Roles of IEC in supporting effective Smart City standards

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Abstract: The International Electrotechnical Commission is using its systems approach, honed in the development of international smart grid standards, to identify the requirements of cities and smart city solution providers for tried and tested solutions to common challenges and is working with the wider international standards development community to develop the coherent and interoperable packages of standards needed. This study discusses such developments and provides insights into the current state-of-the-art.

1 Introduction

1.1 Smart City

A Smart City is a city where improvements in quality of life, services, sustainability and resilience are accelerated by the widespread and transformative use of data and technology.

All cities aim to improve; the smartness of a city is shown by how well it uses data and technology to help in this process. This is not just about the city administration, but about all agencies in the city, along with the citizens themselves, exploiting data and technology to achieve their own objectives more effectively, while contributing to the overall quality of life, sustainability and resilience of the city.

Smart City is not simply about incremental improvements to existing ways of doing things. Rather it is about transformational change – the implementation of new and better ways to deliver the improvements needed.

1.2 Importance of standards for cities

Standards are vitally important to enable the provision of competitively priced and effective products and services. They offer two key benefits:

i. They provide clear descriptions of best practice – allowing companies and organisations to review and improve the way they carry out their work.

ii. They enable common approaches to tackling common challenges and thus open up large-scale market opportunities, while avoiding vendor lock-in.

These benefits are just as relevant for Smart Cities. However, cities are still, by and large, implementing specific and tailored smart solutions to their problems. This highly customised approach adds considerably to the cost, time to implement and the risks of these solutions.

The widespread development of Smart City standards has the potential to help cities all over the world to benefit more quickly and effectively from global best practice, as well as to open up new and profitable opportunities for the industry.

Broadly speaking, there are three different kinds of standards used in cities. There are

• basic standards that help cities work,
• new standards that support incremental improvements,
• big picture standards that focus on citywide transformation.

The basic standards comprise thousands of existing standards that are needed to ensure that everything in the city works properly. They are not specifically related to Smart Cities, but it is important for Standards Development Agencies to check that they are still fit for purpose in the Smart City world.

Often a city’s path to smartness is by implementing many initiatives to tackle individual urgent or important needs. Some of these new approaches may require new standards. However, it is vital that these incremental improvements and new standards are designed in such a way that they can be easily integrated with other smart initiatives that the city may develop in the future. There is, therefore, a need for frameworks and reference architectures that will enable the potential linkages to be identified and addressed from the earliest stages.

Finally, there is the need of citywide, strategic standards, that can help the city administration and other key actors develop roadmaps and integrated strategies to address key issues such as security, resilience, data sharing and city management to ensure that these are dealt with holistically and effectively.

1.3 Challenges of developing city standards and the role of the International Electrotechnical Commission (IEC)

Before looking at the work that the IEC is undertaking on Smart City standards, it is important to understand the difficulties that need to be addressed in order to develop effective standards for cities. We will therefore start by reviewing some important challenges, both in terms of what needs to be standardised and also in terms of the standards development process. We will then cover the different types of Smart City standards and activities that are needed to help cities and industry work together to develop and implement the new solutions required.

The paper will then go on to describe the work of the IEC’s System Committee (SyC) Smart Cities. While the scope of the IEC is international standards relating to electrotechnology, it has developed a collaborative, systems approach to developing standards, which enables it to potentially play a role of much wider significance in the Smart City standards landscape.

2 Smart City standards development

2.1 Types of standards needed

To understand the type of standards needed for Smart Cities, it is important to consider four key challenges:

i. Cities take pride in their uniqueness.

ii. The need to address the requirements of many different stakeholders.
iii. Cities are complicated systems of systems.
iv. Smart solutions are transformational.

It is worth looking at each of these in more detail.

2.1.1 Cities take pride in their uniqueness: Every city takes great pride in its unique history and qualities, and globalisation is forcing cities to focus on identifying their unique ‘selling’ points in order to attract visitors and investment. If all cities are genuinely unique, then it might seem impossible to develop standards that all cities will be able to follow.

