DIN/DKE – ROADMAP

# THE GERMAN STANDARDIZATION ROADMAP

## SMART CITY

Version 1.1

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DIN

Publisher

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# 1 INTRODUCTION

An English-language search of the term **„smart cities“** on Google retrieves over 4.3 million results; the term **„smart city“** gives more than 8.4 million results from all over the world. The urbanization process is being discussed on all continents, and the associated challenges of this process has become a focus throughout the world.

Although there is not yet any internationally standardized terminology, there is indeed a worldwide desire to sustainably enhance the quality of life in cities and communities. The diversity of definitions also reflects the diversity of the challenges facing us. For some, a city is **smart** if there is a sustainable water supply; for others, this **smartness** is reflected in autonomous driving with an app-controlled parking management system as part of a car-sharing program. Whether or not information and communications technology is truly the core of all possible solutions can be questioned. What is certain, however, is that areas of life and technology which have been considered to be independent of each other are becoming more closely networked: street lamps are serving as Wi-Fi stations and charging stations for electric vehicles; streets become pedestrian zones or vehicular areas based on need; waste receptacles send signals indicating they are full (as with the „Bigbelly“ system from Boston); district cooling and chemical energy storage support cogeneration plants in buildings; packages do not need to be delivered in person.

The systematic approach of all these individual solutions cannot have a full impact until previously separate aspects are networked, both technically and organizationally. This not only involves the optimization (acceleration, cost reduction, automation etc.) of previous processes, but also structural reorganization and possibly even a paradigm shift. For example, future considerations as to improving product transportation (a more efficient movement from A to B) might be replaced by discussions of the general necessity of this transport in the first place. This will be made possible by means of localized production (Industry 4.0) and decisions can be made solely on an economic basis. Beyond economic considerations, however, the approach to life of the citizens themselves (whether in rural or urban areas) is also going through increasingly rapid changes.

Standards bring safety and security, and can help lower hurdles to gradually realizing the vision of the **Smart City**. This can lead to greater economic growth without reducing individuality and technological creativity in urban life. These considerations are the focus of standardization that is no longer driven by products alone, as in the field of smart cities. Furthermore, it is not only technologies that can be standardized, but also processes and services, which support public procurement, for example. The technological convergence of topics relating to **Smart Cities** and **Industry 4.0** requires a greater interaction, which in turn brings new challenges to the organization of interfaces. Here, standardization is entering a new world. It is not only traditional national standards organizations like DIN/DKE who see it as their duty to face these challenges; radical changes are taking place in the vertical structure of international standardization as well.

This version of the Smart City Standardization Roadmap, Version 1.1, is an incremental revision of Version 1.0. In Version 1.1, a special focus is placed on giving an overview of current standardization activities and interim results, thus illustrating German ambitions in this area. The term **roadmap** refers to the declaration of the policies, topics and approaches of standardizing bodies in this area. This is a process that is not in any way complete, and is oriented towards economic and political developments. This „rolling roadmap“ is a snapshot of the current situation, giving insight into international developments. Its purpose is to create transparency, and give all interested parties the possibility to take part in standardization activities relating to urban planning.

# 2 IEC SEG 1 SYSTEMS EVALUATION GROUP

At the end of 2013 Smart Cities experts from Japan, China and Germany formed an evaluation group under the umbrella of the International Electrotechnical Committee (IEC). Being the very first Systems Evaluation Group to be formed, it also goes under the name of SEG 1. The group was given an 18 month remit to examine the topic of Smart Cities from a technical and organizational perspective, with instructions by the IEC to assess how and to what extent standards and specifications could provide support to cities and communities as they move towards the more „intelligent“ city.

IEC/SEG 1 was subdivided into eight dedicated working groups (WG) to examine the key elements or „systems“ of a city. Of these eight working groups, Germany provided technical input in only one, WG 8 „Mobility and Logistics“. An overview of the findings of the working groups is given below.

## 2.1 WG 1 City Service Continuity (Led by Japan)

WG 1 studied ways of ensuring continuity of municipal services to enable these to be maintained without interruption, even in an emergency. The working committee also formulated use cases and proposed topics for standardization work. Priority is being given to **electricity continuity systems** (ECS) that continue to function in emergencies such as natural disasters, and also to providing **electricity continuity plans** (ECP) that are suitable for use worldwide. Concepts relating to this have already been presented in the IEC/MSB White paper „Microgrids for disaster preparedness and recovery with electricity continuity plans and systems“.

ECS and ECP consider the following aspects:

- identification and prioritization of facilities with special requirements (e.g. hospitals, public buildings, transport systems, communication systems);
- estimation of the consequences of interruptions to communal services;
- classification and prioritization of technologies, components and equipment;
- classification of incidents according to their type and magnitude as a basis for estimating risks of interruptions to supply;
- maintenance of supply during the incident.

Current standards deliverables mainly describe **electrical safety** (IEC 61508) and **business continuity management** (ISO 22301). However a system approach for integrating all components of an urban infrastructure does not yet exist. WG 1 recommends making a distinction between standards that can be used in the planning and provision of individual municipal services and such that lend themselves to application in fully networked communal services where the city‘s system already has integrated alternatives enabling continuity of supply. Future standardization activities will mainly centre around management system standards for **business continuity plans** and community resilience.

