etc.) (iii) statistics and maintenance of national inventories.

### Challenges and Lessons Learned

The identification of the lessons learned is currently underway and the pilot test related to this case study is ongoing. Such an exercise in applying an international standard, which is related to the Sustainable Development Goals at a national level, has not been performed elsewhere in the region. While there are no other significant examples to follow, this exercise sets an example of its own.

### Potential for Replication

The experience of this case study and the pilot test (focusing mainly on the development of natural gas resources- conventional and unconventional), could be extended to renewables projects in Mexico (both solar and wind). Moreover, the experience gained in Mexico could be replicated in other countries in the Latin American region and, possibly, other regions like Africa, within the framework of South-South cooperation.

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**Contact Name:** Ulises Neri Flores  
**Organisation:** National Hydrocarbons Commission  
México

## Case study n°4

# Implementation of the Energy Management System (EnMS) in Accordance to the UNIDO Methodology and ISO 50001 at Large Industry Companies

**Country:** The former Yugoslav Republic of Macedonia

**Level:** National

**SDG Addressed:** SDG7 – Affordable and Clean Energy

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## Summary

The objective of this case study is to demonstrate the benefits of proper implementation of an energy management system for industry. This was done by training energy representatives from several companies in the essential implementation of energy standards, in accordance with ISO 50001.

This training contributes to the building of national capacities by boosting the awareness of industries that require energy efficiency improvements through structured approaches with clearly defined standards. By adhering to already defined international standards the companies have a guarantee that the service received is of sufficient quality and it ensures accurate performance indicators for their processes. This will support the achievement of SDG 7.3: “By 2030, double the global rate of improvement in energy efficiency”.

## Background

The industrial sector of the former Yugoslav Republic of Macedonia (FYROM) is energy intensive and consumes more than 40% of the country's energy. None of the established policy measures in the country have addressed energy consumption of the industrial sector, especially the large companies.

With the implementation of ISO 50001 Energy Management System certification standard in the country, there is a framework for establishing energy

management best practice to help the industry to improve its energy efficiency and make a return on investment. The standard enables organisations to establish the systems and processes necessary to improve energy performance, including energy efficiency, use, and consumption. Subsequently, this helps to bridge the gap that was present by the lack of policy measures.

## Strategy

ISO 50001 is based on the management system model of continual improvement also used for other well-known standards such as ISO 9001 or ISO 14001. This makes it easier for organisations to integrate energy management into their overall efforts to improve quality and environmental management.

ISO 50001 provides a framework of requirements for organisations to develop a policy for more efficient use of energy and data to better understand and make decisions about energy use and measurement of results.

## Results and Impact

The results of trainings have increased the national capacities and the implementation of ISO 50001 Energy Management System has resulted in:

- 12 partner enterprises (70% success rate);

- 23 national consultants / expert trainees;
- full cost/value of national consultants;
- include progressive development and implementation;
- energy savings 1 Yr.: 13.19 GWh (67% no cost);
- energy savings 5 Yr.: 165 GWh;
- money savings 1 Yr.: 862,700 USD (55% no cost);
- money savings 5 Yr.: 10,792,000 USD;
- cost of the pilot project so far: 290,000 USD.

### Challenges and Lessons Learned

The biggest challenge was to inform companies that proper monitoring tools provide a practical and affordable way of reducing energy consumption, in addition to optimising the production and efficiency of their processes.

Developing the pilot project for the implementation of ISO 50001 with established companies, has

demonstrated how the application of international standards strengthens trust between companies and improves the quality of services. Accordingly, when an international standard provides clear guidance for implementation, measurable indicators of performance and a proper benchmark for comparison between companies, then the conversation is redirected from “does this work?” to “how do I make this work for my company?”.

### Potential for Replication

This pilot project was used as a starting point in developing the energy management system in the industry. The main objective is for this to be replicated across the entire industrial sector. These kinds of projects are easily replicated in developing countries with similar industrial sectors.

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UNECE

## Case study n°5

### The Use of Alternative Energy Resources in the Carpathian Region of Ukraine

**Country:** Ukraine

**Level:** National

**SDG Addressed:** SDG7 – Affordable and Clean Energy

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#### Summary

The objective of the case study is to show how international standards have been used by the State Commission of Ukraine on Mineral Resources to promote the development of alternative, non-conventional, energy sources (e.g. thermal waters in the region of Carpathia). This directly contributes to the achievement of SDG 7.2: “By 2030, increase substantially the share of renewable energy in the global energy mix”.

#### Background

The implementation and application of alternative (non-conventional) energy sources is a government priority for the Carpathian region. The legislation favours the use of alternative energy sources in the fuel-energy complex, which is legislated in: the Law of Ukraine On Alternative Energy Sources, the Program of Governmental Support of Development of Non-Conventional and Renewable Energy Sources and Small Hydro-and Thermal Power.

Alternative energy sources in this region include: wind, solar radiation, biomass, soil heat (including hydro geothermal energy), and rivers. An advantage of using alternative energy sources is the low carbon emissions. The most favourable conditions for the use of thermal waters can be found within the flat part of the Transcarpathian region.

The potential of water power resources has been assessed in the Zakarpattia Region. An advantage of the use of geothermal power stations is their ecological compatibility. Discharge waters are re-injected into the underground horizons that provide the region with eco-safety and a stable ecological cycle.

Development of non-conventional energy is one of the factors which guarantees national and ecological security in Ukraine. The use of alternative energy sources will: reduce dependence on the import of expensive energy carriers, provide energy independence for remote consumers of electric power, stimulate the development of production connected with microelectronics, electrical engineering, hydromechanics, and special construction.

#### Strategy

The national standards in energy efficiency, renewable energy and alternative fuels have been harmonised with the ISO standards (e.g. ISO 50001:2014, DSTU ISO 50004:2016, DSTU ISO 50015:2016). 50004:2016, DSTU ISO 50015:2016).

## Results and Impact

To develop alternative energy resources, it is necessary to take the following steps:

- Perform zoning of the territory according to prospects and efficiency of the use of one or another type of energy and to develop the information-analytical system for operational control and management of energy equipment.
- Apply innovative wind- and solar- accumulating power plants with the purpose of supplying individual consumers (decrease in energy dependence can promote reduction of prices for tourist services) and the possibility of feeding power networks.
- Position small hydroelectric power stations on the mountain rivers.
- Equip hydrothermal spas and consider the possibility of heating houses with geothermal installation.

Additional studies on the use of water power resources in the Carpathian region are required for the production of eco-friendly electric power.

## Challenges and Lessons Learned

The use of geothermal resources is complicated compared to the conventional energy sources. The cost of geothermal stations, with the total capacity of 2 – 2.5 thousand MW, is estimated between 1.5-2 billion USD. The payback period for such a project is estimated at less than 5 years. Accordingly, the use of geothermal energy represents a challenge because of: (i) the considerable costs associated with the drilling of wells and re-injection of wasted water and (ii) the creation of corrosion-resistant heat technology.

## Potential for Replication

This experience can be used in other countries, especially those that are rich in thermal waters (for example, Hungary).

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**Contact Name:** Georgii Rudko  
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## Case study n°6

### Integration of Large Scale Photovoltaic Power Plants in Benban – Aswan Governorate – South Of Egypt

**Country:** Egypt

**Level:** National

**SDG Addressed:** SDG7 – Affordable and Clean Energy



#### Summary

The main objective of this case study is to show how generating green electricity can be utilised in achieving national social and economic development. The international standards, mainly IEC standards, are adopted by the Solar Energy Plants Grid Connection Code and the Egyptian Transmission Grid Code. This directly contributes to the achievement of SDG 7.2: “By 2030, increase substantially the share of renewable energy in the global energy mix.”

#### Background

At present, only 50 MW have been connected to the grid since March 2018, and the remaining capacity will be operated in two stages – anticipated to be completed by mid-2019. After starting its full operation, the four substations may be disconnected separately or together. This will cause a big problem for the grid operator (Dispatch centre), as there will be a need for standby generation from conventional power plants or from hydro power plants from Aswan High Dam.

#### Strategy

Solar Energy Plants Grid Connection Code in addition to the Egyptian Transmission Grid Code and The Egyptian Distribution Network are mainly based on IEC standards. Some examples of the used IEC standards include: IEC 62446, IEC 62305-3, IEC 62271, IEC 62116.

#### Results and Impact

The International standards will support the Egyptian grid in the following ways:

- Grid connection requirements, such as grid connection point, solar plant component, grid connection ranges, start-up of the solar plant, power quality (harmonics, flickers, voltage unbalance, voltage fluctuations), and grid protection.
- Power operational and maintenance requirements, such as active power control, reactive power control, fault ride through maintenance.
- General administrative connection process, such as the application for connection point, solar plant development application, connection agreement; initial tests, clearance for connection, commissioning test and certificate.
- Testing and commissioning.

### Challenges and Lessons Learned

The operation of the largest solar power plant will introduce certain challenges for the grid through its impact, such as fluctuations, evacuation of the electricity generated, etc. The main challenge is to enhance the capability of the grid operator to be able to deal with the large solar power plant and understand the grid code problems (e.g. power quality issues).

### Potential for Replication

IEC Standards have a high degree of replicability and the usage of the standards implemented in this case study can be considered in other locations in Egypt or worldwide.

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# Case Studies

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**11** SUSTAINABLE CITIES  
AND COMMUNITIES



## Standards for Sustainable Cities and Communities





## Introduction

A smart sustainable city is, as defined by ITU-T Study Group 5, 'an innovative city that applies information and communications technology (ICTs) and other means to improve quality of life, efficiency of urban operations and services, and competitiveness, while ensuring that it meets the needs of current and future generations with regards to economic, social, environmental as well as cultural aspects'.

As complex, multi-dimensional systems of systems, urban areas require standards which will ensure the interoperability of structures and services, and work to reduce the adverse environmental impact of cities. With urban areas anticipated to host an approximate 70% of the global population by 2050, the challenges faced by city inhabitants and services will continue to evolve. As primary sources of energy consumption and greenhouse gas emissions, cities pose complex challenges to sustainable development, but also present great opportunities for growth and innovation; for example, the Zambian Standardisation Bureau has demonstrated such long-term vision and commitment in their promotion of smart construction practices.

The proliferation of standards for intelligent transportation systems (ITS) and services demonstrates their critical role in ensuring the interoperability of innovation. ITU's Study Group 20 on the Internet of Things (IoT) and its Applications, including Smart Cities and Communities, have further verified how platforms such as ITS demand the integration of diverse technologies and systems, drawn from many different standards bodies and technology providers.

Broad collaboration amongst standardisation bodies is necessary to ensure interoperability and identify common characteristics of smart cities, in a global sense. Future collaboration with partner organisations is necessary to support policymakers and standards developers to create tools which understand the evolving nature of cities and provide the impulse for shared action at all levels.

The United Smart Cities programme strives to support cities in the planning and development of sustainable urban solutions. By accelerating urban initiatives through knowledge-transfer and the promotion of smart sustainable city profiles, the

United Smart Cities initiative allows policymakers to assess competing priorities and define their city action plans. The Swiss city of Pully has used the key performance indicators of the United for Smart Sustainable Cities (U4SSC) initiative, based on the international standards 'Recommendation ITU-T Y.4903/L.1603', to identify the city strengths, opportunities for development and challenges. In complement, the administration of the City of Valencia has used several standards to develop key performance indicators (KPIs), shared on an open platform and dashboards.

