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ICT Standardisation Observatory and Support Facility in Europe

Landscape Report on CitiVerse Standards

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Smart Cities: People-Centric

1. Complex heterogeneity of cities

They differ completely, even within cities themselves and nation-wide, not just across global regions, with a melting pot of diverse social, cultural, political systems, traditions, and history, as well as ever-changing economic, ecological, and demographic conditions. So, needs and priorities are different, and one solution will certainly not fit all.

2. Resources are constrained

Water, food, and energy are just the beginning of the plethora of resources that need to be planned for, maintained, and supported. For some cities, like Los Angeles, the lack of proximity access to water makes it a fundamental concern. When the source of life, water, must be pumped down 100s of kms of pipelines from Northern California, any operational issues can leave its citizens in dire straits. When it comes to agriculture, issues with climate, production efficiencies, and logistics are not just a farmer's problems, but especially affect urban daily life. And, without sufficient energy, then cities slow down and eventually come to a standstill.

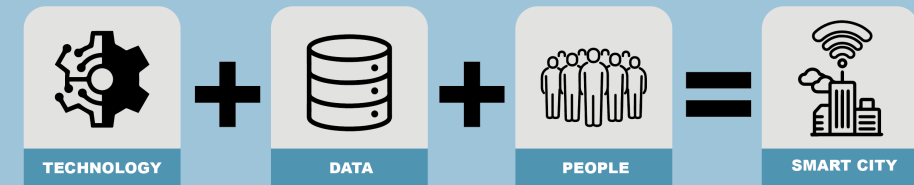
3. Physical space is constrained

Yes, cities do grow, but this requires intelligent urban planning based on understanding what exists today, what the limitations are, the options, the relationships between residential areas, and the consequences it has on not just the area it grows into, but the existing city too.

4. We are at very different stages of digital transformation

Cities have and will continue to develop in different ways, especially in digital transformation. On the top of the digital scale, we have smart cities like Singapore, with cities playing catch up across India, China, the EU, the US, UK, Australia and so on. Then, during the COVID-19 pandemic, we wake up and realise that over 3 billion people worldwide do NOT currently have access to the Internet. Let alone digital services in Energy, Mobility, Healthcare, Education and Government.

Smart Cities require three main ingredients for their creation and to give them life:



5. Social well-being is key

Here's a very worrying trend. More and more people living in cities are lonely, feel isolated, and take anti-depressants. In the Harvard Business Review (2017), Vivek Murthy, M.D., who served as the 19th surgeon general of the United States during the Obama administration, stated that "During my years caring for patients, the most common pathology I saw was not heart disease or diabetes; it was loneliness".

6. Expectation is higher than ever

In today's world, with access to pretty much anything from global markets and with fast-changing appetites, people generally need and want more, and they always expect better and better from their cities and leaders.

7. Priorities are fluid

Social, cultural, economic, and demographic trends and politics continuously change a city's priorities.

Scope - why standards are of critical importance for the CitiVerse

Smart Cities and Communities, and Local Digital Twins are being progressively deployed in the EU. Advanced solutions will be rolled out as natural interfaces to deploy the CitiVerse at different levels in conjunction with urban platforms, new simulation algorithms and other emerging technologies. The ultimate goal will be supporting citizen's participation and exploration of such hybrid worlds.

There are many different standards bodies who are working on solving issues in particular technical areas to support digital twins in cities and Metaverse, with a people-centric focus.

It is important that we all work closely together to help deliver what is needed.

The matter is urgent due to many ongoing activities all around the world on these kind of digital twins with heavy investments.