## 2.2 WG 2 Urban Planning and Simulation System (Led by China)

In its final report, WG 2 proposed ways of using simulation systems for planning the sustainable city. The increasing urbanization of our living spaces means that urban planners face the challenge of ensuring supply and disposal, land use, lighting and communication in cities, while making sure that these can grow in a sustainable manner. To this end, the working group studied a simulation model to plan and predict cities' development. It recommends development of standards on **urban planning** and **simulation data management** that are not currently within the scope of existing standards committees. Topics and interfaces relating to three-dimensional urban design are to be identified applying use case methodology. Aspects to be addressed are:

- visualization of urban growth, together with the associated processes;
- current space requirements and expansion predictions;
- integration of public spaces, buildings, recreation areas, roads etc.
- consideration of the transport network in its role as essential infrastructure.

## 2.3 WG 3 City Facilities Management (CFM) (Led by China)

WG 3 concentrated its efforts on looking at the management of cities' underground facilities, which it defines as „buildings or structures of a city" underneath the earth's surface that incorporate the following elements to meet human needs:

- transport systems;
- energy supply and electricity;
- water supply and disposal, gas supply lines;
- safety and security, disaster prevention and precautionary actions;
- information and communication;
- environmental protection;
- public administration, industrial facilities and residential buildings.

The working group examined ways of establishing an intelligent monitoring system for buried pipelines incorporating water supply, water disposal, gas distribution, heat distribution and electricity. The challenge is to achieve a holistic approach to initial planning, extension work, maintenance and data storage in respect of buried pipelines, with the inclusion of the relevant planners and operators from the various part of the city. Data on each system, such as the water supply, are captured by sensors and transmitted via a network. These data are collated and evaluated to ensure trouble-free operation. The working group recommends giving priority to the following areas for future IEC standardization projects:

- a reference architecture and monitoring system description
- data sharing and data flow, definition of interfaces
- requirements relating to data management, aggregation and evaluation.

The following ISO committees were identified as partners for collaboration with ISO:

- ISO/TC 268 Sustainable development in communities
- ISO/TC 267 Facilities Management
- ISO/IEC JTC 1 Automatic identification and data capture techniques; Data management services; Sensor networks; IT security techniques

## 2.4 WG 4: Use Case Smart Home (Led by China)

WG 4 examined the topic of Smart Cities from the perspective of individual citizens in their own homes. The task of WG 4 was to sound out the possibility of making recommendations for standards or specifications for the Smart Home. Systems found in homes are:

- the infrastructure of the home (internal water, gas and communication connections);
- home entertainment (TV, multimedia);
- safety and security (smoke detectors, motion detectors etc.);
- the physical environment (temperature, climate, noise);
- electrical household goods (washing machines, toasters).

There are also numerous interfaces between individual citizens‘ (smart) homes and the (smart) city comprising the totality of all households:

- utilities provision (energy, water, gas);
- disposal (waste, waste water);
- surveillance and control of the living environment;
- communal facilities and medical facilities;
- public transport;
- finance and logistics systems.

The working group made the challenge clear: At present not even the systems within a home are interconnected. Only when this has been achieved can the next step – the connection of households to the external systems – take place.

### Approach

WG 4 recommends there be a standardized „smart home service system“ (SHSS). This will connect different subsystems within a household and create an interface to the external systems of the **Smart City**.

### Recommendations

WG 4 recommends development of a multipart standard on SHSS. The parts would comprise:

- the general SHSS system architecture;
- a SHSP service platform (external interface);
- a SHSC system (internal interface);
- interoperability services and interfaces between SHSS and other systems;
- data protection;
- testing and validation.

## 2.5 WG 5: Use Case Smart Education (Led by China)

WG 5 dealt with ways of optimizing and personalizing learning behaviour and education opportunities. Education currently takes place in the form of a fixed curriculum at a fixed location within an education system that is neither personalized nor context-specific. In the view of WG 5, the learning experience hitherto has been fragmentary and isolated, limiting the development of learners‘ abilities.

### Approach

WG 5 recommends standardizing the „Personal Learning Space“ (PLS). Individuals should be provided „on demand“ with services that are tailor-made to suit them personally. It is thought this will lead to more „self-efficiency“ and enhance learner engagement and self-motivation. To achieve this objective, it will be necessary to collate learning processes and resources from a wide spectrum of scenarios. A PLS will not only help create a personal portfolio of learning data, it will enable seamless life-long learning by ensuring connectivity of the different systems and domains.

### Recommendations

WG 5 recommends development of a multipart standard dealing with the following aspects:

- PLS architecture in general;
- learning space structure (data format, information model);
- learning space function (multiple functions with interfunctionalities);
- PLS resource management (physical and data resources);
- interface between PLS and other Smart City systems;
- data protection;
- testing and validation.

## 2.6 WG 6: Smart Cities Assessment (Led by China)

WG 6 describes the Smart City program as being at an early stage of global development. Decision-makers such as city governments, science and industry need a basis for argumentation when considering the effectiveness of the changes leading towards a „smart“ city. The system of Smart City indicators established for this purpose define the objectives and key elements of Smart City development and provides support in the planning, design and realization of various urban development systems. WG 6 terms as „smart“ the components of an urban environment that allow the integration and interoperability of the various systems within a city and the dense networking of systems across many different levels, or “layers”. It will be necessary to examine and assess these layers individually and in combination while also identifying which, and by what means, components are to be interlinked.

