Case Studies

Standards for Sustainable Cities and Communities

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

Summary

The objective of this case study is to show how the City of Pully (Switzerland) has used the key performance indicators of the United for Smart Sustainable Cities (U4SSC) 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, the city of 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, the city 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 moto "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 digitalization 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 in order 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 in order 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 analyze 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 normalized 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, the Third U4SSC meeting in Malaga, Spain, and among others.

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, waste, water and sanitation, safety, housing, health, education, food security, water and sanitation, 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 the purpose of 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 specialized knowledge in order 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. (for example, at what level of access to internet will it be considered sustainable?). 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 are capable of reflecting 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 in order 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, Wuxi and among others.

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Case study n°2

Managing spontaneous volunteers in the response and recovery to natural disasters

Country: Chile, Argentina, South Korea, UK

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 UK.

Presentation objectives:

- To show 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 show how we used the UK 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 show how the policy and plans for local government will translate into a national policy in Chile and Argentina.
- To show 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 we implement them in South Korea and other new countries we aim to work in (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 experssed 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, ISO22319: 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 UK Government department, which found that the UK 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 (UK), 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 number of 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 bureaucractic centralism were mitigated through the use of 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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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

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 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 U.S. lone and is supported by many commercial enterprises.

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

The Global-Scale 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 customized 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, highly 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, tsunami, tornadoes) where each second delay could result in lives lost.

The Global-scale 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 recognized 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 realize an effective Alert Hub is the accelerating 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 Sates operates a kind of national scale Alert Hub known as IPAWS, which aggregates over 1000 CAP alert feeds within the U.S. 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 including a clone prototype operated by the Hong Kong Observatory and another Alert Hub being developed to serve all of 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 specialized 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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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 a number of standards including ISO 37120 to develop key performance indicators (KPIs) shared on an open platform and dashboards. This allowed breaking information silos in the administration, leading to integrated, transparent and enhanced decision management.

This supports several indicators under SDG 11 including in particular SDG 11.3 "By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management"

Background

City management involves handling the right information in order to take correct decisions. ISO37120 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 but in the end reporting ISO KPIs: air quality measures, noise level control are specific problems addressed with IoT solutions but eventually reporting ISO 37120 KPIs.

Strategy

When the began in July 2014, there were no global standards for Sustainable Cities. On its launch, ISO 37120 became a guide for València's KPI standardization. València became Platinum Certified by the World Council on City Data in 2015. Since adopting the ISO standard, the VLCi project Team contributed on the Spanish Working Group AENOR CTN178 on Smart City topics, contributing to the document "UNE178201" on Smart City Attributes and Requirements and working on UNE178202 on Smart City, 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 with ISO37120 KPIs, which are reported by the city management using city dashboards.

Results and Impact

Basing our KPI definition and city strategy on City Global Standards (e.g. ISO37120, ITU Y.4903/L.1603) – in addition to a number of 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 city manager decisions
- Align vertical solutions (IoT deployments) so standard KPIs are fed from devices deployed in the city
- 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 ISO37120 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, a document collecting all KPI functional definitions, attributes, operators and formulas in order 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: We found some KPI calculations challenging as not always the information is detailed to the "local level", the "city level" and interpolation or further research is required. Good technical resources are critical, in order 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 reutilized 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), using FIWARE (open source platform) datamodels to give structure to the information provided by the devices deployed in the city, so it should be easy to replicate in any other city using FIWARE components (i.e. Context Broker).

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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

Summary

This case study shows how the Government of Egypt has used standards such as the ISO 14813-1:2015 on "Intelligent transport systems" 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 nation-wide safety control applications and supports the achievement of SDG Goal 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 high 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 vendors lock-in, standardised solutions are key to ensure interoperability and decrease 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 standardized service and functional architecture, standardized communication protocols and interfaces between the field equipment and the backend, and center to center data exchange.

Background

ITS entail the integration of many different technologies, and systems from many vendors and technology providers. Typical objectives include increasing roads 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 center levels or a hybrid approach. Adopting an open architecture and choice of optimal integration points 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 equipments 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 micrometers 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 though 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 needs to adopted either at the aggregation level, or the back end level to mitigate these issues.

ETSI EN 300 220 Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD) is a possible option for short range wireless communications devices. 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 a nation wide safety control applications require continuous (quasi-continuous) communications with the vehicles. This might be difficult to realise given the heterogeneity of the infrastructures deployed over a country. Forums like CALM forum could help to solve these problems along with their requirements and interfaces to and from different technology stacks. For example, the 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.