End goal: fit local digital twins together, with each other and with CitiVerses

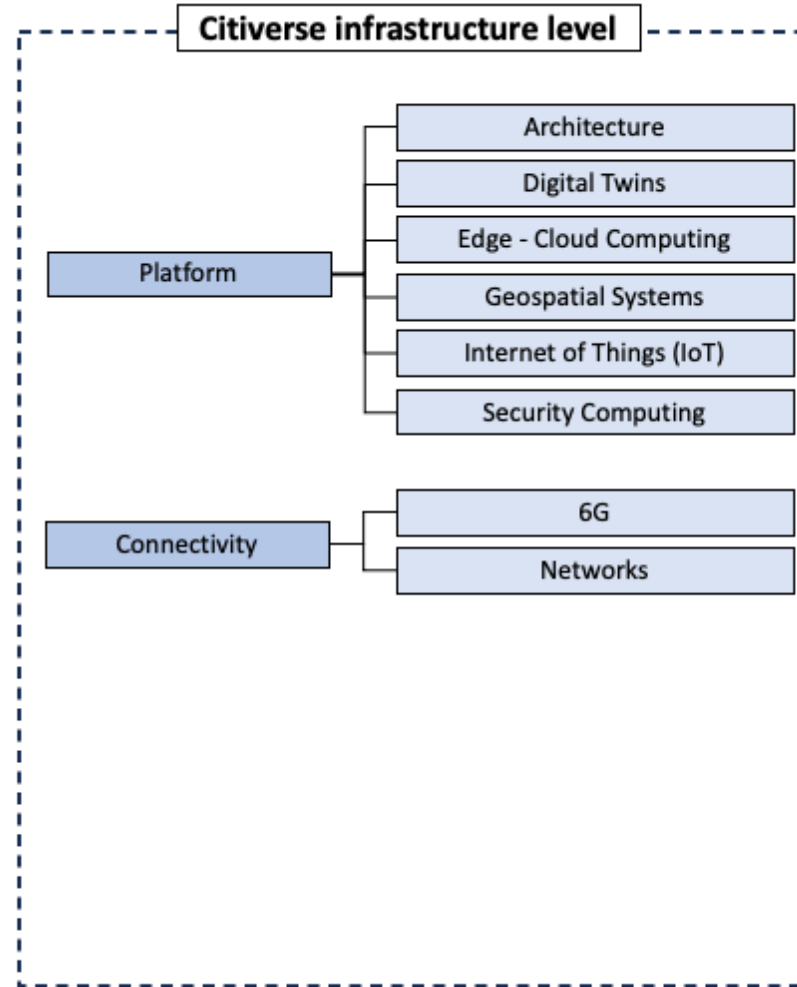
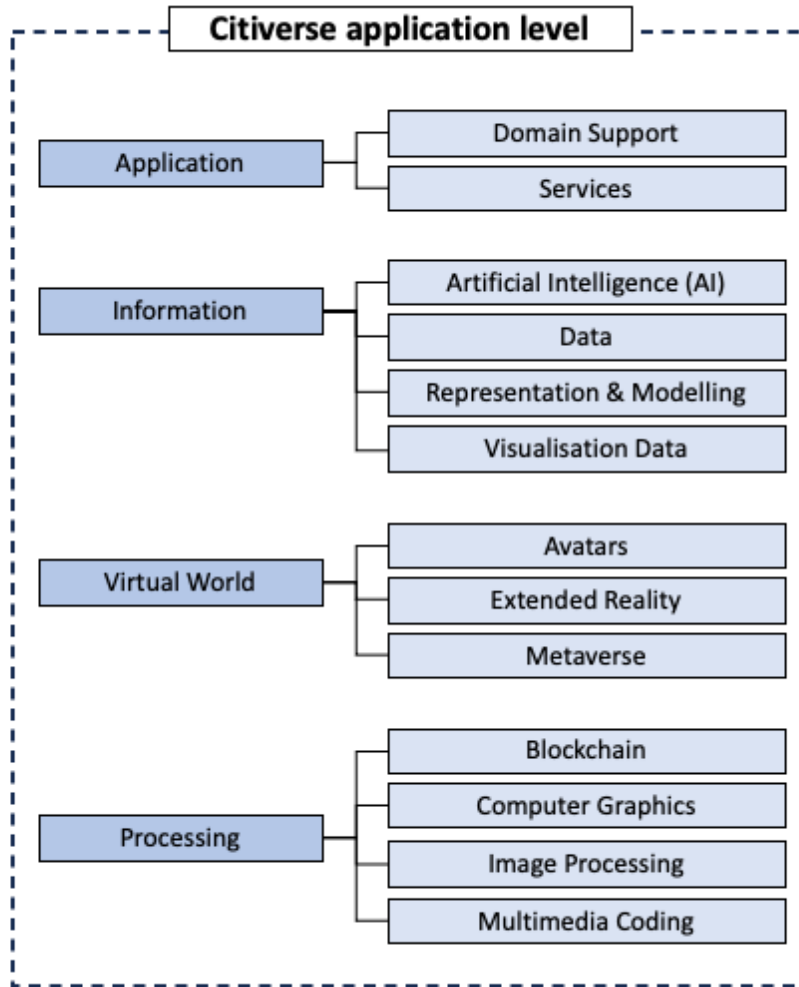
Goals of the Landscape Report on CitiVerse Standards

Produce a Landscape Report on the standardisation and pre-standardisation work relevant to the CitiVerse and take this input to work out a pre-standardisation roadmap for the CitiVerse, by mid November 2022.