- In the **integration layer**, systems are described in their logical relationship with each other.
- In the **component layer**, systems and components are described realistically (e.g. in the context of which component is linked to which other components, and how they are linked).

### Approach

In a Smart City these two layers must be combined.

### Recommendations

WG 6 recommends development of the following deliverables to enable a comprehensive **Smart City Assessment**:

- a Smart City vocabulary und reference model;
- Smart City KPIs (Key Performance Indicators) and domain KPIs
- Smart City API specifications
- Smart City fusion specification

## 2.7 WG 7: Smart Cities Framework Johannesburg (Led by South Africa)

Johannesburg established a framework derived from studies on the transformation of Johannesburg into a **Smart City**. Cities’ development generally takes the form of „direct evolution“, and the transformation into a Smart City should happen in much the same way as previous urban developments. Johannesburg distinguishes between two processes of urban development, citing examples of each:

- top-down (e.g. Songdo City, South Korea; PlanIT Village, Portugal, Rio de Janeiro)
- bottom-up (e.g. Amsterdam, Barcelona, Helsinki, Paris, Rome, Bologna)

WG 7 identified the following factors on which the success of the transformation of Johannesburg into a Smart City depends:

- the inclusion of the city's inhabitants and transparency of all processes and analyses;
- a sustainable environment;
- analysis of the laws and regulations, and widescale integration of the region;
- a focus on quick wins.

Specific standardization projects were not identified.

## 2.8 WG 8: Mobility and Logistics (Led by Germany)

WG 8 explored potential developments and visions for the future of mobility and transport. Not only the movement of people constitutes a challenge to logistics and mobility in urban areas; other issues ranging from parcel delivery to car-sharing and parking space management also need to be addressed. Furthermore, these topics have been dealt with in isolation up to now. The motivation behind global standardization in this area is the need to support sectors of industry that have truly global features and are „standard-proof". However the form of existence of WG 8 (and the other working groups) means that its scope is limited.

WG 8 identified three typical scenarios involving technologies:

- they are already, or will shortly be, economically relevant but are faced with the problem typical of first movers in that they are not yet able to be turned into business models owing to the lack of a standard,
- they are of benefit to society as a whole,
- they lend themselves to wide-scale application, i. e. they do not require a high-tech infrastructure.

Such scenarios are

1. city parking/parking space management
2. supplier-neutral self-service parcel collection points, including payment models and data security
3. driver assistance based on traffic light data for connected vehicles (e.g. such as in the German UR:BAN project[1)]

When SEG 1 becomes a „systems committee" one or more scenarios may be selected and concrete standards developed for these.

1 http://urban-online.org/de/vernetztes-verkehrssystem/urbane-strassen/index.html

**Recommendations**

- Hurdles are rarely of the technological kind. In the examples given, the technology is fully mature and has been demonstrated to work. Regulatory fine-grained markets are a considerable hindrance, and rules and regulations at variance with a technology can even go so far as to block it completely. With this in mind, there is a clear need to establish appropriate interoperability between regulations and processes.
- Current (public) funding of innovative mobility scenarios in Western countries concentrates on insular „city laboratories“ performing on an (excessively) high innovative level. This does not make the transition to business models any easier, and makes forecasting impossible. With this in mind
  - the level of innovation should be lowered,
  - the variety of topics and technologies should be reduced in favour of a smaller number of scenarios that are close to the market and have wide-reaching potential.
- Suppliers of most infrastructure technology are mostly few in number, and implementing and establishing innovative infrastructure scenarios via regulations or other public doctrines means that these suppliers can take advantage of their market position to operate a policy of high prices. This priority should be given to promoting scenarios permitting mutual „multi-stakeholder“ business models. Examples 1 to 3 have been selected in line with this recommendation.

## 2.9 Task Group „Reference Architecture Model“

With the understanding that a city or community is a „system of systems“ – a complexity of different areas, domains, infrastructures, organizations and activities – the Task Group‘s objective was to develop a uniform reference architecture model that technically represents the aspects of the Smart City. This model is to describe all key elements, actors and stakeholders relating to a city or community in a precise and understandable manner. In such a model, use cases can also be represented and presented in a simplified way, with the aim of meeting the need for standardization where there are gaps.

Because this is such a complex challenge, however, it has not yet been possible to draw up such a holistic reference architecture. Up to now, the Task Group has concentrated on listing the necessary requirements for such a model, along with quantitative research. This has resulted in 20 different proposals for the reference architecture as submitted by various countries. However, these proposals only partially meet the requirements formulated.

DIN/DKE, which were involved in this research, are continuing to support this work. To ensure the German national viewpoint is sufficiently represented in international activities, they rely on the technical support of German experts.

# 3 ISO/IEC JOINT TECHNICAL COMMITTEE 1 (JTC 1)

ISO and IEC's Joint Technical Committee 1 Information Technology has formed a **Smart Cities** Study Group (SG 1) to examine the needs and potentials for standardization in this area. The following projects were discussed:

- the core concept model (CCM) of the Smart City
- the Smart City reference model
- security assurance of the Smart City construction

SG 1 will focus on studies around the Smart City reference model and Key Performance Indicators covering Smart City life. SG 1 will explicitly consider the work going on in the following committees: ISO/TMB/AG on Smart Cities, IEC/SEG 1, ITU-T/FG SSC and ISO/TC 268.