Crisis management is an important function of a responsive regulatory regime and standards play a key role in the development and implementation – in line with the Sendai Framework for Disaster Risk Reduction 2015-2030 – of holistic disaster risk management, at all levels. The Common Alerting Protocol (CAP) is an international standard format for emergency alerting and public warning. Adopted by the National Oceanic and Atmospheric Administration (N.O.A.A.), the standard is designed for "all-hazards", related to weather events, earthquakes, tsunami, volcanoes, public health, power outages, and many other emergencies. Today, 75% of the world's population lives in a nation with at least one CAP alert feed operational or under development.

With respect to timely and effective responses in situations of severe disruption, research from the Humanitarian and Conflict Research Institute has demonstrated how standards can enhance disaster management practices by involving spontaneous volunteers. In Indonesia, the Centre for Disaster Mitigation and Technological Innovation (GAMA-InaTEK) demonstrates how the application of the new International Standard ISO 22327 on "Security and resilience - Emergency management – Guidelines for Implementation of a Community-Based Landslide Early Warning System" strengthens community resilience to disaster and reduces potential casualties in high-risk areas. Their work further highlights the complementary need for socialisation to disseminate knowledge of landslide and disaster response to at-risk communities, as a precursor to the effective implementation of the standard.



## Case study n°1

### How to Measure the Smartness and Sustainability of a City using International Standards: The Case of Pully.

**Country:** Switzerland

**Level:** Local

**SDG Addressed:** SDG 11 – Sustainable Cities and Communities

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#### Summary

The objective of this case study is to show how Pully (Switzerland) has used the key performance indicators of the United for Smart Sustainable Cities (U4SSC) initiative to identify the city's strengths, opportunities for development and challenges. This programme supports several indicators under SDG 11; in particular, SDG 11.3: "By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management". The main agency involved was the administration of the city of Pully, in collaboration with Swisscom and ITU.

As Professor Peter Drucker said: "you can't manage what you can't measure". For this reason, Pully was in search of tools that could help its politicians and administration to measure the effectiveness of the city's smart city projects and the city's progress in reaching different SDGs. Therefore, in 2017, Pully decided to implement the U4SSC Key Performance Indicators (KPIs) for Smart Sustainable Cities (SSC) and began to collect data according the KPIs.

#### Background

For 4 years, the city of Pully has developed several smart city projects with the motto "step by step, success by success". In 2017, it was observed that the city was ready to develop a comprehensive smart

city strategy. To do that, it was important to have a "picture" or "overview" and establish a baseline scenario on the level of digitalisation of the city. Therefore, it was decided that Pully would participate in the U4SSC KPIs project and adopt the U4SSC KPIs for Smart Sustainable Cities.

The United for Smart Sustainable Cities (U4SSC) initiative is a UN initiative coordinated by ITU and UNECE with the support of 14 other UN agencies. It is dedicated to achieving SDG 11: "Make cities and human settlements inclusive, safe, resilient and sustainable". One of the tools developed by the U4SSC is the KPIs for SSC. The U4SSC KPIs for Smart Sustainable Cities are developed based on the international standards "Recommendation ITU-T Y.4903/L.1603 on Key Performance Indicators for smart sustainable cities to assess the achievement of sustainable development goals". The main purpose of the KPIs is to establish the criteria to evaluate ICT's contribution in making the city of Pully smarter and more sustainable, and to provide Pully with the means for self-assessments to achieve the SDGs.

#### Strategy

Pully collected the KPIs according to the "Collection Methodology for Key Performance Indicators for Smart Sustainable Cities" developed within the U4SSC initiative, which details how this implementation could assist in making management decisions. In order to collect the necessary data for the KPIs, Swisscom

brought human resources to support the city of Pully. Once Pully's participation in the KPIs for SSC project was officially confirmed by ITU, by April 2017, the city began to analyse the KPIs and send them to the city's departments, and to various offices such as the Vaud Statistic Office and the Federal Statistical Office, to collect the needed data.

After receiving the KPIs, Pully created a normalised file for each KPI, with all the relevant information (content, origin, quality, reliability etc.). By September 2017, all the data for the KPIs was collected. By February 2018, the collection of the data was certified by an external auditor. To further share the experience of the city's work on smart sustainable cities, Pully has delivered several presentations at: The World Smart City Forum in Barcelona, the SmartSuisse conference in Basel, and the Third U4SSC meeting in Malaga, Spain.

## Results and Impact

A global overview of the smartness and sustainability of Pully has been established. This has enabled the Department for Industrial Services and Technical Office to identify the strengths of the city. With respect to achieving the SDGs, the noted strengths include: environmental quality, air quality, water and sanitation, safety, housing, health, education, food security, urban planning, innovation, ICT infrastructure, and employment.

Implementation has further helped policymakers to identify opportunities for improvements, which include: energy, social inclusion, buildings, electricity supply and transport. Multiple related challenges have also been acknowledged such as: child care availability, renewable energy consumption, public energy consumption, cycling transportation, and open data.

The city of Pully, together with Swisscom and in collaboration with ITU, is currently developing a report to showcase Pully's experience in implementing the KPIs. This report is the key outcome document that the city will use to communicate with its politicians and citizens on the results of this project and identify the next step the city must take to continue its digital transformation. This report will also be a resource to set up future collaboration with other cities for knowledge sharing. The report is expected to be published by the end of 2018.

## Challenges and Lessons Learned

Translating the result of the KPIs into an easy to understand manner is very important. Policymakers and citizens alike must be able to interpret the results without any specialised knowledge to take actions based on the results. To that end, a graph that helps to illustrate the current situation of the city based on the results of the KPIs, has been developed.

While the U4SSC initiative has certified that Pully collected the data needed for the KPIs, it does not set a quantifiable or measurable target for evaluation. Therefore, each city must define its own target levels which makes it difficult to measure its achievement and to compare the results with other cities.

KPIs can be used for self-assessment and adopting best practices. In the case of Pully, it is necessary to first determine whether the U4SSC KPIs for SSC can reflect the complex nature of the city. From the Pully experience, it was found that the choices made by the U4SSC indeed highlighted some of the most important aspects of a city but often to the detriment of others.

## Potential for Replication

The U4SSC KPIs for SSC are designed with accessibility, flexibility and replicability in mind. The KPIs consist of a core set and an advanced set of indicators. Cities only have to provide data for the core set of KPIs to begin to evaluate its progress in reaching the SDGs. Over 50 cities worldwide have already implemented these KPIs including Dubai, Singapore, Maldonado, Kairouan, Manizales, Valencia, and Wuxi.

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**Contact Name:** Alexandre Bosshard  
**Organisation:** City of Pully, Department for Industrial Services and Technical Office

## Case study n°2

# Managing Spontaneous Volunteers in the Response and Recovery to Natural Disasters

**Country:** Chile, Argentina, South Korea, United Kingdom

**Level:** National, Subnational, Local

**SDG Addressed:** SDG 11 – Sustainable Cities and Communities



## Summary

The objective of this case study is to enhance disaster management practices by involving spontaneous volunteers following a natural disaster in Chile and Argentina, using lessons from implementing ISO22319 in the United Kingdom.

### The objectives of this case study are:

- To detail the role of national, sub-national and local governments in the UK in the development of the initial policy and plans for implementing ISO22319 on spontaneous volunteers.
- To explain how actors used the United Kingdom's policy and plans and translated those into local governments in Chile and then into Argentina – constantly enhancing the policy and making it more transferable to new countries.
- To demonstrate how the policy and plans for local government will translate into a national policy in Chile and Argentina.
- To illustrate how the content of the policy and plans have differed (and how they were the same) for UK, Chile and Argentina.
- To share policy makers' experiences and lessons learned from developing a policy on spontaneous volunteers using ISO22319.

- To show how the content of the policy and plans may differ when implemented in South Korea and other new countries (e.g. Kenya).

## Background

Spontaneous volunteers (SV) are individuals who are unaffiliated with existing official response organisations but who are motivated to provide unpaid support to disaster response and/or recovery. SVs can reduce the impact of disasters, particularly where the capacity of official responders is insufficient. Given the difficulties encountered in the management of SVs in past disasters, authorities in the UK, Chile, Argentina and South Korea have expressed a wish for a formalised approach to managing these volunteers. ISO22319 (Guidelines for planning the involvement of spontaneous volunteers in disasters) provides clear guidance on the topic, and thus, governments have worked to implement it.

## Strategy

The new international standard, ISO 22319: Guidelines for planning the involvement of spontaneous volunteers in disasters, was published in 2017 after being developed within Working Group 5 (Community resilience) of ISO Technical Committee 292 (Security and Resilience). This standard was initiated following a project for the Government of the United Kingdom, which found that the country's civil protection community were in need of guidance on what to do with SVs who offer their support to emergency responders. Many other countries have

experienced difficulties in knowing what to do when SVs offered their help during past disasters.

ISO22319 is available in Spanish, French and English, and has been adopted by IRAM (Argentina), BSI (United Kingdom), and other countries.

## Results and Impact

To better understand the impact of ISO22319 and the SV policy, interviews were held with local government officials from different countries. Below are a few quotes from these government officials:

- Increased capacity and speed to respond to disaster: *"we have been able to increase capacity to deal with spontaneous volunteers by training Rotary International and Civil Service representatives ... has led to quicker response times, as we now have people on call to deal with the influx of spontaneous volunteers ... helped to reduce risk for the volunteers ... now accepted by a small group of spontaneous volunteers who previously worked in the floods and found it difficult to work with the Local Authority – and made a commitment to working with us"* Barbara Sharratt, Emergency Planning Officer, Somerset County Council, UK
- New confidence from exercising the policy and plans: *"We have carried out two live play exercises involving members of the community role playing as 'spontaneous volunteers' - one scenario around an evacuation and one scenario regarding spontaneous volunteers presenting to volunteer for oil pollution clean-up"* Laura Edlington, Emergency Planning Officer, Lincolnshire County Council, UK
- Raised awareness in the public of how to respond and have good practices: *"The project has impacted positively our region and it has consistently attracted media attention. Our region is quite exposed to natural hazards. Developing a plan on spontaneous volunteers is making us more aware of all the stages and actions we need to take to manage properly spontaneous volunteers in times of disaster. This will help us avoid several issues we had in the past because we didn't know how to include spontaneous volunteers in our emergency plans."* Alex Tardón, Director of Emergency Planning, Biobio Regional Government, Chile.
- Strengthen the partnership working of our stakeholders: *"This [policy] is the result of the*

*effort and dedication of our Department of Civil Protection and Emergencies and 24 institutions in the Concepcion area which has involved several stakeholders ... The project has impacted positively our region"* Robert Contreras, Governor, Concepcion region, Chile.

## Challenges and Lessons Learned

To effectively implement ISO 22319 in different countries requires slight changes which reflect the distinct characteristics inherent to each country/region, and fully respect the social, cultural and political differences. Further, the role of local government and strong local leadership are key factors in encouraging the sustainability of the SVs plans.

The need for bottom up implementation was crucial and bureaucratic centralism is a fundamental challenge to the successful implementation of ISO22319. Instances of bureaucratic centralism were mitigated by running workshops and events to design the SVs policies (i.e. the bottom-up approach). The involvement of stakeholders from local and national government (and from the public) has been very successful.