However, it is important to remember that all cities

(a) Deliver the same set of services: All cities need to provide their citizens with housing, food, water, energy, work, health, education, transport, security and so on.

(b) Face common challenges: These include

- Extreme weather conditions, growing food shortages and energy vulnerabilities.
- Increased competition for resources and economic activity.
- Inward migration, leading to increased congestion, pollution and demands on service provision.
- Ageing populations – impacting on both the tax base and the costs of public services.

(c) Benefit from the same advances in technology: New technology developments are increasingly being used by cities. These include

- Digital connectivity.
- New affordable ways to collect large amounts of data and the ability to analyse and draw insight from it.
- The more collaborative relationship the Internet enables between customer and supplier.

Because of this, it is possible to develop standards to address some of these common concerns – to act as building blocks that can be used by individual cities in a way that makes sense to them.

In other words, Smart City standards are not about ‘a one size fits all’ city. Rather, they are about identifying common solutions to common city problems, and developing standards relating to those solutions in a way that will allow cities to use those standards, in whatever combination makes sense, to tackle their unique opportunities and challenges.

So, the first requirement for city standards development is to identify the common needs of cities and the common solutions that can help meet those needs.

2.1.2 Need to address the requirements of many different stakeholders: When developing Smart City standards, we need to provide guidance that meets the needs of many different types of stakeholders.

Of course, Smart City standards, first and foremost, need to work for cities – not just for the city administration, though that is really important, but also for all service providers, citizens, businesses, and all organisations and individuals that visit, invest in, or have any role in the city.

The standards also need to reflect the concerns of regional and national governments. These will have key policy commitments to ensure a consistent experience for the citizen throughout the region or nation and will be keen to ensure that any investments they make provide value for money.

And they also need to work for the businesses that are developing and selling Smart City products and services.

There are many Standards Development Organisations (SDOs), each with different roles and different areas of expertise. These standards bodies were set up largely to take into consideration the needs of industries and because of this tend to be focused around a completely different set of concerns to those of cities and city stakeholders and national governments.

Cities and national governments are concerned about issues such as clean air, reliable and affordable energy, efficient transport systems, healthy citizens, economic prosperity, climate change.

However, standards bodies focus on issues such as IoT, data management, data security, Artificial Intelligence, wireless spectrum management, modern methods of construction and so on.

To develop Smart City standards around, for instance, the provision of efficient transport systems, it is likely that IoT, data management and security, Artificial Intelligence and so on would all need to play a part in the solution. This means that packages of standards covering many different kinds of issues need to be developed to address each city need.

So, another requirement of a Smart City standards programme is to identify the different stakeholders involved in addressing any city need and all the requirements of each of them.

2.1.3 Cities are very complicated systems of systems: Another key challenge in developing standards for cities is that cities are complex systems of systems.

The many different city functions are carried out by systems – health, transport, economy, housing, security, education and so on – which interact with each other in many different ways. They also interact with the built environment the city infrastructures, and with overall city management.

Because of this, any initiative that is designed for anyone of these systems needs to take into account the wider context, as it is likely to affect many other systems as well. For instance, encouraging the use of electric vehicles in the city to improve air quality not only links transport and health, but also requires re-designing the city electrical supply.

So, standards related to anyone city system cannot be developed without considering the wider impact.

This requires interoperability, where information is shared between two or more city systems. This may be simply involve developing interfaces between two systems, or in many cases, it might be better to develop a common platform shared by several systems.

The common platform might be a communications platform, an IoT platform, a data platform, a procurement platform, a management platform or even a common planning platform.

In any case, when developing standards in any of these areas for any specific city system, it is important to ensure that these standards are consistent with standards developed for similar issues in other city systems.

So, Smart City standards need to address interoperability between standards developed for specific areas of city life and need to support the development of common platforms.

2.1.4 Smart solutions are transformational: A new technology solution may well require things to be managed differently, procured differently, paid for differently. It may also provide useful data that can itself lead to further transformational solutions.