SG 1 is paying particular attention to monitoring cloud computing activities, which it sees as the key element of the Smart Cities infrastructure. DIN's Information Technology and Selected IT Applications Standards Committee (NIA (www.nia.din.de)) is formally responsible for ISO/IEC JTC1 /SG 1, but an autonomous national mirror committee on Smart Cities does not yet exist and the work is being overseen by DIN's Smart Grid steering body.

# 4 ISO/TMB/SAG SMART CITIES

The Smart Cities Strategic Advisory Group (SAG) of the International Organization for Standardization ISO began its work mid 2014 after having been given a mandate by ISO's Technical Management Board (TMB) to carry out a comprehensive analysis of Smart Cities within 18 months. Seven countries, China, Germany, UK, France, Japan, Korea and USA, are currently involved in the research, the main aims of which are to

- formulate a definition of a **Smart City,**
- identify current and future ISO standards projects relating to **Smart Cities,**
- examine how potential stakeholders (industry, research, cities, communities, urban planners) can be involved in these projects,
- identify city requirements,
- identify potential interface problems,
- demarcate the specific areas of competence of IEC, ITU and ISO and identify opportunities for collaboration between the organizations.

ISO also points out the need for a holistic approach to this research. ISO's structure has evolved over the years, with each of its 225 Technical Committees (TCs) covering a distinctly separate area (such as timber, water analysis, welding, disposal systems…). For the work on Smart Cities, however, this will have to make way for a networked structure, since, consistent with the vision of an intelligent, networked city, connectivity of the individual technologies (e-mobility, electricity supply, sensors, refuse disposal, e-Government) is essential. It is no longer viable to regard each area in isolation: instead, existing ISO/TCs must work interactively, sharing their expertise. The Smart City is also often called the „system of systems". One of the existing committees, ISO/TC 268 **Sustainable development of communities** is already addressing the practicalities of the systems problem. In early 2016 this committee will be joined by another – IEC – systems committee. Not only the subjects covered by the two committees overlap, but they also share experts, guaranteeing a close exchange of electrotechnical and non-electrotechnical expertise.

# 5 ISO/TC 268

Since 2012 members of ISO/TC 268 Sustainable development of communities have been discussing ways of helping to shape the future of communities in a sustainable manner. This not only involves describing ways of providing technical support but developing empirical indicators by which to compare cities. The intention of the committee is to produce holistic solutions that are independent of sector or geography.

A total of 23 countries are participating, with representatives from industry in the Far East showing particularly strong commitment.

ISO/TC 268 has developed two standards since it was first established.

- ISO 37120 Sustainable development of communities – Indicators for city services and quality of life
- ISO 37150 Smart community infrastructures – Review of existing activities relevant to metrics

Two more are currently under development:

- ISO 37101 Sustainable development of communities – Management systems – Requirements with guidance for resilience and smartness
- ISO 37121 Inventory and review of existing indicators on sustainable development and resilience in cities

More information on ISO/TC 268 is available at:
http://www.iso.org

# 6 ACTIVITIES OF ITU-T ON SMART CITIES

The International Telecommunication Union (ITU) is the United Nations specialized agency for communication and information technologies. Its Telecommunication Standardization Sector (ITU-T) develops international telecommunication standards. In 2013, the **Smart Sustainable Cities** Focus Group was set up within ITU-T Study Group 5 **Environment and climate change**. The focus group does not develop standards itself, but it does recommend which standards should be developed at the next level, in Study Group 5, and how these can best be implemented.

So far, ITU-T SG 5 FG-SSC has issued the following reports in this area:

- Technical report „An overview of smart sustainable cities and the role of information and communication technologies“
- Technical report „Smart sustainable cities: an analysis of definitions“
- Technical report „Electromagnetic field (EMF) considerations in smart sustainable cities“
- Technical specifications „Overview of key performance indicators in smart sustainable cities“
- Technical report „Smart water management in cities“

After a comprehensive analysis of the existing definitions of the term „Smart City“, FG-SSC agreed to formally approve the following:

“A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social and environmental aspects”.

Another step has been to create the following working groups:

- Working Group 1 “ICT role & roadmap for smart sustainable cities”
- Working Group 2 “Smart sustainable cities infrastructure”
- Working Group 3 “KPIs and metrics for smart sustainable cities”
- Working Group 4 “Policy & positioning (communications, liaisons and members)”

ITU-T SG 5 FG-SSC will focus on saving resources by increasing efficiency through the use of ICT. Its scope covers areas as diverse as facility management, water supply, and cross-sectoral issues such as cybersecurity and data protection. It still needs to be clarified how and to what extent this new strategic focus can be squared with the committee structure of ISO and IEC in its current form.

# 7 CEN/CENELEC/ETSI – SSCC-CG

The aim of the CEN-CENELEC-ETSI **Smart and Sustainable Cities and Communities Coordination Group** (SSCC-CG) is to coordinate and promote European standardization activities relating to Smart Cities. Originally conceived to be completed by the end of 2014, SSCC-CG's mandate has been extended by the European standards organizations CEN, CENELEC und ETSI by a further two years and will run until the end of 2016. Bearing in mind that European interests, particularities and needs are at the forefront, the SSCC-CG also receives and provides input from the European Commission, in particular through the Smart Cities and Communities European Innovation Partnership (EIP).