ISO22319 has been successfully implemented in countries and regions that have a "real need" for managing SVs. Developing local and national plans on SVs gave a practical and simple approach to solve a difficult issue in times of disaster.

## Potential for Replication

Initially, the policy and plans were developed in two regions in the UK (Somerset & Lincolnshire) and then later reproduced in Chile and Argentina. Going forward, the policy and plans will be replicated in South Korea and Kenya.

Potential exists for this work to be replicated in NGOS, which take responsibility for working with spontaneous volunteers. Replication into NGOs has been done in the UK and there is scope for this in Chile.

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**Organisation:** University of Manchester (UK) and University of Chile (Chile)

### Case study n°3

## The Global-Scale Alert Hub for Official Emergency Alerts

**Country:** United States of America

**Level:** National

**SDG Addressed:** SDG 11 – Sustainable Cities and Communities



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### Summary

The objective of this case study is to show how the Common Alerting Protocol (CAP) standard (ITU X.1303) and other standards have been used by the United States of America's National Oceanic and Atmospheric Administration (N.O.A.A.) and other national administrations for public alerting in emergencies. The CAP is a remarkable success story with 75% of the world's population living in a nation with at least one CAP alert feed operational or under development. Additionally, the CAP has led to myriad technical advances, cited in over 300 patents in the United States of America alone and is supported by many commercial enterprises.

The CAP directly contributes to the achievement of SDG 11.b: "Develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels".

The global Alert Hub aggregates emergency alerts across official news feeds using the Common Alerting Protocol (CAP) standard, greatly simplifying access and source management. It is implemented on an internet cloud, using open source freeware developed in the Filtered Alert Hub initiative (see <http://alert-hub.org>), part of the National Oceanic and Atmospheric Administration (NOAA) Big Data Project.

The Filtered Alert Hub freeware provides customised alert feeds for any of 2000+ defined places (countries and cities), with further selection by any CAP content criteria. The freeware is designed for an internet cloud, so that an implementation would be highly reliable, immediately available, and fast enough that a published alert can reach online users within two seconds. Such speed is crucial for sudden-onset threats (e.g., earthquakes, flash floods, tsunamis, tornadoes) where each second delay could result in lives lost.

The global Alert Hub is an implementation of the Filtered Alert Hub technology. It is set to restrict the alert sources to authorities in the international Register of Alerting Authorities. It is also set to select only high-priority alerts: where people in the alerting area need to act within one hour in response to an extreme or severe emergency having at least 50% certainty.

### Background

Historically, emergency messages have been mostly unstructured text, composed like a press release. Unstructured text is a barrier to automated communications processing, especially because emergency messages varied widely across hazard threats, and across countries and languages as well. The Common Alerting Protocol (CAP) standard

addressed this problem with a “standard form” an XML message constructed through fill-in boxes and check boxes to convey just the essential alerting data and information about any kind of emergency.

Every officially recognised source of CAP alerts is in the international Register of Alerting Authorities, maintained by WMO, a treaty-level organization within the UN family.

## Strategy

Essential to the development of an effective Alert Hub is accelerating the uptake, by alerting authorities, of the Common Alerting Protocol (CAP) standard, ITU X.1303. Today, 75% of the world’s population lives in a nation with at least one CAP alert feed operational or under development. Some countries have very many. For example, the United States of America operates a kind of national scale Alert Hub known as IPAWS, which aggregates over 1000 CAP alert feeds within the country. Italy has a CAP alert source for every fire station nationwide.

In addition to CAP, the Alert Hub technology and the international Register of Alerting Authorities are built on many other international standards, including: ISO/IEC 10646, ISO 3166, ITU X.660, ISO 19125, ISO/IEC 11179, and ISO 639, as well as Internet and W3C standards such as XML, RSS, ATOM, HTTP/HTTPS, and TCP/IP.

## Results and Impact

The CAP standard, ITU X.1303, has been widely adopted in the 13 years since its first release. CAP is now the pre-eminent standard for public alerting of emergencies in most countries. CAP has led to myriad technical advances, cited in over 300 patents in the U.S. alone.

CAP is supported by many commercial enterprises. For example, Pinkertons uses CAP in support of its business intelligence services to 80 of the 100 world largest companies. Microsoft and IBM each offer comprehensive management packages for cities and both are CAP-enabled. Google supports CAP in its products as a public service to alert users in harm’s way.

CAP and the Filtered Alert Hub initiative specifically are fundamental to the global-scale WMO Alert Hub prototype. This already includes a clone prototype operated by the Hong Kong Observatory and another Alert Hub being developed to serve all South America. Both AccuWeather and The Weather Company have stated intent to use the WMO Alert Hub once it is operational.

## Challenges and Lessons Learned

Given that public safety systems, including CAP-enabled systems, are targets for deliberate mischief, strong security and authentication is essential. ICT security techniques such as encryption and digital signage are used in many CAP systems, but some implementers have difficulty implementing such techniques fully and correctly. A challenge to the ICT community is to make good security easy.

CAP-enabled systems are often life-critical, so it is essential that each message is schema-valid. XML fully serves this requirement, but many programmers find XML challenging, especially with regard to XML namespaces. XML’s complexity has led to “dumbed down XML” facilities in some programming languages, and to the use of JSON in Javascript. In a CAP context, these XML substitutes must be used with great care. For example, it is common to find latitude and longitude coordinates reversed in a CAP system where JSON was used somewhat carelessly.

Many real-world implementations of the CAP standard mis-handled use of the “Unknown” value in three enumerated lists: “urgency”, “severity” and “certainty”. Apparently, it is not common for system designers to correctly handle a missing value; instead the value is handled as though assigned a minimal value.

## Potential for Replication

The initiative has produced freeware already used in multiple global-scale Alert Hub prototypes. Operational costs are minimal: annual cloud service charges for one prototype is about 2000 USD. Systems at other scales or a subset of all hazards would cost substantially less.

The Alert Hub technology could be applied at any level: global, national, provincial, city, and down to communities, campuses, parks, etc. It could also provide specialised alerting services to globally-dispersed populations such as persons with disabilities, or to anyone in a place where he/she does not understand the native language, such as visitors and refugees.

The technology could be used by any service that has a situational awareness component, whether for purposes of emergency management or for risk management, logistics, investment planning, selective dissemination of news, and business or defence intelligence, among many others. It could be used as the core aggregation and dissemination facility that underlies virtually any monitoring/alerting system. In that sense, it could be directly employed in myriad existing systems specialized by type of man-made or natural hazard, such as typhoons, floods, tsunami, volcanoes, landslides, earthquakes, transportation disruption, firefighting, missile defence, anti-terrorism, child abduction, etc. For instance, it could be a useful adjunct to the global-scale Humanitarian OpenStreetMap Team efforts.

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**Contact Name:** Eliot Christian  
**Organisation:** Team leader of the Filtered Alert Hub,  
part of the Big Data Project operated by NOAA



## Case study n°4

### València Smart City Platform – City Standard Based KPIs for Smart City Management

**Country:** Spain

**Level:** Local

**SDG Addressed:** SDG 11 – Sustainable Cities and Communities



#### Summary

The objective of this case study is to show how the administration of the city of Valencia (Spain) has used several standards, including ISO 37120, to develop key performance indicators (KPIs) shared on an open platform and dashboard. This allowed breaking information silos in the administration, leading to integrated, transparent and enhanced decision management.

This supports several indicators under SDG 11, including SDG 11.3: “By 2030, enhance inclusive and sustainable urbanisation and capacity for participatory, integrated and sustainable human settlement planning and management”.

#### Background

City management involves handling the right information to take correct decisions. ISO 37120 supports policymakers to achieve this goal, by providing a global framework for cities; defining a hundred KPIs common for all cities adopting the standard.

Further, having standard KPIs has enabled València to build solutions based on information coming from internet of things (IoT) devices.

#### Strategy

When the initiative began in July 2014, there were no global standards for Sustainable Cities. On its launch, ISO 37120 became a guide for València's KPI standardisation. València became Platinum Certified by the World Council on City Data in 2015. Since adopting the ISO standard, the VLCi project Team contributed to the Spanish Working Group AENOR CTN178 on Smart City topics, contributing to the document “UNE178201” on Smart City Attributes and Requirements and working on: (i) UNE178202 on Smart City and (ii) UNE178104 on Smart City Platform Interoperability.

Since 2016, València has been a contributor to the ITU Y.4903/L.1603 standard on “Key performance indicators for smart sustainable cities to assess the achievement of sustainable development goals”. This work is ongoing and València plans to be ITU Y.4903/L.1603 compliant by 2018/19. Every smart solution, built by means of the VLCi platform, contributes to ISO 37120 KPIs, which are reported by the city management using city dashboards.

#### Results and Impact

Basing the KPI definition and city strategy on City Global Standards (e.g. ISO37120, ITU Y.4903/L.1603) – in addition to several other national standards (e.g. UNE178104, UNE178201, UNE178202 and UNE178108) – has allowed València to:

- Report KPIs at a global level, allowing us and other compliant cities to check and compare with them.
- Build rational dashboards based on standard well defined KPIs to support the decision-making of city management.
- Align vertical solutions (IoT deployments) so standard KPIs are fed from devices deployed in the city.
- Obtain quicker results as following the standards as our guideline.

The application of City Standards and the utilisation of the open platform (i.e. VLCi platform) have resulted in greater levels of visibility and global compliance.

### Challenges and Lessons Learned

The implementation of ISO 37120 was a considerable undertaking for València City Hall. In addition to numerous joint commitments and consultations, the standard's implementation necessitated collaboration across all government departments.

Prior to all these meetings, City Hall developed a document collecting all KPI functional definitions, attributes, operators and formulas. This was done to structure the work with all the City Hall Departments, find the data sources and document it accordingly.

Collaboration is key, but methodology and a structured work plan is essential. It was found that some KPI calculations were challenging as the same level of information calculations always detailed to the "local level" or the "city level" – greater interpolation or further research is required. Good technical resources are critical, to achieve a quick data integration.

### Potential for Replication

València's smart city and KPI experience can be replicated easily as forms (in Spanish) and methodology can be reutilised and adapted easily to any other city. The solutions built on the VLCi platform are FIWARE based (data is integrated using NGSI and stored and processed in HDFS) use FIWARE (open source platform) data models to give structure to the information provided by the devices deployed in the city, it should be easy to replicate in any other city using FIWARE components (i.e. Context Broker).

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**Contact Name:** Ramón Ferri  
**Organisation:** Smart City Office Chief –  
València City Hall (Spain)

## Case study n°5

### Interoperability of Intelligent Transportation System (ITS) Services and Systems

**Country:** Egypt

**Level:** National

**SDG Addressed:** SDG 11 – Sustainable Cities and Communities



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#### Summary

This case study shows how the government of Egypt has used standards, such as the ISO 14813-1:2015 on “intelligent transport systems (ITS)”, to enhance transport safety, security and mobility on a total of 6000KMs of key highways and transportation routes in the country. This was the first phase of nationwide safety control applications and supports the achievement of SDG 11.2: “By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety”.

Egypt has been suffering from some challenges with respect to high levels of congestion and occasional safety related incidents. The Egyptian government has set an ambitious target of enhancing the road network infrastructure and implementing ITS to enhance transport safety, security and mobility on a total of 6000 KMs (1st phase) of key highways and transportation routes in the country.