For instance, when Transport for London launched the Oyster card in June 2003, it might simply have been seen as a more convenient way to pay for travel. However, because the system works on all types of public transport and automatically calculates the cheapest fare, it also provides travellers with greater flexibility in how they travel around the city and so encourages greater use of public transport.

Also, it provides Transport for London with a great deal of useful information as to how people are moving around the city and so be better able to plan future transport improvements.

Requirements for any system can be illustrated using a stack such as the one shown in Fig. 1.

To implement the new Oyster system, the requirements of most of the layers of the stack had to be taken into consideration. The data collected by the many thousands of card readers had to be transported reliably to ensure that the information about each journey could be accurately gathered and interpreted so that the correct fare could be taken from each traveller. The Oyster card itself had to be linked to the banking payment systems. Then were the organisational issues of how the new system would enable ticket offices to be eliminated and the space used in different ways and for the need to retrain existing staff.

So, this one transformational change required a great many changes in a whole range of areas.
In general, a smart solution developed within any one of these layers will certainly require a change in some or all of the others. Therefore, no solution developed within one of these layers will work unless the required changes in the other layers are also addressed.

This means that for transformational Smart City solutions, the city systems need to interoperate at each layer of the stack – in other words, platform solutions are needed at every layer.

So, Smart City standards need to be developed in packages, where appropriate standards are developed for each layer of the stack to ensure that the new transformational solution can work effectively.

2.2 Challenge of how Smart City standards are built

There are two challenges that affect how Smart City standards need to be built:

- **The coordination challenge.**
- **The speed challenge.**

2.2.1 Coordination challenge: There are many different organisations developing city standards:

- Industry consortia – developing open standards that meet industry concerns.
- Professional member organisations – developing standards for their members to use.
- Mainstream national and local standards bodies – recognised by all local and national stakeholders.
- Mainstream international standards bodies – recognised by all international stakeholders.

Each of these has an important role to play – but coordination is a key challenge.

What is needed is to:

i. make it easy for cities and industry to be able to put together the right packages of standards from different technical committees (TCs) and SDOs,

ii. align the standards between different TCs and SDOs so that they complement and support each other and that any gaps are addressed.

Smart City standards therefore need to be built collaboratively.

- They need to draw on the specialist expertise of different TCs, and different SDOs,
- new forms of collaboration are needed – closer than the existing formal liaison arrangements and easier to set up than existing joint working groups.

**So, Smart City standards need to be built collaboratively.**

2.2.2 Speed challenge: In the past, standardisation took place only after the successful introduction of a new product by a market leader and adoption of the product idea by other vendors.

Now, in a world of fast-moving change, sometimes standards are needed to provide the certainty to enable the market to develop.

Where standardisation takes place before product implementation, standardisation has to start by analysing the demand and requirements for new solutions. This is best carried out through undertaking a stakeholder analysis, identifying what each stakeholder needs in order to carry out their role, then identifying what standards already exist. Then through using gap analysis, to identify:

- where existing standards need to be extended or modified,
- where interoperability between standards developed in different domains needs to be addressed; and
- what new standards might be needed.

The results of this analysis can then be tested out and verified with the stakeholders concerned.

**So, Smart City standards work needs to be proactive and analyse the demand and requirements for new solutions.**

2.3 Kinds of standards work needed

As we have seen, standards work needs to start by identifying the commonalities between cities. It is also clear is that to solve a single city need many different types of standards are required to meet the different requirements of city stakeholders and the different layers of the stack and all of these standards need to form a coherent package.

We need complete solutions, or more accurately – we need to map and solve the set of issues that all need to be addressed for all stakeholders to be able to work together to solve the overall problem and find value in doing so.