It is clear that 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 rather 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 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 is on drafting 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 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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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

Summary

The objective of the case study is to show the impact of the 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 proved to be able to save lives when the disaster occurs. This directly contributes to the achievement of SDG Goal 11.b , to "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 (KEMENDESA), 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 responsed in the event of a warning from the system. Socialization was conducted to disseminate the knowledge of landslide to the community and local communities and authorities were encouraged the local community, accompanied with the local authority, to make Standard Operation Procedure (SOP) for evacuation and developed evacuation map that was 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 works sustainably, greater cooperation and commitment between the government and the community is needed.

Background

Landslides are one of the most widespread and frequent natural and anthropogenic hazards in the world. The implementation of mitigation measure usually focused in avoiding slope failure or diverting the moving mass away from vulnerable elements or build reinforcement to protect the threatened elements. However, it is quite often that this particular zone has been developed as dense settlement of housing and infrastructure areas, and the relocation of people living in this area to the saver zone cannot be conducted due to some socio-economical constrains. Thus, development of landslide warning system becomes very critical to protect the people living in the landslide risk area.

The majority of the early warning system included the implementation of various technological and modeling methods to predict landslide. For example, a system installed in the Citarum River Catchment in Indonesia uses hydrological-geological modeling 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 having similar geomorphology and geological condition, 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 the awareness and encouraged the governmental disaster management agency, such as the Indonesian National Authority for Disaster Management (BNPB) and Regional Disaster Management Agency (BPBD), and related stakeholders to conduct regular socialization 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. In order 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.

Taking into account the four key elements of a people-centered early warning system (UN-ISDR, 2006) and the hybrid socio-technical approach for disaster risk reduction, a universal standard for landslide early warning systems which comprises seven sub-systems, namely: risk assessment, dissemination and communication of knowledge, establishment of a disaster preparedness team, development of an evacuation route and map, development of standard operating procedures, monitoring, early warning and evacuation drill, and commitment of the local government and community on the operation and maintenance of the whole system.

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).

Regular monitoring and socialization was conducted together with the Regional Disaster Management Agency (BPBD) to deliver disaster knowledge to the community. The community was familiarized with the local geomorphology and topography of the region and neighboring village to be able to make their own evacuation plan. Then, the community accompanied