In principle, the system architecture involves the deployment of field equipment (sensors, cameras, RFID readers, and other nodes with edge analytics capabilities); all interconnected through a highly reliable and resilient communication infrastructure, to the backend system, a central command and control centre employing traffic management applications. A common pitfall for cities and countries implementing such systems is to go by a specification or a proprietary protocol locked by a single vendor. To avoid vendor lock-in, standardised solutions are key to ensure interoperability and decrease total cost of ownership (TCO).

This case study demonstrates key challenges facing governments in achieving interoperability between different ITS components, and the key approaches done to alleviate such problems. That usually includes the implementation of a standardised service and functional architecture, standardised communication protocols and interfaces between the field equipment and the backend, and centre to centre data exchange.

#### Background

ITS entail the integration of many different technologies, and systems from many vendors and technology providers. Typical objectives include increasing road transportation safety and security along with enhancing mobility and transport efficiency. This in turn requires the design and implementation of many integrated modules. Examples include enforcement applications (e.g. speeds detectors systems, weigh in motion, and other traffic violations detection), tolling, passenger information systems, and traffic management. There are different approaches of integration depending on the required level of monitoring and control. Options include integration at the field devices level, or the aggregation nodes, or at the control centre levels or a hybrid approach. Adopting an open architecture and selecting an optimal integration point is the recommended approach.

## Strategy

Implementing a standardised architecture facilitates the process of laying down the required functionalities for the system to operator effectively and efficiently. Using a standardised communication infrastructure facilitated the aspect of integrating different equipment from different vendors. The communication infrastructure can use a wide range of standards depending on requirements analysis. These include for example, ITU-T G.651: Characteristics of a 50/125 micrometres multimode graded index optical fibre cable, ITU-T G.652: Characteristics of a single-mode optical fibre cable, and other ITU-T G Series Recommendations. The IEEE has also a suitable standard for the Gigabit Ethernet cases, there is the IEEE 802.3-2005 standards.

On the other hand, specialised urban traffic controllers following some specifications like *Open Communication Interface for Road Traffic Control Systems (OCIT)*, *Sydney Coordinated Adaptive Traffic System (SCATS)*, *Split Cycle Offset Optimisation Technique (SCOOT)*, can be difficult to integrate, given the legacy nature of these systems. Using the American NTCIP is a widely used standard in the industry for connecting to field devices, and especially for the variable message signs. But NTCIP devices are not compatible with some of the major urban traffic controllers. This issue complicates the integration process a little bit. Special measures need to be adopted either at the aggregation level, or the back-end level to mitigate these issues.

For the RFID use cases, the EN 302 208 ultra-high frequency radio frequency identification (UHF RFID) up to 2W effective radiated power (ERP) is adopted.

Depending on the scope and requirements of the project, realising nationwide safety control applications require continuous or quasi-continuous communications with the vehicles. This might be difficult to realise given the heterogeneity of the infrastructures deployed over a country. Forums could help to solve these problems along with their requirements and interfaces to and from different technology stacks. For example,

ISO 25111 provides the architecture and common requirements for connection of “continuously on” systems and “connection time managed” of public wireless communications systems. Additionally,

ISO 21212, and ISO 21213 specifies air interface requirements for interfacing 2G and 3G systems with CALM respectively.

The industry is yearning for standards that would unify, or better inter operate and inter work different systems together.

The proliferation of IoT and other commonly used IoT platforms make things even more complicated. Efforts to standardise IoT platforms, which can also serve ITS applications, can be found in ITU-T Y.4200 and Y.4201 on Requirements for the interoperability of smart city platforms; and High-level requirements and reference framework of smart city platforms, respectively. The ITU-T SG20 is also currently working on developing a framework of cooperative intelligent transport systems based on the Internet of things (Y.IOT-ITS-Framework).

## Results and Impact

Standards allow:

- High level of interoperability between different system
- Avoidance of vendors lock-in and hence better services, higher quality and better performance versus costs options
- Future scalability, by adopting a modular approach based on a standardised architecture
- Better maintenance planning
- Lower overall TCO

## Challenges and Lessons Learned

Perhaps the main challenges lie in the difficulty of selecting the standards at the different levels of the system. Standards themselves, especially on regional levels entail differences which are triggered in principle by competing industry ecosystems. Perhaps, this highlights the importance of international standards developing organisations (SDOs) like the ITU, IEC, ISO to develop an internationalised set of standards or at least principles that would unify requirements and/or architectures to realise interoperability.

Another important challenge concerns the drafting of the RFPs, requirements, and specifications of such complex system, with a future looking eye on the technological advances in the field, and the intersection of emerging new technologies like the IoT, AI, big data, and cloud. Designing, and implementing a system with no future planning outlook could cost a country millions of investments costs, to upgrade, or inter operate with newly required features or functionalities.

### Potential for Replication

The experience presented in this case study can be replicated in almost all domains which require the integration of many complex subsystems on a rather national level. Examples include smart cities operation and management, utilities, and security related use cases.

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**Organisation:** Vice Chairman, Study Group 20 on IoT and its Applications including Smart Cities and Communities; Co-Chairman of Working Party 1



## Case study n°6

### **ISO 22327 Community-Based Landslide Early Warning System as a Tool towards Sustainable Community Development on Disaster Risk Reduction**

**Country:** Indonesia

**Level:** National, Subnational, Local

**SDG Addressed:** SDG 11 – Sustainable Cities and Communities



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#### Summary

The objective of the case study is to show the impact of the initial trial – carried out in 98 districts throughout 28 provinces of Indonesia – of the new International Standard ISO 22327 on “Security and resilience - Emergency management - Guidelines for implementation of a community-based landslide early warning system” to strengthen community resilience to landslide disasters.

The standard – which has just been approved and is in the process of being published – has already proved to be able to save lives when the disaster occurs. This directly contributes to the achievement of SDG 11.b: “Develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015- 2030, holistic disaster risk management at all levels”.

The standard was implemented in collaboration with the Indonesian National Authority for Disaster Management (BNPB), Ministry of Village, Development of Disadvantaged Regions and Transmigration of Indonesia (KEMENDES), and Regional Disaster Management Agency (BPBD), as regional response team, to ensure the objective of this standard was successfully captured by the community.

Early warning systems were installed at the districts with the highest possibility of landslide occurrence. Technical assessment was carried out for determining the hazard risk area. Other than technical issues, it was ensured that the community understood how to respond in the event of a warning from the system. Socialisation was conducted to disseminate

the knowledge of landslide to the population and local communities and authorities were encouraged to make Standard Operation Procedure (SOP) for evacuation and develop evacuation maps that were familiar to the local knowledge. In the application of this standard, it was found to significantly reduce casualties caused by landslide. However, to ensure that this system will work more sustainably, greater cooperation and commitment is needed between the government and the community.

#### Background

Landslides are one of the most widespread and frequent natural and anthropogenic hazards in the world. The implementation of mitigation measures usually focus on: (i) avoiding slope failure or diverting the moving mass away from vulnerable elements, or (ii) building reinforcements to protect the threatened elements. However, it is quite common that this zone has been developed as dense settlement of housing and infrastructure areas, and the relocation of people living in this area to the safer zone cannot be conducted due to some socio-economic constraints. Thus, development of landslide warning system becomes very critical to protect the people living in the landslide risk area.

Most of the early warning system included the implementation of various technological and modelling methods to predict landslide. For example, a system installed in the Citarum River Catchment in Indonesia uses hydrological-geological modelling to predict the landslide. However, cultural, economic,

social, and demographic considerations are often left out of the design compared to the other technical aspects in the currently developed early warning systems.

By implementing a simple, low-cost early warning system and improving the dissemination of information at local and national levels. The need for a legal standard is important to exemplify the early warning capacity and increase the community compliance. Considering that landslide disasters commonly occur at a local area sharing similar geomorphology and geological conditions, the proposed standard only addresses local scale landslide. This standard is aimed at empowering individuals and community at risk to act in sufficient time to reduce the number of the casualties. This standard is also expected to increase awareness and encourage the governmental disaster management agencies, such as the Indonesian National Authority for Disaster Management (BNPB) and Regional Disaster Management Agency (BPBD), and related stakeholders to conduct regular socialisation and monitoring to ensure the sustainability of the whole system of early warning.

### Strategy

The approach needs inter-disciplinary roles to support disaster risk reduction in the context of community development. The technical approach plays a role in the risk assessment and installation of hazard

monitoring and warning services. However, based on experience in installation of landslide early warning instruments in Southeast Asian countries since 2007, focusing only on the technical approach does not guarantee the effectiveness and sustainability of the systems. To overcome this problem, applying a social lens plays a key role in the success of the program, particularly in terms of establishing the disaster preparedness protocol, developing the response team, evacuation map, a standard operating procedure, and enhancing local commitment.

The ISO standard comprises seven sub-systems, namely: (i) risk assessment; (ii) dissemination and communication of knowledge; (iii) establishment of a disaster preparedness team; (iv) development of an evacuation route and map; (v) development of standard operating procedures; (vi) monitoring, early warning and evacuation drill; and (vii) commitment of the local government and community on the operation and maintenance of the whole system.

The Universitas Gadjah Mada (UGM), in cooperation with the government bodies and private sectors, has implemented the newly proposed standard in 98 districts throughout 28 provinces in Indonesia and in Myanmar (as shown in Figure 1).

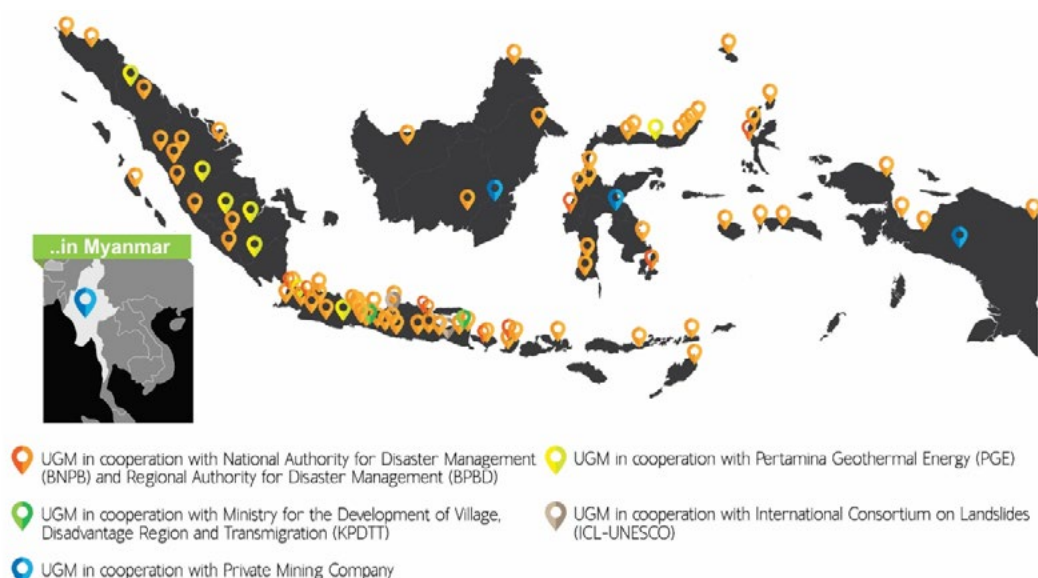


Figure 1 Installation of Early Warning System in Indonesia and Myanmar

Regular monitoring and socialisation was conducted together with the Regional Disaster Management Agency (BPBD) to deliver disaster knowledge to the community. The community was familiarised with the local geomorphology and topography of the region and neighbouring village to be able to make their own evacuation plan. Then, the community accompanied with BPBD was encouraged to develop their own Standard Operation Procedure (SOP) for evacuation, evacuation map, and community preparedness team with the approval from authorised agency or experts. A self-evacuation drill is also conducted once a year to ensure local government, the community, and preparedness team are aware of what to do when the warning is issued by the early warning equipment.