We can list the different types of standards work needed as...
i. Developing citywide standards that are built top down – big picture, strategic standards covering such issues as city reference architectures, management requirements, data management and so on.

ii. Developing citywide standards that are built bottom up, using existing system/domain specific standards (and possibly adding additional features). For instance, when developing a city resilience standard, it makes sense to start from existing standards on resilient buildings, resilient organisations, resilient IT systems and so on. This is partly because all of these provide good practice to build on, but more importantly, because these standards would already be implemented within the city. The work would be to make sure that all of these standards could be scaled up to a city scale, to make sure that any gaps in the issues addressed by existing standards were filled, and to integrate them all together.

iii. Identifying any standards, developed within individual city systems/domains, that need to interoperate with standards developed within other city systems/domains
   a. through one-to-one interoperability; or
   b. by scoping out a common platform to which they all could interface.

iv. Developing guidance documents for cities on how to put together the right portfolio of standards to support key city needs.

3 IEC approach

3.1 International Electrotechnical Commission

Founded by Lord Kelvin in 1906, the IEC is the world’s leading organisation developing and publishing International Standards for all electrical, electronic and related technologies. Close to 20,000 experts from industry, commerce, government, test and research labs, academia and consumer groups participate in the IEC Standardization work.

The IEC is one of three global sister organisations (IEC, ISO, ITU) that develop International Standards for the world. When appropriate, IEC cooperates with ISO (International Organization for Standardization) or ITU (International Telecommunication Union) to ensure that International Standards fit together seamlessly and complement each other. Joint committees ensure that International Standards combine all relevant knowledge of experts working in related areas.

As shown in Fig. 2, the IEC already makes many standards of relevance to Smart Cities. However, these have largely been the basic type of standards that enable the city to work properly. In order to ensure that cities can transform through smart use of data and technology, a systems approach is needed to build on these existing standards and to add new ones.

3.2 Systems approach

Nearly 10 years ago, particularly through its work on smart grid standards, the IEC recognised that the multiplicity of technologies and their convergence in many new and emerging markets, particularly those involving large scale infrastructures, demand a new and top down approach to standardisation, starting at the system or system architecture level.

We can define the Systems Approach as a holistic, iterative, discovery process that helps by first defining the right problems in complex situations and then by finding elegant, well-designed and workable solutions. It incorporates not only engineering, but also human and social aspects.

The IEC has set up several SyC with the aim of setting high-level interfaces and functional requirements for systems that span the work areas of multiple IEC TCs or Sub Committees. A SyC does not dictate to other TCs what work should be carried out but works through collaboration and consensus with the TCs concerned to achieve a work plan followed by all.

There are five active IEC SyC with others under considerations. Apart from Smart Cities, the others cover Active Assisted Living, Low Voltage Direct Current and Low Voltage Direct Current for Electricity Access, Smart Manufacturing, and Smart Energy.

All the SyC follow a common process in their work. This uses a cycle of activities that need to be followed over and over again, as the requirements of each system continue to change. Further information about the IET Systems Approach can be found on its website [2].

4 IEC SyC Smart Cities

4.1 Introduction

The IEC has developed many standards that are important for the efficient functioning of cities.

Fig. 2 IEC standards relevant to Smart Cities [2]
However, it was felt that rather than simply dealing with each of these standards in isolation, the IEC needed to develop a systems approach to city standards.

The terms of reference for the IEC SyC Smart Cities state that the aim is

‘To foster the development of standards in the field of electrotechnology to help with the integration, interoperability and effectiveness of city systems.’

To develop the electrotechnology standards that will support Smart Cities, it is important not to start with electrotechnology, but rather with detailed research to understand what cities need. Only then does it become possible to scope out the packages of standards to be developed by different SDOs to meet those needs and, within those, identify the requirements for electrotechnical standards.

Therefore, the terms of reference for the SyC Smart Cities state that its aim will be fulfilled:

- by promoting collaboration and systems thinking between IEC/TCs, the SyC and other SDOs in relation to city system standards;
- by undertaking systems analysis to understand the needs for standards and assess new work item proposals related to city systems;
- by developing systems standards where needed and by providing recommendations to existing SyCs, TCs/SCs and other SDOs’.

4.1.1 History: The IEC Standards Management Board agreed to set up a Systems Evaluation Group (SEG) on Smart Cities in June 2013, with the first meeting taking place in December 2013. After several face-to-face meetings, the SEG recommended the setting up of a SyC on Electrotechnical aspects of Smart Cities.