The SSCC-CG is also compiling an overview of other relevant international standardization activities. Unlike technical committees at CEN, ISO and IEC, the SSCC-CG does not develop standards. Instead, it has an advisory function, reporting directly to the standards organizations' steering bodies, to which it also proposes recommendations. Current SSCC-CG members include representatives from the relevant technical committees of CEN, CENELEC und ETSI, the CEN/CENELEC **Sector Forum Energy Management** (SFEM), the CEN **Strategic Advisory Board on Environment** (SABE), the CEN-CENELEC **Management Centre** (CCMC), the Secretariat of ETSI, and representatives of the European Commission, European associations and national standards bodies.

The main task at hand for 2015 remains the successful implementation of a European strategy for smart/sustainable city/community standards. SSCC-CG identified four primary objectives and proposed appropriate courses of action:

i. **Development of a suitable framework for SSCC**; specifically the following three measures:

**Firstly,** work should press ahead on the draft model mapping out how a city or community works in order to identify which, and at what level, standards will be able to help it become **smarter**. The model describes cities and communities as „system of systems". Thus, standards and specifications for a Smart City or Smart Community must engender interoperability and compatibility at all levels and in all layers.

**Secondly**, there should be further elaboration of the concept of interoperability in the context of Smart Cities formulated as **Commitment no. 7352** in response to the **„Invitation for Commitment"** of the European Innovation Platform.

The concept aims to
(1) make it easier for cities and communities to find relevant standards and examples of good practice,
(2) enable specific requirements for new standards to be clearly defined,
(3) facilitate comparison of different Smart City projects in order to identify practical solutions for specific situations.

Work on the concept should be carried out in consultation and cooperation with all relevant stakeholders.

**Thirdly**, an agreement should be drafted between the international standards organizations (ISO, IEC, ITU etc.) and international institutions such as the World Bank on a common set of concepts relating to Smart Cities.

ii. **Inclusion of all stakeholders in standards activities**, especially those stakeholders and circles that are not yet familiar with the standards business. Efforts will be targeted at cities, urban networks, countries, consumers, institutes and researchers that are highly relevant to „Smart Cities" but have not yet had any direct contact with the world of standardization.

As a **concrete step**, a public information campaign will be staged with the support of leading partners. It will be launched before work on specific standards is begun in order to first create a common basis and a common language enabling the development of deliverables that are perceived less as formal standards than as solutions to challenges posed by modern society.

The information campaign should be at both national and European level to mobilize the relevant stakeholders. **Other measures** foreseen are (1) organizing workshops and discussions, (2) drafting and disseminating documents and other information about standardization, and (3) educating and advising stakeholders (such as city officials) about standardization and Smart Cities.

iii. Implementation of standardization

**Firstly**, SSCC-CG will be established as the main vehicle for identifying existing standards and standards currently under preparation. This involves both (1) coordinating existing CEN-CENELEC and ETSI technical committees and the **Advisory Groups/Coordination Groups** that already deal with standardization of relevance to SSCC (in matters such as IT, security, ICT and buildings) and (2) recommending the development, modification and revision of standards by CEN, CENELEC and ETSI. In addition (3), the applicability of international standards for the European market should be assessed and EU-specific needs highlighted. The activities of SSCC-CG should also to be aligned (4) with those of the EIP, placing special focus on potential activities within the „Standards" priority area in the EIP's **Operational Implementation Plan**.

The **second measure** involves using processes such as the architectural framework currently under development to coordinate those initiatives at international and European level identified as being of relevance to SSCC, and also advising public authorities on the stan-

dards that need to be drafted, exchanged or modified. Particular focus should be placed on developing a key set of strategic standards.

A **third measure** aimed at implementing and establishing particular standardization processes in Europe centres around encouraging provision of guidance on **Smart Citizens**' needs. Besides making SSCC standardization accessible, the guide should also take legal and ethical aspects into consideration.

iv. **Communication and active promotion of SSCC standards**, starting with a selection of key standards.

This **measure** will make use of media and modern tools as well as forming networks with existing partners and initiatives. It will necessitate coordination of lines of communication and appropriate guidelines will also need to be drawn up.

# 8 NATIONAL DEVELOPMENTS: ACTIVITIES OF DIN/DKE

DIN and DKE have formed a national strategy group (steering body) on Smart Cities to monitor international developments and call attention in Germany to the many activities that are in progress. The strategy group envisages a division into the following areas:

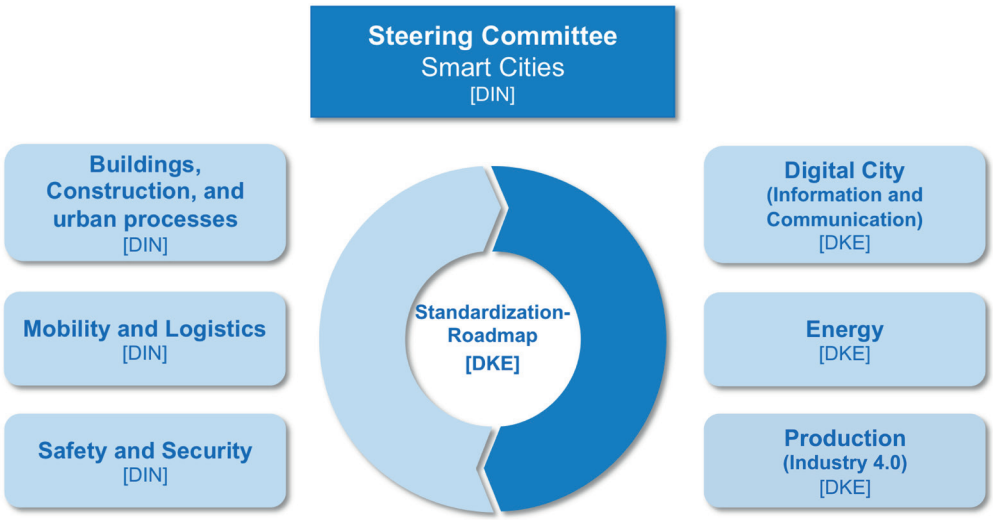


*Figure 1: Division of technical areas at DIN and DKE*

## 8.1 Mobility and logistics

A series of workshops was held at which the following challenges were identified in respect of Smart Cities:

**Transport management and intelligent transport systems**

At the beginning of 2015 the European Commission passed a draft mandate on the development of European Standards dealing with „intelligent transport systems“. Some aspects of this topic have already been dealt with in existing European and international committees. A selection:

| | |
|---|---|
| DIN CEN/TS 16157-1 | Intelligent transport systems – DATEX II data exchange specifications for traffic management and information – Part 1: Context and framework |
| DIN EN 28701 | Intelligent transport systems – Public transport – Identification of Fixed Objects in Public Transport (IFOPT) |
| CEN/ISO TS 17425 | Intelligent transport systems – Cooperative systems – ITS application requirements and objectives for selection of communication profiles |

| | |
|---|---|
| CEN/ISO TS 17426 | Intelligent Transport Systems – Cooperative Systems – Contextual speeds |
| CEN/ISO TS 17427 | Intelligent Transport Systems – Cooperative Systems – Roles and responsibilities in the context of co-operative ITS based on architecture(s) for co-operative systems |
| CEN/ISO TS 18750 | Intelligent transport systems – Cooperative ITS – Definition of a global concept for local dynamic maps |

**Navigation and use of public data**

| | |
|---|---|
| DIN EN ISO 19134 | Geographic information – Location-based services – Multimodal routing and navigation |
| DIN CEN/TS 15531 | Public transport – Service interface for real-time information relating to public transport operations – Part 1: Context and framework |
| DIN EN ISO 24014 | Public transport – Interoperable fare management system |
| DIN ISO 24530 | Traffic and Travel Information (TTI) – TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) |

**Other areas identified as requiring standards or specifications:**

- Use of public spaces for freight handling purposes and establishment of distribution centres in the vicinity of urban areas
- Spaces for parcel box systems and carrier-neutral parcel box solutions
- **Track and trace** data sets: definition of the standard data set and addressees' digital identity
- Guidelines for transport and urban planning
- New transport systems for parcel delivery (e.g. cargo bikes)
- Unblocking of processes and delivery times

A period of discussion is underway together with experts from the logistics sector, the automotive industry, town planners and retailers in order to assess the potential opportunities and limits associated with the development of standards or specifications in these areas.

## 8.2 Energy

An energy task group has been set up to investigate the various energy carriers and energy forms found in urban applications. The focus is on the production, utilization and consumption of energy, particularly electricity, heat, gas and water, with the experts concentrating on those aspects that extend beyond those covered elsewhere (such as in the standardization roadmaps for the Smart Grid or Smart Home + Building). The remit of the task group is to examine the interfaces with other areas of relevance (e.g. mobility) and the special energy needs of the urban environment. The concept of the Smart City aims to optimize the use of energy and resources across systems and domains, with the interaction of the various actors playing a crucial role. Its success depends on a broadbased communication infrastructure as well as the interoperability and compatibility of the individual systems. One of the challenges is accommodating the various activities that have already started; an example is the forming of the „Smart Energy“ systems committee which has brought with it the difficult task of demarcating work areas and roles in order to avoid duplication of efforts.

Here too, the focus is currently on identifying and collating „use cases“ as a way of evaluating topics for future standardization work. A workshop is due to be held in August 2015 in which representatives from municipalities and public services will compile practical examples revolving round issues such as the integration of electromobility in power grids, and energy monitoring and planning of urban districts. These use cases will then be elaborated on and analysed with a view to revealing potential synergy effects attributable to standards-based solutions that can also be of relevance elsewhere.

## 8.3 Digital City (information and communication)

By combining cross-sectoral technologies, information and communication (ICT) is the basis for cross-domain networking and is thus the cornerstone on which the concept of Smart Cities is founded. At the same time, international and national discussions have shown that ICT‘s place within the broad spectrum of topics associated with Smart Cities is not yet clearly defined or acknowledged by all. ICT is either understood as an element taking equal place alongside others or else it is considered to be the precondition on which the Smart City depends.