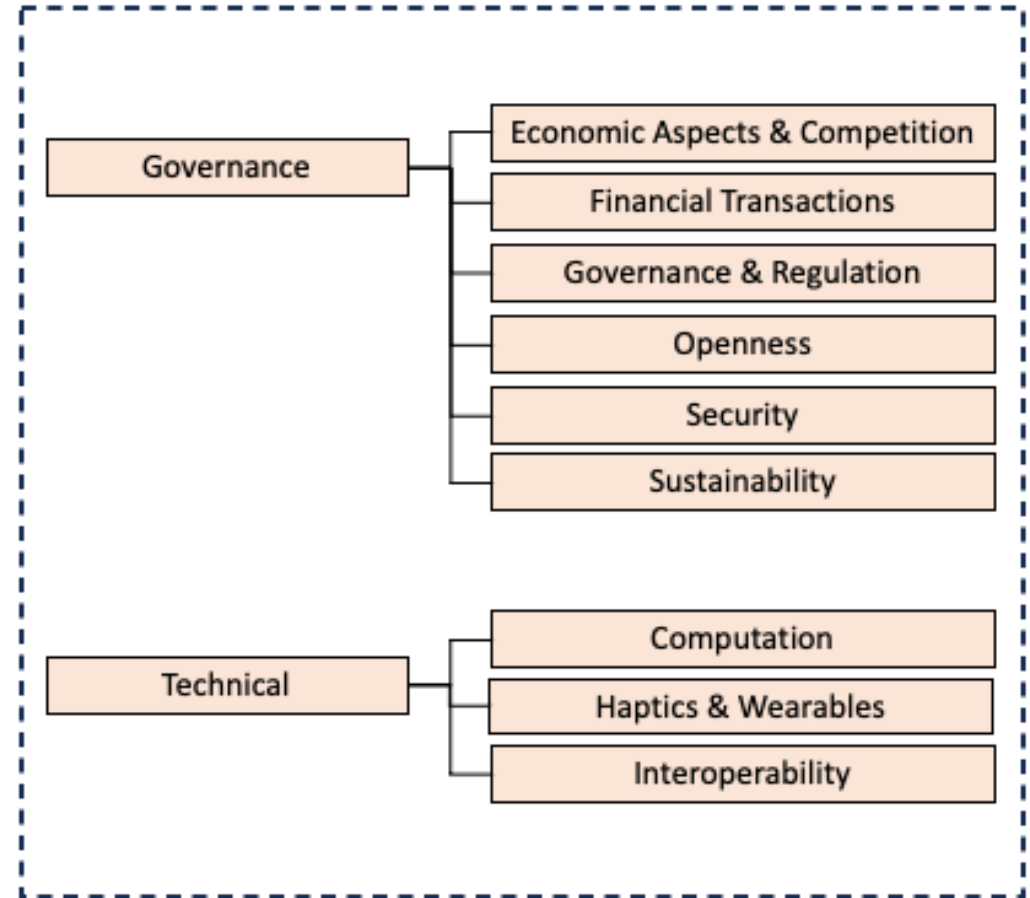
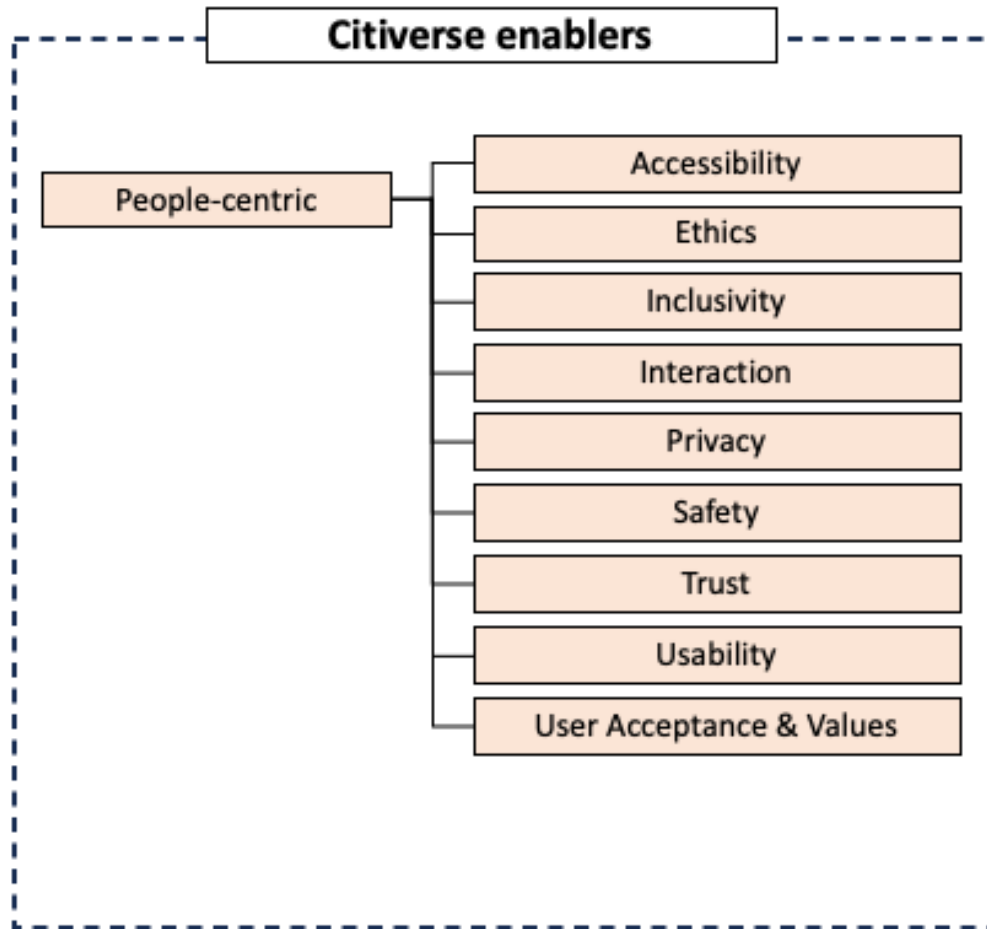
Main Objectives & Goals