The first meeting of the SyC Smart Cities took place in Singapore in July 2016. Further face-to-face meetings were then held in Tokyo in February 2017, Shanghai in June/July 2017 Dortmund in January 2018, Washington DC in July 2018 and Varanasi in December 2018.

4.1.2 Role of the SyC Smart Cities: The terms of reference make it clear that the SyC Smart Cities will make some standards – specifically systems standards. These include

- Frameworks, use cases, terminology etc.
- Citywide, strategic standards.
- Guidance documents for cities re standards.

However, its most important role is to bring the expertise of the 20,000 IEC experts to help solve the problems of cities, and to collaborate with other SDOs to develop coherent packages of city standards.

So, the value of the work of the SyC Smart Cities will not be shown so much by how many standards it produces itself, but rather by how many standards it enables other TCs and SDOs to produce.

4.2 IEC SyC Smart Cities process and structure

The IEC SyC Smart Cities uses the systems process that has been developed within the IEC as shown in Fig. 3.

In order to carry out this work, the SyC Smart Cities are structured as shown in Fig. 4.

4.3 Working groups

4.3.1 WG 1: terminology – defining key terms and developing concept systems: One of the most basic and important aspects of standardisation work is the development of clear definitions for key terms. This allows confidence that the standards can be applied correctly, without any misunderstanding. Clear definitions are also vital to help Smart Cities practitioners to plan and implement new Smart Cities projects effectively.

WG 1 is developing agreed definitions for key Smart City terms. It is not starting from scratch, but first collects existing definitions from IEC, ISO and ITU, along with other SDOs, to see which of them best depicts how each term is used in the Smart City context.

This is important because the same word can refer to different things, depending on the context. For instance, here are the definitions of ‘Communication’ from two different ISO Committees:

ISO/TR 17427-3:2015,3.8 defines it as: ‘wireless (and in some cases, wireline) networks that facilitate data exchange, including roadside ITS-stations where appropriate’.
ISO 27991:2008, 3.1 defines it as: ‘means of passing essential information between the relevant persons assigned to operate the MES’.

Clearly, both are appropriate definitions within their own frame of reference, even though they are completely different from each other. So, just because there is an existing definition from one of the SDOs, does not mean that this definition would be appropriate for use in the Smart City Context. However, even where there is no appropriate definition, the preferred approach will be to modify an existing definition, to preserve as much consistency as possible with existing standards work. WG 1 will only develop a completely new definition if there is no existing relevant definition to draw on.

WG 1 is also building concept systems to show how the different key terms in the Smart City link together. These not only add clarity to the definitions for individual terms but will also provide a useful foundation for work on a Smart City ontology for Smart City standards. This will support the development of machine-readable standards, and thus make it easier for appropriate standards to be found and utilised.

4.3.2 WG 2 market relationship: WG 2 leads on the first three steps of the IEC Systems approach. It

i. Identifies the most important needs of cities and of Smart City solutions providers.

ii. Scopes out those needs in detail by identifying all the stakeholders that have a role, identifying all the situations where they need help, and then developing these into use cases.

iii. Analyses the use cases in order to scope out the requirements for standards.

Also, it will work with cities and Smart City solutions providers to pilot and road test IEC Smart City related standards.

In 2017 WG 2 conducted a global City Needs Survey to investigate the most important city needs, examining the different priorities and views of different stakeholders. WG 2 will continue to study the needs of cities through questionnaires and interviews.
However, it is now focusing on analysing in depth the different city needs that the survey identified, to identify all the different stakeholders and their differing requirements.

At the present time there are three New Work Items under consideration – each relating to collecting and analysing use cases. These are

• Clean water in the Smart City.
• City Information Modelling.
• Intelligent Operations Centre.

More will be added. None of these are focused on electrotechnology, but all of them have many aspects where electrotechnology will play a role and by reviewing all the use cases it will be easy to determine the specifically electrotechnical requirements for standards. This will also enable us to work with other SDOs to ensure that the necessary packages of standards are developed to meet each city need.