In Germany‘s view the question of ICT‘s position vis-à-vis other areas urgently needs to be clarified, and the Information and Communication Task Group has set about finding a solution that it can propose to the various international standardization committees in the standardization field.

The Task Group places particular importance on obtaining information of practical relevance (e.g. by gathering, and subsequently analysing, examples of use cases) in order to evaluate which changes are necessary, especially as regards standardization. Take for example the plethora of platforms for assorted data in towns and cities. Most of these are not interoperable

within an individual city, let alone between cities. It is anticipated that cataloguing the various requirements will pose a major challenge.

## 8.4 Safety and security

In the context of Smart Cities, the term “safety and security” is taken to mean protection of the general public and the security of the infrastructure intrinsic to the concept of Smart Cities. Public safety covers aspects such as hazard control, crisis response and civil security. The Smart City opens up new perspectives for rescue services, disaster prevention services, the police and others, but it also brings new challenges. Highly networked urban areas present entirely new sources of information that can be used to protect the public while also necessitating interaction with those involved.

The ICT infrastructure must be available for a Smart City‘s potential to be fully realized. To prevent this critical infrastructure presenting new risks it is imperative that it is protected against abuse and manipulation. These aspects are addressed by the classic security-specific objectives IT security, availability, integrity and authenticity. IT security has a key role to play in the Smart City. Without a functioning IT infrastructure the Smart City cannot unfold, and the population could be presented with very real risks. Attacks on IT systems have become so frequent that hardly a day goes by without some mention in the media of a spectacular IT security breach. Even areas which just a few years ago were considered to be impervious to attack are being hacked via the Internet. The main reason for this is the progressive penetration of ICT in nearly all areas of life. An insufficiently secure IT system that controls a Smart City‘s water supply has enormous risk potential. This makes it absolutely essential to take a close look at IT security needs when developing any new system relating to „Smart Cities“, especially because the Smart City is characterized by an extremely close networking via ICT of previously independent systems. New safe and self-repairing architectures need to be defined in order to protect against all possible risks. However, urban networking also affects citizens directly. Public surveillance systems that are also used in traffic control, smartphones helping people navigate the Smart City, and many services based on IT networks need new technologies and new concepts to protect citizens‘ privacy. At the technical level, IT security is essential to guarantee a defined level of data security.

To make the most of the advantages presented by the „Smart City“ concept for new functions, services and business models, it will be necessary to set up new standardized and automated communication processes and to define the most important interfaces between the systems and infrastructures of the Smart City, as well as between the city itself and the area surrounding it. Wherever possible, this should be done making use of existing, established IT security and data protection technology standards.

At this moment in time, practical aspects of safety and security in Smart Cities are not the subject of standardization. Responsibility for overall coordination of standardization IT security

activities at DIN is the IT Security Coordination Office (KITS). KITS has drawn up an overview of suitable existing IT security standards. (www.kits.focusict.de).

The international standards committee ISO/IEC JTC 1/ SC 27 „IT Security Techniques“ is responsible for the standardization of generic IT security. In its current structure, ISO/IEC JTC 1/SC 27 comprises five working groups:

WG 1: Information Security Management Systems
WG 2: Cryptography and Security Mechanisms
WG 3: Security Evaluation and Assessment
WG 4: Security Controls and Services
WG 5: Identity Management and Privacy Technologies

The web pages of JTC 1/SC 27 (http://www.jtc1sc27.din.de/en) give more information on the work of the subcommittee and its working groups. These activities are „mirrored“ at national level by DIN‘s Information Technology and Selected IT Applications Standards Committee in Working Committee 27 „IT Security Techniques“ (NA 043-01-27 AA), which is subdivided into five working groups to match those in SC 27.

At the European level no committee is explicitly dealing with generic IT security standardization as yet. The ongoing European standardization work deals with more specific aspects of IT security, such as RFID technology; another example is the work on telecommunication technology at ETSI.

DIN‘s Civil Security Coordination Office (KoSi) coordinates standardization in the field of civil security. KoSi counts the following among its main activities:

- Public safety (organized crime, combatting terrorism etc.)
- Security of infrastructure and supply facilities
- Protection of property from theft and vandalism, supply chains, financing
- Border security (national borders/border crossings, coastal borders, airports, identity)
- Threats (chemical, biological, radiological, nuclear, explosives – CBRNE)
- Restoration of security (operational readiness, crisis management, re-establishing and optimizing security)
- Security services

KoSi‘s Steering Committee comprises experts well experienced in collaboration on civil security matters.

At the international level, ISO/TC 292 “Security” develops operational standards for the security sector. These are introduced into the European standardization procedure through CEN/TC 391 “Societal and Citizen Security”, which is also in charge of standards developed for the European Mandate M/487 “standards for security”.

## 8.5 Production (Industry 4.0)

Industrial production is undergoing a new form of networking that requires a never-before-seen integration of systems across domains and hierarchies. **Industry 4.0** is an area characterized by a high degree of interdisciplinarity. Sectors of key relevance for Industry 4.0 include mechanical engineering and automatic control, ICT, ergonomics, security technology, services, maintenance and logistics.

The joint efforts on the part of German industry and research are based on a common understanding of the basic terminology, reference models and architectural concepts that provide a framework on which all developments can be aligned. In this area, standardization is the foundation of the overall success of Industry 4.0.