### Results and Impact

Since 2007, landslide monitoring systems have been implemented in Indonesia, starting with a manual monitoring device, paper-recorded device, utilisation of data logger through to using real-time monitoring systems. This universal standard is carried out to support the implementation of a landslide early warning system in Indonesia where the trial of this proposed methodology was done. Both approaches (technical and social), supported with continuing education and research, are expected to be able to involve all the related stakeholders, reduce the cost of system implementation and maintain its sustainability.

The implementation of this standard has strengthened the community resilience to landslide disaster and proved to be able to save lives when the disaster occurs. For example, this system was able to save 100 households in Aceh Besar when a landslide occurred in 2015. Universitas Gadjah Mada, in collaboration with local BPBD, was able to conduct evacuation in sufficient time when the sirens from the early warning system rang. This experience proved that the whole system in the standard has a significant impact on saving human lives and reducing casualties. This standard has also become an important guideline for the disaster management agency in Indonesia. Therefore, the Indonesian government has taken a serious action by including this standard as a reference for National Medium-term Development Plan (2015-2019) for reducing disaster risk especially for landslide.

### Challenges and Lessons Learned

The application of ISO 22327 in Indonesia requires consistent strategy and support from the government, universities, NGOs and private sectors for the implementation of community-based projects. However, there is still a gap and disconnect between the institutional and strategic approaches to disaster risk reduction, which will affect the effectiveness of community-based projects on landslides prone areas. Based on previous experiences when implementing this standard system since 2012, there are a few key challenges and unexpected conditions that need to be prepared for. The factor of success in this landslide early warning systems is the multi-stakeholders participation. However, coordination among stakeholders can be very weak.

Another obstacle concerns the difficulties faced by disaster risk reduction programs. The level of local community awareness and preparedness is not constant at any given time. Usually after experiencing a disaster, the community preparedness levels can be high, however it is likely to decrease over time. The use and maintenance of the monitoring and warning devices tend to become neglected as community awareness decrease. For example, the landslide early warning system was installed in early 2015 in Pariaman, West Sumatra, Indonesia. An evaluation and monitoring of the devices was conducted in December 2015 to ensure the sustainability of the system. However, the devices were found not to be treated well and have not been taken care of by either the BPBD or the local community. The community assumed the landslide was not likely to occur - as it had been months since the installation - and, thus, there was no urgent requirement for them to prepare for the disaster.

### Potential for Replication

Since 2007, Universitas Gadjah Mada (UGM), in cooperation with the Indonesian National Authority for Disaster Management (BNPB) and the Ministry of Village, Development of Disadvantaged Regions and Transmigration of Indonesia (KEMENDES), have developed simple and low-cost equipment for landslide monitoring and early warning. This model of landslide early warning has been quite effective in improving the community resilience of landslide-vulnerable villages. Other than that, community preparedness can be strengthened by conducting dissemination of information and communication, developing standard operation procedure and evacuation map, as well as strong commitment between related stakeholders and community. All of these approaches are easily followed by the communities and strongly recommended to be implemented in other hazard risk areas.

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## Case study n°7

# ASTM International Standards Supporting Sustainable Concrete Construction

**Country:** Zambia

**Level:** Local

**SDG Addressed:** SDG 11 – Sustainable Cities and Communities



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## Summary

The objective of this case study is to show how ASTM International Standards on Concrete and Concrete Aggregates have been used in Zambia, the United States of America and other countries with two main goals. The first is to increase the potential for recycling building materials and in particular concrete, reducing the amount of these materials that end in landfills. The second is to codify practices for adding water, notably allowing for the use of recycled water, to concrete at a job site. The implementation of this second standard led to water conservation, and enhanced quality of raw materials used in the construction industry.

This contributes to the achievement of different Goals and Targets, including: SDG 11.1: “By 2030, ensure access for all to adequate, safe and affordable housing”, and SDG 1.6: “By 2030, reduce the adverse per capita environmental impact of cities”.

## Background

Concrete is a sustainable infrastructure component due to properties such as: durability, recyclability, allowable variation in constituent materials, and relatively low energy consumption in production when compared to an alternate building material such as steel.

## Strategy

The featured standards assist in addressing practices for reuse/recycling of concrete or constituent materials. Recognising the increase in sustainable construction practices and working to address practical issues encountered in the production and use of concrete, ASTM Technical Committee C09 on Concrete and Concrete Aggregates developed standards that can be applied universally regardless of the material, its source, and location of application. The first two standards address better practices for adding water, notably allowing for the use of recycled water, to concrete at a job site.

These ASTM International standards are: (i) C1602, covers mixing water for producing hydraulic cement concrete; and (ii) C1603, details measuring solids in water; used to determine the solids content of mixing water for concrete when one or more of the water sources is wash water from the work site.

The second two ASTM International standards address the use of recycled industrial materials in concrete production. They are: (i) C1697, covers blended supplementary cementitious materials for use in concrete or concrete production; and (ii) C1798 covers the use of returned fresh concrete for use in new batch ready-mixed concrete.

## Results and Impact

The new standard allows industry to develop a more sustainable construction practice, in which millions of cubic yards of concrete can now be recycled in a way that is safe for end-users and provides a more conscious approach to environmental stewardship. Further, the standard creators enhanced environmental stewardship due to: reused materials that might otherwise be placed in landfills, and water conservation on account of acceptable use of recycled water on the job site.

Zambia's experience confirms the aspects of lower costs and environmental stewardship while also pointing to sustainable construction. In Zambia, the National Construction Council compels the national standards body, the Zambia Bureau of Standards (ZABS), to identify standards needed for the construction industry rather than allowing industry to self-identify needed standards. For this reason, ZABS has adopted C1697 and C1603.

With respect to ASTM C1697, the diversification in the use of different raw materials in the Zambian construction industry, to enhance cohesion and durability in the formulation of mortar or concrete, led to the adoption of the standard. Regarding ASTM C 1603, the standard was adopted to ascertain the content of impurities (solids) in the water to ensure quality raw materials are used by industry.

The use of these standards promotes the recycling of the materials to be used in the construction industry. This has the effect of reducing the number of landfills and supports environmental preservation (land and water bodies).

## Challenges and Lessons Learned

Challenges include educating regulators, industry representatives and consumers on the suitability and benefits of using recycled constituent materials. This may include addressing any reluctance or resistance to using constituent materials and correcting misconceptions regarding the performance of concrete.

Driven by market or regulatory need, the desire to improve sustainable construction practices serves as the impetus for modifications to long-standing specifications for concrete. Identifying ways to lessen environmental impact also enhances economic feasibility (i.e. lower production costs and lessen market costs to end users) of concrete as a construction product. The result is improved economic growth and social prosperity (e.g. more affordable, sustainable housing), without being detrimental to performance. Demonstrated market acceptance will support regulator acceptance of the newly specified product.

## Potential for Replication

Concrete is a local material, insofar as it is not traded across borders but rather produced and transported to nearby local work sites. In addition to the United States of America, and numerous other nations located throughout Africa, Asia, the Caribbean, Latin America and the Middle East report citing one or more of the listed standards.

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**Contact Name:** Ms. Magaret Lungu

**Organisation:** Director Technical Services of Zambia  
Bureau of Standards

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<sup>1</sup> Strubel, L. & Godfrey, J. (May, 2004). How Sustainable is Concrete? Proceedings of the International Workshop on Sustainable Development and Concrete Technology. Paper Presented at International Workshop on Sustainable Development and Concrete Technology, Beijing, China (201-211)

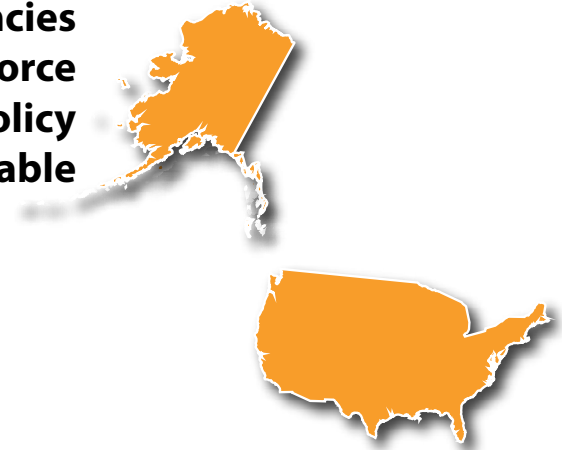
## Case study n°8

### **Next Generation Core Competencies (NGCC): Standards for Building a Workforce with the Knowledge, Creativity, and Policy Expertise for Implementing the Sustainable Development Goals (SDG)**

**Country:** United States of America (USA)

**Level:** National, Subnational, Local

**SDG Addressed:** SDG 11 – Sustainable Cities and Communities



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#### Summary

The objective of this case study is to demonstrate how the Next Generation Core Competencies (NGCC) provide standards for the development of a future disaster risk reduction (DRR) workforce. An updated edition of DRR core competencies is important for refining the trajectory of the discipline, developing capacities requisite to reducing disaster risk and building resilient communities in a turbulent, uncertain and complex future.

The NGCC project was a multi-phase study conducted by a United States of America Federal Emergency Management Agency sponsored focus group. Oriented toward future needs, the competencies have been built on the current DRR competencies, a review of related competencies and global risk trends, a multi-phase Delphi study, and wider DRR community listening sessions.

Core competencies are significant to establish an environment for carrying out the SDGs at all levels in a way that is consistent with approaches taken across communities, civil society and business. Understanding the competencies that will be at the core of successful future practice requires examining how the current and anticipated drivers of sustainability are intensified by the changing interactions between the social, built, and physical environments. Core competencies guide the development of the future workforce, equipping future workers with the skills necessary to foster more resilient communities and apply design processes in coping with the unexpected.

#### Background

The NGCC project was a multi-phase study conducted by a FEMA-sponsored focus group. The future orientation and uncertainty of the outcomes current risk drivers may yield is acknowledged as a fundamental study perspective. As such, meaning was sought and interpreted through related competency findings, as well as conclusions from a range of experts. The social construction interpretation seeks understanding of the world based on historical and social positions of the community we live and work in. Correspondingly, the study utilised multiple strata of information gathering and analytic refinement of the competencies to address any bias arising in the inductive processes.

#### Strategy

The NGCC are in themselves a set of standards that guide the development of the workforce through higher education, workplace development and research. As such, the NGCC are de facto standards that were required to focus DRR/sustainability capabilities. The work was achieved through an inclusive multi-phase process: 1) Focus Group, 2) Delphi Study, 3) Listening Sessions with the broader emergency management community, and 4) Development of a measurement model.