As an example, we can consider the city need for clean water. To identify the standards requirements, we need to

• review the different contexts where clean water is needed – drinking, cooking, washing etc.,
• review the many steps in the process – Collection, purification, delivery and disposal,
• review the many stages of implementation – design, purchase, build, maintain, manage, monitor,
• review the many aspects of implementation – technical, management, financial, communications and so on.

Each of these will involve many stakeholders and for each stakeholder, there will be a variety of use cases.

To do this, WG 2 will develop Beneficiary Stories for each of the stakeholders of the form:

As a ………… When I am ………… I want to ……. So that I can ……………

From each of these Beneficiary Stories, WG2 will develop a high-level use case, with a name, a unique ID number, a statement of the scope, a brief description of the scenario and a list of all the actors concerned, both human and technology.

Fig. 6 shows an example that describes one of the use cases related to the city need for clean air.

As the use case for different stakeholders is collected, we will find many use cases involving common actors and common activities. By analysing these, it will be possible to derive a set of requirements that will ensure that the needs of all key stakeholders and all key use cases will be met in any package of standards that are developed.

4.3.3 Working group 3: WG 3 leads on the fourth and fifth steps of the IEC Systems Approach and works with WG 2 on the sixth step.

It is

i. Developing a Smart City Reference Architecture. This will

• Provide a consistent framework for cities to understand how the requirements of different city systems and citywide management issues relate to each other.
• Provide a structure to categorise use cases and Smart City standards.

ii. Cataloguing and mapping existing standards that are relevant to Smart Cities and identifying SDOs, TCs, SCs etc., which have the expertise to help.

iii. Working with WG2 to identify standards gaps and decide the scope of standards packages.

Smart City Reference Architecture

One of the main obstacles holding back worldwide coordination and cooperation in the implementation of Smart Cities is the lack of a commonly agreed understanding of how to build them. This is where a Smart City Reference Architecture can help.

As we have already seen, cities have a great deal in common with each other. However

• current Smart City implementation projects are generally local initiatives, highly tailored to a particular city,
• they are often considered as simply technology projects, with the wider societal and other impacts not taken into consideration,
• There are many independent city networks and interest groups, each promoting their own approaches, making it difficult to develop a common vision,
• typical financing patterns also do not promote a common vision.

There clearly is a systemic problem which can be helped by the development of a Smart City Reference Architecture.

The purpose of the Reference Architecture is to
• Explain to any stakeholder how future implementations based on the reference architecture can address his/her concerns.
• Provide a common methodology for architecting cyberphysical systems in any particular system domain to enable different people in similar situations to find similar solutions or propose innovations of wider benefit.
• Help stakeholders, programmes and projects to collaborate and coordinate their efforts and develop common agreements (i.e. standards) on various system elements (e.g. services, interfaces, data etc.).

The work on the Reference Architecture has begun by spending time to develop a robust and comprehensive methodology. This is now at the Committee Draft Stage and WG3 is looking for as much feedback as possible to ensure that the actual work on the Reference Architecture itself will be based on a firm foundation.

Standards cataloguing and mapping

There are many hundreds of different standards that are relevant to smart cities, ranging from detailed technical standards too high level strategic and process standards. Many of them are related to different city systems or infrastructures.

Clearly, when a city administration, for instance is procuring a smart city solution, it is only sensible for the relevant standards to be referenced, both in the requests for tenders and in the responses. In general, solutions that are based on existing standards are much more likely to be cheaper and more reliable, while being easier to integrate with existing or future initiatives.

However, these standards are developed by different SDOs and cover a great variety of issues, which makes it very difficult to find all the relevant standards and almost impossible for any one person to know how relevant each of them is to the solution being procured.

Because of this, WG 3 is undertaking a detailed exercise, not simply to catalogue smart city relevant standards, but to find a way to map and categorise them so that it is much easier to understand which standards are relevant to which type of projects. A lot of preparation work has been done and a total of 1149 standards have already been identified, along with some initial thoughts of how they can be categorised.

Formal work on developing the standards will begin in July 2019.