The **DIN/DKE Steering Group Industry 4.0 Standardization**, formed jointly with DKE to coordinate and initiate standardization activities in areas relating to Industry 4.0, began its work at the start of 2014. The aim is to coordinate and bundle work involving the cooperation of German bodies and organizations in all sectors, ensuring that this work is carried out in a timely manner.

Early in September 2014, the DIN/DKE Steering Group Industry 4.0 Standardization submitted to the European Commission, via CEN/CENELEC, a contribution to the EU **Rolling Plan on ICT Standardisation** of the European Multi-Stakeholder Platform. The Rolling Plan is aimed at all ICT stakeholders and presents an overview of those aspects of ICT that require standards or specifications to support political activities within the EU.

At the international level, DIN established a liaison partnership with the industrial internet consortium (IIC) and is furthermore looking to found an ISO strategy group **Industry 4.0**. The symbiotic relationship between consortial and institutionalized standardization activities is bound to ensure the full scope of stakeholder interests.

# 9 LOOKING AHEAD

In the „Smart City“ field there is as great a variety of standardization initiatives as there are areas of life which currently bear the „smart“ label: smartphones, smart textiles, smart TVs, smart materials, smart homes, smart services, smart water, smart energy, smart grids, smart farming etc.

Although such terms often do not have a very long lifetime, the networking that lies behind them has a greater sustainability.

DIN and DKE have been involved in standardization activities in the **Smart Cities** field from the very start. They inform German stakeholders about these activities and make sure there is a comprehensive networking of all actors. These actors include the international standards organizations ISO, IEC and ITU.

While formal cooperation between international organizations is currently not guaranteed, at European level it has been possible to organize cooperation and regular exchanges between CEN, CENELEC and ETSI. DIN and DKE are integrated into these processes and welcome the willingness of the three European organizations to work together. The publication of a technical report (CEN/TR) is in the planning, which will delineate the limits of Smart Cities standardization. This includes questions such as which areas are regulated, where can standardization provide support, and how can ethical issues such as the „smart citizen“ be taken into consideration. DIN and DKE will monitor these developments and inform national stakeholders at regular intervals.

Although founding members, DKE and DIN could not exert their full influence in the consolidation of the Smart Cities Strategic Advisory Group (ISO/TMB SAG) in ISO and the „Smart Cities“ Study Group (IEC/SG 1) within IEC. The latter will bring its work to a conclusion in October 2015. It is expected that a new IEC group, the IEC/SyC Systems Committee Smart Cities, will be formed at the beginning of 2016. National participation in these groups follows the national delegation principle.

Participation in ISO activities takes place via DIN. While ISO/TC 268 **Sustainable development in communities** was founded with the long term perspective, ISO/TMB SAG Smart Cities will cease to exist once it presents its report to ISO‘s Technical Management Board (TMB) in September 2015. It is still not clear what form cooperation with IEC and/or ITU-T will take beyond this point in time.

In any case, DIN and DKE will continue to inform stakeholders about work at European and international level, and where there is an interest, describe how to participate in this work (at national, European and/or international level).

Feel free to contact us!

# 10 GLOSSARY

**DIN** – By agreement with the German Federal Government, DIN (founded in 1917) is the acknowledged national standards body that represents German interests in European and international standards organizations.

**DKE** – DKE, the German Association for Electrical, Electronic & Information Technologies in DIN and VDE, is responsible for the creation and maintenance of standards and safety specifications covering the areas of electrical engineering, electronics and information technology in Germany. The VDE Association for Electrical, Electronic & Information Technologies is responsible for DKE's daily operations. According to the „Guidelines for Standards Committees in DIN", DKE is also an organ of DIN.

**ISO** – The International Organization for Standardization (founded in 1946) develops International Standards in all technical and economic fields, and is headquartered in Geneva.

**IEC** – The International Electrotechnical Commission (founded in 1906) is an international standards organization that prepares and publishes International Standards for all electrical, electronic and related technologies. It is headquartered in Geneva.

**ITU-T** – The ITU Telecommunication Standardization Sector (ITU-T) is one of the three sectors of the International Telecommunication Union (ITU) (founded in 1865). It coordinates standards for telecommunications. The ITU is a specialized agency of the United Nations (UN) and is headquartered in Geneva.

**CEN** – The European Committee for Standardization (CEN) (founded in 1961) is a non-profit standards organization with headquarters in Brussels. CEN provides a platform for the development of European Standards and other technical documents in a number of industrial and service sectors, helping to foster the European economy in global trading.

**CENELEC** – The European Committee for Electrotechnical Standardization (founded in 1973) is responsible for European standardization in the area of electrical engineering. CENELEC is a non-profit organization under Belgian law and is based in Brussels.

**ETSI** – The European Telecommunications Standards Institute (founded in 1988), based in Sophia Antipolis, is a non-profit standardization organization in the telecommunications industry. It is officially recognized by the European Union as a European Standards Organization. ETSI develops globally-applicable standards for the ICT sector.

**ISO/IEC JTC 1** is the first, and so far only, joint technical committee of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). Its purpose is to develop standards in the fields of information technology (IT) and Information and Communications Technology (ICT). The committee was formed in 1987 and is led by the American National Standards Institute (ANSI).

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