A variety of participants were engaged to inform the processes and competency development over several phases of the research. The focus group drafted the précis and conducted the data gathering,

amalgamation, and analysis. Member composition for each task and cycle was varied to reduce possible single researcher bias. The experts in the Delphi cycles provided an iterative reshaping of the core competencies. As a final refining process, the summary report was posted and listening sessions were conducted for the wider community feedback. Additional independent validation study has affirmed the findings of the NGCC project.

The core competencies fall into interrelated and nested categories, which have attributes that build the individual, the practitioner, or relationships. Behavioural anchors and key actions for measurement accompany the new core competencies.

## Results and Impact

The following core competencies were identified and fell into three nested and interconnected categories:

1. DRR Competencies that Build the Individual: operate within DRR framework, principles, and body of knowledge; possess critical thinking; abide by professional ethics; and continual learning
2. DRR Competencies that Build the Practitioner: scientific literacy; geographic literacy; sociocultural literacy; technological literacy; and systems literacy.
3. DRR Competencies that Build Relationships: disaster risk management; community engagement; governance and civics; and leadership.

Each core competency has connected behavioural anchors and key actions that provide an evidence-based model for measures at multiple levels of education and practice. Behavioural anchors and their key actions are specific examples of behaviours that demonstrate competency. The behavioural anchors and their key actions can be used toward observable performance measures or generating measurable learning objectives to underpin a higher education program or curriculum.

The NGCC provide a framework for application through multiple channels. Here are a few examples of ways the NGCC framework is being utilised: (i) FEMA's Executive Program.-organisational change

across the sector is focused on the NGCC; (ii) university alignment of DRR programs to the NGCC; (iii) workplace performance can be aligned to the NGCC using the Behavioural Anchor Rating Scales to guide development; and (iv) the Adapt Institute works as a bridging organisation for implementing the NGCCs through independent courses for higher education and to support workforce development.

## Challenges and Lessons Learned

The development of core competencies requires a long view and patience in getting a wide range of sectors to truly collaborate. Once that initial buy-in is achieved, the work can start to expand quickly. Resulting data serves as a versatile evidence base for: (i) focused improvements; (ii) the refinement of curriculum or organisational practice; and (iii) the locating of unknown potential. Future efforts will focus on the following:

- Develop learning materials to leverage efforts in higher education and the workplace.
- Align core competency models in other human security fields: homeland security, law, fire, public health, and humanitarian assistance.
- Create performance measures for practice.
- Build a platform for advancing the core competencies

## Potential for Replication

The NGCC project has adopted similar forms in other regions, including the Caribbean, Australia and New Zealand. Related human security disciplines, such as public health, have taken similar approaches in developing core competencies. Future alignment across regions and disciplines will allow the SDGs to be implemented more effectively by a focused and collaborative workforce. The value in the NGCC project is a well-defined and validated process that can accelerate the development of similar core competency projects.

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**Organisation:** California State University Long Beach  
 / Red Cross Scientific Advisory Council

# Case Studies

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## Standards for Climate Action





## Introduction

Standards can play a crucial role in the climate agenda and towards the accomplishment of SDG 13, contributing to the monitoring of climate change, the measuring of greenhouse gases, and the fostering of good practice related to environmental management. Indeed, climate action-related standards, *inter alia*, provide businesses and institutions with practical tools to reduce the impact of their operations on the environment, implement effective environmental management systems, communicate on environmental performances, as well as to finance climate change initiatives, deliver climate change mitigation and adaptation strategies, and open the markets to clean energy. The international standardisation community is in the unique position to take appropriate action against increasingly extreme weather events threatening our planet, by further developing standards in support of the achievement of the Paris Agreement.

The principles guiding the development of standards are identical to those informing the design of effective solutions to climate change. Both processes feed on consensus, transparency and innovation. It comes as no surprise that the former could prove instrumental to the success of the latter. Against this backdrop, the following case studies present successful applications of climate action-related approaches implemented by policymakers in different regions of the world. These studies detail how standards can contribute to the achievement of SDG 13 and their inherent potential for replication.

As the impact of energy sources and associated emissions are among the main causes of climate change, it is deemed necessary to ensure that a larger share of renewable energy contributes to the global energy mix. The Chilean Solar Committee has long been implementing standards when installing highly efficient photovoltaic system in the Alcatama desert, with a view to producing cleaner energy and reducing CO<sub>2</sub> emissions. Along the same lines, the Energy Commission in Ghana has enforced Minimum Energy Performance Standards (MEPS) to retrofit both the energy lightning and the household refrigerator markets, resulting in drastically reducing carbon emissions and consumption, thus positively impacting both the environment and the economy of Ghana at large.

With respect to a broader environmental management perspective, the Italian Accreditation Body has adopted an organisational model, based on voluntary international standards. This is considered to be conducive to a more responsible and environmentally friendly behaviour from companies, which enhances institutional capacity for climate change mitigation. Similarly, the African Organization for Standardization (ARSO) has proven the potential of the Eco Mark Africa Certification System in fostering sustainable production and consumption. As a result, the detrimental effects of climate change are effectively addressed and the population pressure on the Africa's natural ecosystem significantly reduced.



## Case study n°1

# Chile and its Efforts Towards High Quality in Photovoltaic (PV) Systems for Desert Conditions: Innovation, Awareness, and Implementation Approach

**Country:** Chile

**Level:** National

**SDG Addressed:** SDG 13 – Climate Action

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## Summary

Chile implemented two standards – IEC 61215-1:2016 “Terrestrial Photovoltaic (PV) Modules: Design Qualification and Type Approval” and IEC 61730-1:2016 “Photovoltaic (PV) Module Safety Qualification” – when installing solar plants in the Alcatama Desert, located in the northern region of the country. This case study aims to demonstrate how the implementation of these standards leads to a longer lifetime of the PV modules, while contributing to the achievement of SDG 13.2: “Integrate Climate Change Measures into National Policies, Strategies and Planning”. The subsequent share of renewable energy in Chile’s national energy mix, would reduce the country’s carbon emissions.

The primary objective is to strengthen the quality infrastructure for PV systems in desert conditions within three main pillars; namely, metrology, standards and conformity assessment schemes. The first phase consisted of installing a national laboratory featuring capabilities and equipment to monitor key parameters concerning the solar industry. The second step, featuring a benchmark study on failures in PV plants has been carried out and an Open Innovation Challenge has been launched by the Chilean Solar Committee, with a view to tackling the most pressing issues affecting companies operating in the solar business. The third stage, currently in progress, aims at integrating conformity assessment schemes into the national PV industry.

## Background

According to the technical specifications delivered by the manufacturers and developers, the PV modules installed in the north of Chile comply with the IEC 61215 and IEC 61730 standards. In the national market, it is understood that these standards ensure the operation of the photovoltaic modules for twenty or more years. However, the standards do not carry out tests to guarantee the modules’ lifetime, not least under the high radiation levels and temperatures characterising the Atacama Desert, where they have been installed.

A shorter lifetime would lead to lower interest for financing PV developments. This could stifle the growing market for solar power generation and delay the achievement of the 2050 Energy Policy goal, which aims to cover the 70 per cent of the country’s energy needs via renewable energy sources. This is indeed considered one of the axis for integrating climate change measures into Chilean national energy policies, strategies and planning (SDG 13.2).

## Strategy

Developing an extended version of IEC 61215 is crucial to adapt the tests to different climate-related conditions, and to provide a model, which allows both for the simulation of a loss of power and the correlation factors between the accelerated laboratory tests and the actual operation conditions. Likewise, in the test protocols, it seems pivotal to consider the high levels of UV radiation under real operating conditions in the Atacama Desert area.

## Results and Impact

The current IEC standards have been conducive to the greater adoption of solar PV in Chile. This has reached a 5% share of generation in the national energy mix and contributed to an estimated reduction of 2.2 million tonnes of CO<sub>2</sub>e in 2017.

It is necessary to advance the development and extension of the current IEC standards, with the aim of ultimately relying on standards, which could guarantee long-term operation and accurately estimate the life time of photovoltaic systems, in different climatic and radiation conditions.

Specific challenges for areas with high solar generation potential, such as the Atacama Desert, present technological questions that need to be considered as part of the development of new IEC standards and/or when updating existing ones, to avoid the maximum emissions of tCO<sub>2</sub>e.

The rise in arid and desert zones, highlights the need for greater sharing of behavioural knowledge and certification of PV systems to other desert zones. The adoption of zero-emissions PV technologies could mitigate many of the more challenging aspects of life in such desert conditions.

## Challenges and Lessons Learned

When satisfied that the demonstrated supplier certifications are sufficient, project developers will seek the option with the lowest investment cost. While some larger companies may purchase the services of suppliers who provide extended certifications to achieve greater quality, this is not necessarily an option available to all market actors.

Challenges arose from the lack of awareness of the impact of radiation conditions in the long-term performance and durability of solar modules and systems.

## Potential for Replication

As a continental leader in the development of solar PV, Chile's experience can inspire others to develop renewable systems. Further, the standards for photovoltaic systems, which guarantee performance and reliability under specific climatic conditions (e.g. Atacama Desert), would equally serve as a benchmark for replication.

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**Contact Name:** Ana María Ruz  
**Organisation:** Chilean Solar Committee – CORFO

## Case study n°2

### **Promoting Environmental Compliance: A Case Study of *Italian Legislative Decree 231/2001***

**Country:** Italy

**Level:** Local, National

**SDG Addressed:** SDG 13 – Climate Action



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#### Summary

The objective of this case study is to show how reference to international standards – such as certification standards (ISO 45001/ISO 14001/ISO 37001/ISO 27001) within a regulatory framework – encourage responsible business practices and penalise environmental degradation. This has the potential to enhance institutional awareness of environmental stewardship and provide a framework for enhanced business capacity in climate change mitigation.

The Decree provides a regulatory framework for corporate accountability. According to it, companies may be held liable or subject to fines and restraining orders, with a view to prohibiting the exercise of the company's activity and confiscation orders, if expressly provided for by the Decree. This is to be considered in relation to certain offences committed, or attempted, by officers, managers or their subordinates as well as by third parties (suppliers, partners, consultants, etc.). Among these offences, environmental disaster and pollution represent a priority target of the Decree. Furthermore, the company itself may be subject, directly and independently, to sanctions in connection with the offences committed by such individuals, unless they have acted exclusively to their own advantage or in the interests of third parties.

A voluntary application of certification standards (ISO 45001/ISO 14001/ISO 37001/ISO 27001) guarantee an exemption of the company's liability.

#### Background

Articles 24-26 of the Decree details the offences committed, for which the entity concerned can be held liable. With respect to environmental destruction, such offences fall into the following categories: (i) environmental disaster (ecosystem) and (ii) environmental pollution (water, air, land, biodiversity, etc.).

If an individual is found in violation of these offences, the Decree provides for a number of sanctions (fines, restraining orders, confiscation orders and publication of sentence), depending on the severity of the crime.

Restraining orders may include the following penalties: (i) prohibition on the exercise of business activity; (ii) suspension or revocation of authorisations or licences that have proved necessary for the commission of the offence; (iii) prohibition on dealing with the public administration; (iv) exclusion from public administration funding, contributions or financing; and (v) prohibition on advertising goods or services.