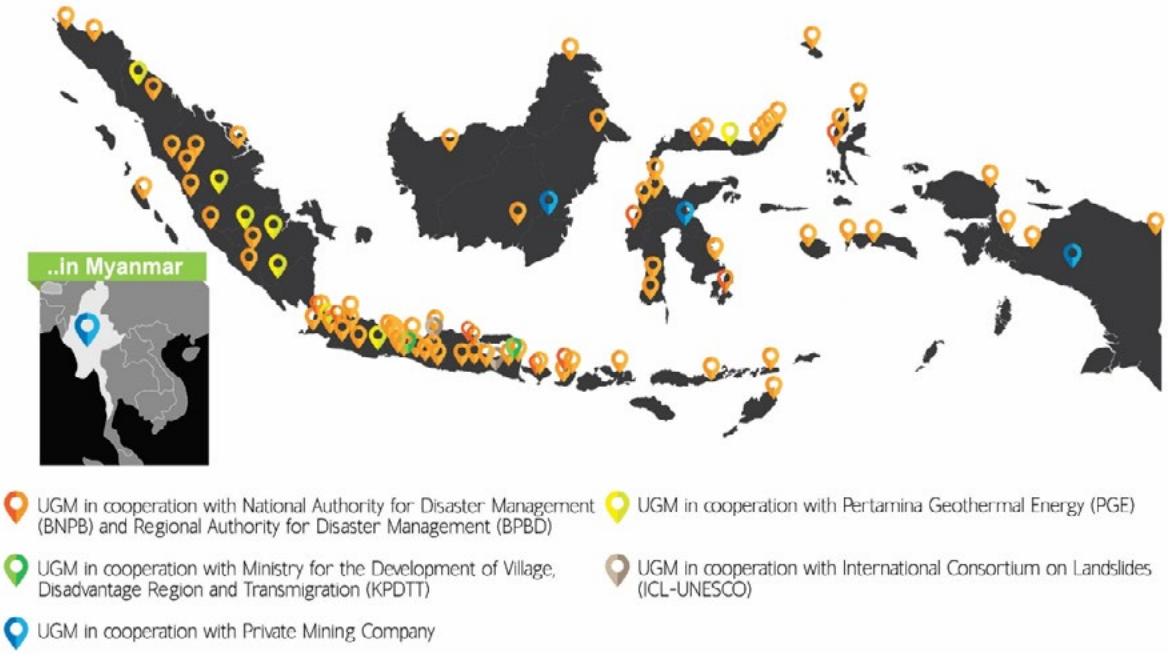

Figure 1 Installation of Early Warning System in Indonesia and Myanmar

with BPBD was encouraged to develop their own Standard Operation Procedure (SOP) for evacuation, evacuation map, and community's preparedness team with the approval from authorized agency or experts. A self-evacuation drill is also conducted once in a year to ensure both local government, the community, and preparedness team is aware on what to do when the warning was 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, utilization of data logger through to using real-time monitoring systems. This universal standard accommodates 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 of the related stakeholders, reduce the cost of system implementation and maintain its sustainability.

The implementation of this standard has been 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 have a significant impact on saving human lives and reducing casualties. This standard has also become an important guideline for disaster management agency in Indonesia. Therefore, Indonesian government has taken a serious action by included 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 few key challenges and unexpected conditions that need to be prepared. The factor of success in this particular landslide early warning systems is the multi-stakeholders participation. However, coordination among stakeholders can be very weak.

Another obstacle in general is 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 is conducted in December 2015 to ensure the sustainability of the system. However, the devices were found not treated well and has not been taken care of both by BPBD nor by local community. The community assumed the landslide will not likely to occur as it has been months since the installation and no need to be excessively prepare for the disaster.

Potential for Replication

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 (KEMENDESA) has developed simple and low-cost equipment for landslide monitoring and early warning since 2007. This model of landslide early warning has been quite effective and strategic to improve the community resilience at the landslide vulnerable villages. Other than that, community preparedness should 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

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 and other twenty 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 SDG 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. Recognizing 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. These supplementary materials include reuse of industrial materials which improves workability, cohesiveness, finish and durability while consuming less energy, improving efficiency and enhancing building performance; 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 stamdard creaters 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 to ensure quality of materials used. 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 of 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 (lower production costs and therefore lower market costs to end users) of concrete as a construction product. The end result is improved economic growth and social prosperity (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, twenty other nations located in Africa, Asia, the Caribbean, Latin America and the Middle East report citing one or more of the listed standards.

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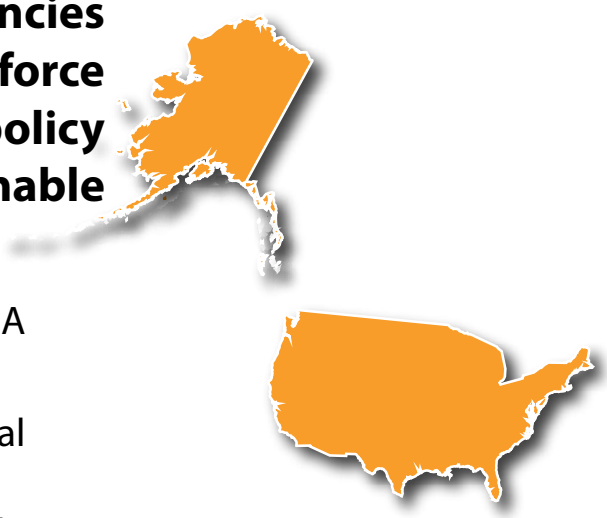
[1] Strubel, L. & Godfrey, J. (May, 2004). How Sustainable is Concrete? Proceedings of the International Workshop on Sustainable Development and Concrete Technology. Paper Presented at International Workshop on Sustainable Development and Concrete Technology, Beijing, China (201-211)

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: USA

Level: National, Subnational, Local

SDG Addressed: SDG 11 – Sustainable Cities and Communities

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 US 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 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 utilized 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 and refining 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; 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 utilized: (i) FEMA's Executive Program. Organizational 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 organization for implementing the NGCCs through independent courses for higher education and to support work force 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 focused improvements, the refinement of curriculum or organizational practice, and locating 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
- Develop performance measures for practice
- Develop a platform for advancing the Core Competencies

Potential for Replication

The NGCC project has taken 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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