The plan is to develop an interactive website that will allow city practitioners to input queries and be provided with a list of relevant standards.

Gap analysis

The key challenge that all SDOs face is how to identify what existing standards needs to be modified and what new standards need to be developed.

One of the key roles of WG2 is to identify what the standards requirements are to address key city needs. However, the next task is to determine what relevant standards have already been built so that the gaps can be defined. This is where the role of WG3 comes in. WG3 will not only be able to identify the standards that have already been developed, but also which SDO Working Groups or TCs have the expertise to fill in those gaps.

The standards work needed could be a whole new standard or set of standards, or it could be patched together many standards – modifying some and developing interoperability between others. In either case, this is for WG2 and WG3 between them to determine.

4.4 Project teams

While most of the work of SyC Smart Cities relates to developing high-level frameworks and collecting and analysing use cases, it can potentially also develop international guidance documents relating to electrotechnical aspects of Smart Cities. Such work would be carried out by a dedicated Project Team.

One example within the SyC Smart Cities at the moment is Project Team 63152, which is developing an International Standard on City Service continuity against disasters – the role of the electricity supply.

The rationale for this important standard is that when a disaster hits a city, then all city services are affected. However, no city service can work without electricity and so the most urgent and important need is to get the electricity supply working again.

This standard will guide how an Electricity Continuity Plan for a city can be developed to ensure that throughout the disaster period there can be an adequate electrical supply to the most vital city services and that the full electrical supply can be restored as quickly as possible.

5 Wider collaboration

Electrotechnical standards clearly have an important role in helping cities become smarter. However, these are only part of a much larger picture and the IEC needs to work closely with other international SDOs to provide the coherent and effective packages of standards that cities need.

Because of this, both the IEC as a whole, and the SyC Smart Cities are committed to close collaboration and joint working with the other SDOs developing Smart City Standards (see Fig. 7).

5.1 World Smart City Forum

IEC organised the World Smart City Forum in Singapore in July 2016, in partnership with ISO and ITU, to start the process of SDO cooperation on Smart City standards. This event brought together experts from cities, industry and Smart City SDOs to develop consensus about what sort of standards are needed and to help align the work of the SDOs more effectively.

The second meeting was organised by ISO in Barcelona in November 2017 and the most recent was hosted by ITU in Santa Fe, Argentina at the end of November 2018.

The World Smart City Forum runs a joint working group on Smart City terminology, with another joint working group on mapping Smart City standards to be set up shortly.

The IEC SyC Smart Cities have played a major role in the working group on Smart City terminology and intends to do the same in the group on standards mapping.

5.2 Collaboration with ISO/IEC JTC1 WG11

ISO and IEC have a Joint Technical Committee that develops ICT standards and WG11 is the working group that focuses on Smart City standards. Because ICT is central to Smart Cities, WG11 has a key role in the development of the standards needed.

SyC Smart Cities have always had a close relationship with JTC1 WG11 and there is a significant cross-over of experts in the two groups.

To deepen and extend our collaboration, it has been decided that both groups will hold the next face-to-face meetings in London on consecutive weeks in July 2019. This will include a joint workshop for the two organisations to plan the next steps in collaboration. Experts from each of the groups are also being encouraged to participate as observers in the meetings of the other group.

This should result in some specific and practical joint initiatives that will demonstrate the value of collaboration. Similar joint meetings and events will be planned with the other SDOs working on smart city standards.

6 Conclusion

Smart City standards need to be developed in a systematic way, recognising that to address complex city needs, the requirements of many different stakeholders must be analysed and satisfied.

The IEC Smart Cities Systems Committee recognises that this means taking time to understand city needs before developing appropriate electrotechnical standards for smart cities. It also understands the importance of working in close collaboration with other Standards Development Organisations to make sure that cities and smart city solution providers have the holistic packages of standards they need.
Fig. 7  Categorising Smart City standards [Source: From an internal IEC SyC Smart Cities document]

7 References

[1]  https://www.gridwiseac.org/pdfs/interopframework_v1_1.pdf

[2]  https://www.iec.ch/about/activities/systemswork.htm