Conviction of the entity for any of the offences provided for in the Decree will always result in the imposition of a fine, set in accordance with the criteria indicated in the Decree. However, restraining orders are imposed only upon occurrence of at least one of the following conditions: (i) the entity has gained a significant profit from the offence, the commission of which has also been caused by a lack of organisational

controls within the entity; and (ii) it is a repeated offence.

Pursuant to Article 6 of the Decree, the entity may be able to rely on a defence and be exempted from liability if they can prove that they have: (i) adopted, and effectively implemented, an organizational model (that can be proved with voluntary certifications) prior to the commission of the offence of the kind actually committed; (ii) appointed an internal control committee, known as Organismo di Vigilanza, with independent powers of action and control; (iii) provided proof that the officer, manager or their subordinates who committed or attempted to commit the offence fraudulently eluded the Organizational Model; and (iv) the internal control committee has conducted adequate monitoring.

### Strategy

The voluntary application of one of the well-known standards (e.g. ISO 45001/ISO 14001/ISO 37001/ISO 27001) helps to exempt the company from liability. In the event of an environmental disaster, a certified (ISO 14001:2015) company is not convicted, yet the liability is limited to the employee who violated the relevant law. If this good procedure was sufficiently implemented, the top management remains immune from prosecution and the violation of the procedure is due to fraudulent individual behaviour.

### Results and Impact

According to a research study, jointly carried out by Symbola Foundation and Banca Intesa, companies certified to meet specific environment-related standards have seen their revenues increase by 3.5% (around 1.5 percentage points more than the non-certified ones), while the number of their employees grew by 4% (compared to the 0.2% evidenced in non-certified firms). It is predominantly the smaller companies that gained the largest advantages; SMEs with environmental certification recorded a spread, as compared to non-certified competitors, of +4 points in turnover and +1.2 points in employment.

These are some of the studies promoted by Accredia that have pointed out the advantages of a quality

investment for companies and society. Such advantages spread across the company structure through better day-to-day management, and benefit society, as they improve environmental sustainability and contribute to an effective management of occupational safety and health.

### Challenges and Lessons Learned

It is crucial to ensure the competence of the auditors, and to guarantee an effective application of the standards.

### Potential for Replication

It is possible to replicate this experience; the law that is pushing the reduction of sanctions, the Italian Decree D.lgs 231/2001, has already been replicated by Spain - Ley Orgánica 1/2015.

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**Contact Name:** Emanuele Riva

**Organisation:** Accredia (Italian Accreditation Body)

### Case study n°3

## Implementation of the Eco Mark Africa Certification System through the Eco Mark Sustainability Standards

**Organisation:** African Organisation for Standardisation (ARSO)

**Level:** Continental Program

**SDG Addressed:** SDG 13 – Climate Action



### Summary

Led by the African Organisation for Standardisation (ARSO), the Eco Mark Africa (EMA) aims at promoting the associated ecolabel across the African continent for sustainably-produced products and services, and advocating their certification via four standards concerning the domains of agriculture (ARS/AES 1:2014), fisheries (ARS/AES 2:2014), forestry (ARS/AES 3:2014) and tourism (ARS/AES 4:2014). The EMA seeks to foster sustainable production and consumption, while eliminating conformity assessment issues that might result in deterring trade among African countries and the international community at large. Ultimately, the EMA addresses the detrimental effects of climate change and population pressure on the continent's natural ecosystem, thus indirectly contributing to the achievement of SDG 13.2 "Integrate Climate Change Measures into National Policies, Strategies and Planning." Considering the volume of Africa's intra- and extra-regional trade, should the EMA take hold, it would contribute to significantly reducing the threats posed by climate change across the African continent and beyond.

### Background

The Eco Mark Africa (EMA) is a certification recognition system for sustainability standards arising from the growing global concern for environmental protection on the part of governments, businesses and the public. African economies are among the most heavily affected by the detrimental effects of climate change, with mitigation and adaptation strategies becoming

vital for the continent. Sustainably producing goods and services represents a suitable means of adjusting to climate change and meeting the associated consumers' rising demand worldwide.

In this context, ecolabelling is an effective market-based instrument to enhance access of African products to international markets, while at the same time fostering sustainable consumption and production patterns. This would prove beneficial to businesses, as ecolabelling provides them with a way of measuring performance and communicating the environmental credentials of products; to consumers, as ecolabelling guide their purchasing decisions by supplying information about what "the story" of the products; to governments, which could use ecolabelling to encourage behavioural change of producers and consumers towards long-term sustainability.

### Strategy

The EMA seeks to promote the certification of sustainably-produced goods and services through the following four standards:

- ARS/AES 1:2014 "Agriculture — Sustainability and Eco-labelling — Requirements," providing requirements for the sustainable production, processing and trading of agricultural products, including food, beverages and non-food products; livestock and livestock products, bee products; wild harvested products; agricultural fibre products.

- ARS/AES 2:2014 “Fisheries — Sustainability and Eco-labelling — Requirements,” providing requirements for the sustainable harvesting of fish up to the point at which the fish are landed and applies to marine and inland capture fisheries only
- ARS/AES 3:2014 “Forestry — Sustainability and Eco-labelling— Requirements,” providing forest owners and managers with environmental, economic, social, and cultural criteria as well as requirements that support the sustainable management of forests. It is intended for application to any forests being managed to produce forest products and services.
- ARS/AES 4:2014 “Tourism — Sustainability and Eco-labelling — Requirements,” establishing a common understanding of sustainable tourism, and specifies the minimum that any tourism management services wishing to be sustainable, should aspire to reach.

## Results and Impact

The EMA certification system is expected to have a beneficial impact on the following dimensions:

- Producers, as the EMA would stimulate market demand for environmentally sustainable goods and services, export diversification, as well as international and regional market access. Additionally, it would contribute to fostering sustainable production methods, especially with respect to climate change adaptation;
- Consumers, because the EMA would improve transparency on the origin of products as well as on environmental and social conditions of production in Africa. Furthermore, it will enhance consumer safety by providing information on the environmental, social and economic impacts of selected goods and services;
- Trade and industry, as the EMA would allow for the integration of climate-relevant criteria into companies’ sustainability policies, while

becoming a truly credible African brand to be incorporated into the marketing strategies of said firms;

- The African continent, since the EMA would provide the industry with the unique opportunity to tap into new sustainability supply sources in Africa and beyond, which is deemed to be a critical component to preserve, protect and improve Africa’s natural environment.

## Challenges and Lessons Learned

Two main challenges were identified during the implementation of the standards. First, high costs were associated with the certification process and other conformity assessment activities in Africa. This adds to the insufficient knowledge of and attention to the need and importance of ecolabelling, especially amongst government policy makers, industry/SMEs, consumers and the public.

As far as lessons learned are concerned, these include a greater need of awareness creation about ecolabels as well as of benchmarking with other labels. Furthermore, the creation of partnerships to support the program would also be recommended.

## Potential for Replication

The EMA Certification System can be replicated to other sectors, including mining and extraction, textile and leather, as well as building and construction (especially in relation to green buildings). Moreover, the EMA can apply to the benchmarking with other certification schemes, and to the development of capacity of Cleaner Production Centres (CPCs) aimed at facilitation the certification process itself.

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**Contact Name:** Philip Okungu Anyango  
**Organisation:** African Organisation for Standardisation (ARSO)

## Case study n°4

# Climate Change Mitigation through Electrical Appliance Market Transformation

**Country:** Ghana

**Level:** National

**SDG Addressed:** SDG 13 – Climate Action



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### Summary

The objective of this case study is to prove that Minimum Energy Performance Standards (MEPS) are an effective means to reduce carbon emissions and that deliberate market intervention policies facilitate the uptake of energy efficient appliances. The case study considers the retrofit for both the energy efficient lighting and the household refrigerator markets put into place by the government of Ghana. The resulting drastic reduction in consumption benefitted consumers in terms of avoided bill payments, while it had even more evident positive implications on the environment and the economy of Ghana at large.

### Background

In the early 1990s, population growth, economic expansion and drought-induced low output of the hydro dams, coupled with a thriving appliance market generated a gap between demand and supply of power. Such a discrepancy was worsened by the use of second-hand, inefficient appliances imported from Europe and elsewhere, which resulted in an estimated loss amounting to the 30 per cent of total generated electricity. Mandatory energy efficiency standards and labelling programmes were introduced to solve the problem.

### Strategy

Minimum Energy Performance Standards (MEPS) were developed for lighting and air-conditioning appliances in 2005, followed by refrigerating appliances in 2008. The MEPS for lighting, air-conditioners and refrigerators were set, respectively, at 33 lumens per watt, an energy efficiency ratio (EER) of 2.8 and 600kWh per year. Additionally, authorities imposed a ban on the importation of used refrigerating appliances, used air-conditioners and incandescent lamps.

Between 2007 and 2008, the government of Ghana also designed and implemented targeted market intervention and fiscal policy measures, including the import of six million Compact Fluorescent Lights (CFLs) to be distributed at no cost to consumers as a replacement for incandescent bulbs. Furthermore, a rebate scheme was put in place with the aim of facilitating the switch from used, inefficient refrigerators to brand-new, efficient ones. Additional personnel were posted to the main ports to enforce the ban on the importation of prohibited electrical appliances and lighting devices.

### Results and Impact

The lighting retrofit resulted in reducing the peak load by 124MW, in saving 452MWh of energy per day (which translates into US\$ 39.5M per year), and in saving 105,000 tons of CO<sub>2</sub>. Additionally, between September 2007 and September 2009,

the penetration rate of energy efficient lightning technology increased exponentially, from 3 per cent to 79 per cent, whilst that of incandescent bulbs decreased from 58 per cent to 3 per cent.

The refrigerator rebate scheme led to the replacement of 10,000 second-hand, inefficient refrigerators, and the saving of 4000GWh of electricity and 1.1 million tons of CO<sub>2</sub>. Finally, between November 2012 and December 2015, the average annual refrigerator consumption dropped from 1,200kWh per unit to 385kWh.

### Challenges and Lessons Learned

The government of Ghana had to face several challenges when implementing the MEPS. These included insufficient institutional collaboration between the organisations concerned, such as the Energy Commission, the Ghana Standards Authority, and other stakeholders whose support would have been instrumental to the success of the program; the lack of laboratories to perform verification tests on the appliances; frequent bribery attempts and political interferences.

The lessons learned, on the other hand, were many, and featured, inter alia, a strengthened system of leadership and institutional engagement. This was achieved by including officials from several institutions into the steering committees of various undergoing projects, who then became the gatekeepers for the Energy Commission in their respective host organisations. Furthermore, the Energy Commission managed to adapt existing structures to carry out the tests, instead of waiting for new laboratories to be established.

### Potential for Replication

The experience is replicable in several developing countries, due to similar socio-economic and cultural issues. Following this lead, Nigeria and Senegal have indeed adopted MEPS, establishing themselves as the only countries in West Africa to have done so.

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**Contact Name:** Kofi Adu Agyarko  
**Organisation:** Energy Commission, Ghana

## Case study n°5

### Enforcement of Solar Standards for Sustainable Energy Supply and Environment Protection.

**Country:** Tanzania

**Level:** National

**SDG Addressed:** SDG 13 – Climate Action



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#### Summary

The objective of the case study is to show how standards on solar photovoltaic technologies have enabled the scale up of access to modern energy in Tanzania. Energy is deemed crucial in achieving all SDGs, yet if it is not sustainably harnessed, it will adversely impact the individual and the environment.

This case study presents the example of a public-private partnership (PPP), devoted to developing and enforcing environmentally-friendly standards in Tanzania. The strengthened observation, with respect to solar photovoltaic system, has a twofold beneficial impact: increasing (clean) energy access in the country while contributing to the achievement SDG 13.2: “Integrating Climate Change Measures into National Policies, Strategies and Planning.” This is especially done via a larger share of renewable energy sources in Tanzania’s national energy mix, which translates into reduced emissions as well as into an effective mitigation strategy aimed at reversing the detrimental effects of climate change.

#### Background

The increased awareness of the potential of solar PV technology in granting Tanzanian remote, off-grid communities the access to electricity led some businessmen to import substandard solar products. Such products had

negative impacts on the health, economy and environment at large. These poor-quality products had a very short lifetime, resulting in economic loss of the end users, while piling up electronic wastes in the environment – there is in fact no well-established recycling framework in Tanzania. The need for the development and implementation of standards on solar PV technologies represented the obvious solution to these problems.

#### Strategy

In order to address the issue, the Tanzania Renewable Energy Association (TAREA) implemented several standards: IEC 60086-1:2015 “Primary Batteries – Part 1: General”, IEC 60086-3:2015 “Primary Batteries – Part 2: Physical and Electrical Specifications”, IEC 60623:2017 “Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes-Vented Nickel-Cadmium Prismatic Rechargeable Single Cells”; and IEC 62259:2003 “Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes – Nickel-Cadmium Prismatic Secondary Single Cells with Partial Gas Recombination”.

#### Results and Impact

The implementation of these standards significantly contributed to: (i) decreasing the inflow of substandard solar PV products into the Tanzanian market, (ii) reducing electronic wastes (especially with respect to solar batteries), and (iii) increasing the adoption of clean solar technology in remote, off-grid areas in the

country. The exponential spread of PV systems across Tanzania led to a reduced burden on the environment resulting from energy production- contributing to the establishment of a climate-friendly virtuous circle.

### Challenges and Lessons Learned

The presence of unofficial harbours along the coastline of the Indian Ocean, presented significant challenges for law enforcement officers and undermined attempts to control the import and dissemination of substandard solar products. Further, inadequate levels of enforcement personnel led to some borders being unpatrolled.

The free market in Zanzibar created significant challenges along the Tanzanian coast, as products were brought from Zanzibar at night and distributed from uncontrolled locations. Standards, however, proved to be a powerful tool to support the introduction, into the Tanzanian market, of high-quality, efficient PV systems and stifle demand for substandard, imported products.

### Potential for Replication

The experience can be replicated in Zanzibar, which is affected by a dramatic lack of control over the quality of solar PV products.

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**Contact Name:** Eng. Matthew Matimbwi  
**Organisation:** Tanzania Renewable Energy Association (TAREA)

## Case study n°6

### **Beyond Carbon Accounting: Development and Application of a Framework to Assess Companies' Low-Carbon Transition**

**Countries:** United Kingdom & France

**Level:** Subnational

**SDG Addressed:** SDG 13 – Climate Action



#### Summary

The case study starts from the assumption that identifying and measuring the extent to which companies are effectively enacting a low-carbon transition is challenging. For example, many commitments are announced by the companies, yet it is rather difficult to understand how meaningful they are. Along the same lines, there is lack of data to track these climate action commitments, as well as an overall shortage of verification on the compliance. Combined, these two factors lead to a credibility issue on corporate climate action.

This case study aims at showing how the framework and methodologies developed under the Assessing Low-Carbon Transition (ACT) project – itself based upon standards – can contribute to developing a series of indicators building on innovative concepts. These include, among others, carbon budgets, science-based targets, as well as embedded carbon or asset level data. The goal is delivering a rating system that benchmarks companies against a 2°C trajectory.

#### Background

As core economic agents, businesses play a fundamental role in the low-carbon transition. For a company, transitioning to a low-carbon economy is a complex undertaking, posing challenges as well as offering opportunities. Even in the presence of

policy incentives, there needs to be a clear will and leadership to address this ambitious challenge.

Over the past fifteen years, carbon accounting has become a must for organizations mindful of the climate impact of their activities. Indeed, many of them voluntarily disclose their Greenhouse Gas (GHG) emissions and management practices by responding each year to CDP's (formerly the Carbon Disclosure Project) questionnaire or reporting to other voluntary/mandatory schemes.

In parallel, new concepts, needs and tools have appeared, with a view to reversing the trend of continuously growing emissions. These feature science-based targets, carbon management systems, carbon pricing, and new metrics for investors. While carbon reporting remains a crucial first step, it is time to move beyond it and understand which companies are concretely progressing towards a 2°C pathway. In this context, the amount of early action done in the short-term will be a prominent determining factor regarding the costs of the transition in the long-term.

The question is: *can companies be trusted on the commitments they make to climate action?* Assessing Low-Carbon Transition (ACT) methodologies contributes to creating a necessary accountability layer on the present willingness and ability of companies to commit themselves to a low-carbon future.

## Strategy

The ACT framework and methodologies are themselves a standard, which in turn builds on standards. First and foremost, ACT framework and methodologies were developed following the emergent standard ISO 14080:2018 “Greenhouse Gas Management and related Activities – Framework and Principles for Methodologies on Climate Actions,” which provides a framework to identify, assess and revise methodologies, as well as for their development and management.

Beyond that, ACT builds on ISO 14064-1:2006 on GHG management; ISO 14064-3:2006 on validation and verification GHG assertions; the GHG Protocol; the Sectoral Decarbonization Approach (an emerging method on setting science-based targets); the GHG Protocol Scope 3 standard; and CDP disclosures - a de facto standard for corporate climate reporting.

## Results and Impact

What makes this case study peculiar is that it does not rely on a single standard, but on a family of standards. To drive the type of change required for the low-carbon transition to succeed, an entire system of standards needs to be put in place. They are interdependent and will create a new standard infra- structure from which trust will be built for a new economy.

ACT demonstrated that, despite the individual importance of each of the standards related to GHG measurement, management, reporting and verification, an accountability layer is necessary to create the transparency and trust in companies when they claim to be contributing to a low-carbon transition as well as to the path towards a well-below 2°C world.

## Challenges and Lessons Learned

Despite building on several existing standards, there are further areas that would benefit from standardisation – and the fact that there are no standards for them is a challenge in itself. To name a few of those areas: (i) science-based target setting; (ii) asset-level data; (iii) embedded emissions (and their calculation); (iv) disclosure of data related to climate relevant R&D; (v) disclosures around business model and business model change; (vi) the concept of transition plan. In fact, it could be observed that carbon management and transition management is a fast-evolving field, and there are many different concepts constantly appearing that need to be standardized.

## Potential for Replication

The concrete experience is replicable in other locations and contexts. Indeed, ACT methodologies allow for the assessment to be made against global transition scenarios or country-specific scenarios. In 2016, the ACT pilot project used the global scenarios developed by the International Energy Agency (IEA) to make company assessments. However, in the French Road Test, country-specific scenarios developed by the French Environment and Energy Management Agency in a multi-stakeholder process were used as main reference. In the future, ACT plans to be applied in Brazil and Mexico, using local scenarios developed for the industry of these countries.

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**Contact Name:** Pedro Faria  
**Organisation:** Carbon Disclosure Project (CDP)

## Case study n°7

### The Private Sector and its Contribution to the SDGs: A Journey to Data Gathering Through Corporate Sustainability Reporting in Colombia

**Country:** Colombia

**Level:** National

**SDG Addressed:** SDG 13 – Climate Action



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#### Summary

The private sector is key to achieving the SDGs and the 2030 Agenda. Its role has shifted from a traditional financial partner to a more active one by engaging with communities, governments and other stakeholders to foster sustainable development. In recent years businesses have advanced significantly by adopting sustainability strategies as well as reporting methodologies aimed at measuring and communicating their economic, environmental and social impacts. This information is often generated sparsely and, usually, it is not aligned with the SDGs. This hinders its accurate and timely collection and aggregation to assess the overall contribution of private sector to sustainable development.

Together with the United Nations Development Programme, Business Call to Action, and the Global Reporting Initiative, the Colombian government analysed the contribution of the national private sector to the SDGs. The objective being to understand the role the private sector can play with respect to facilitating the collection of SDGs-related business data. This is done by means of impact measurement and sustainability reporting, carried out in accordance with the GRI standards.

#### Background

The pilot project aimed at aggregating and mining data disclosed by the private sector in the public corporate sustainability reports, with a view to

including the business contribution to the national voluntary review report presented at the 2018 High Level Political Forum.

#### Strategy

The project partners, together with the Competitive Council for the Private Sector, identified the key topics and relative business disclosures that would be used for this pilot. The eight indicators linked to five SDGs were selected based on the national Green Growth Plan, for which business data was already collected but not yet linked to SDG targets and business indicators.

To enable the data gathering process, the project partners set up an online tool which allowed companies to fill in available information directly and through different regional entities, such as the Private Competitiveness Council, Bogota's Chamber of Commerce, and Antioquia Sostenible and Asobancaria. In addition, to ensure conformity and alignment, the partners developed methodological notes defining the scope and the data expected from businesses based on eight GRI Standards.

The final phase consisted of validating and analysing the collected data. A multi-actor team from UNDP and the Colombian National Planning Department (DNP) collected, systematized and analysed the reported information. The main findings were presented to the multi-stakeholder body and integrated in the Voluntary National Reviews (VNR) presented in July

2018 at the High Level Political Forum. Based on the experience, the partners also drafted lessons learned to improve the process in the future and inform other countries.

## Results and Impact

The main findings were included in the Colombia VNR and presented the national private sector impact on the 5 SDGs under review in 2018. More and more governments are realizing the value of corporate social responsibility and sustainability reporting: the number of VNR reports that mentioned it has increased from 11 in 2016 to 27 in 2018. Unlocking the potential of the corporate SDGs-related data disclosed through sustainability reporting is the next step.

To make such data available, governments first need to encourage companies to disclose their sustainability information. Secondly, governments shall utilise the information disclosed to assess business contribution and impacts on sustainable development, and thus, the SDGs. Only then, such a contribution will be reflected and included within the measurement systems, to picture the reality of the goals implementation at national and global levels.

## Challenges and Lessons Learned

The lessons learned include a number of recommendations: 1) improving the reporting process with companies through more personalized follow-up mechanisms, thus facilitating the interpretation of records and its relationship with the company's economic and productive performance; 2) increasing reporting times and analysis timeframe, so as to address data inconsistency issues and confirm information with companies; 3) using standardized data registration mechanisms, such as web-based tools, in order to reduce the chances of human error in data transcription, while gaining more time for the aggregation process; 4) having an SDG expert team by theme, with a view to improving data interpretation and enabling report writing with a technical approach; 5) strengthening the description of the requested information on each of the indicators, hence reducing the risk of a wrong or inconsistent reporting due to the interpretation given by each company.

## Potential for Replication

The pilot is replicable in other countries. Governments and national statistical offices are encouraged to look closely at this matter and engage with private sector data as a new complementary source which will also lead to reinforcing partnership with the private sector.

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**Organisation:** Fundación Internacional para el Desarrollo de Gobiernos Confiables (México)

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# Standards for the Sustainable Development Goals

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