- Generate a Landscape Report on the standardisation and pre-standardisation work relevant to the CitiVerse (Metaverse for Citizens) looking at horizontal dimensions and enablers like trust, security, privacy, sustainability and accessibility, openness, interoperability; and vertical dimensions like networks, edge/ cloud, blockchain, AI, computer vision, image processing, AR/ VR, virtual and real-world integration, linking all to specific needs stemming from defining concrete use cases for relevant services and capabilities.
- Insert in a targeted fashion-way the outcome and findings of the Landscape Report into a pre-standardisation roadmap of the CitiVerse proposal that would best fit into EU values and promote innovation and industry's uptake in the Union.

Verticals identified for the Landscape Report on CitiVerse Standards



Enabling characteristics identified for the Landscape Report on CitiVerse Standards



Excel Records: Landscape Report on CitiVerse Standards

Reference	Title Full	Abstract/Scope	DocType	Published	Verticals	Enablers	Source
ISO 9241-394:2020	Ergonomics of human-system interaction - Part 394: Ergonomic req	This document establishes the requirements and recommendations for	Standard	2020-04	Extended Reality	interaction, user acceptance and values	ISO TC 159 SC 4
ISO 9241-910:2011	Ergonomics of human-system interaction - Part 910: Framework for ISO 9241-910:2011 provides a framework for understanding and		Standard	2011-07	Extended Reality	interaction, user acceptance and values	ISO TC 159 SC 4
ISO 9241-920:2009	Ergonomics of human-system interaction - Part 920: Guidance on t	ISO 9241-920:2009 gives recommendations for tactile and haptic	Standard	2009-03	Extended Reality	interaction, user acceptance and values	ISO TC 159 SC 4
ISO 9241-940:2017	Ergonomics of human-system interaction - Part 940: Evaluation of t	This document - describes the types of methods that can be used for	Standard	2017-11	Extended Reality	interaction, user acceptance and values	ISO TC 159 SC 4
ISO/TR 9241-380:2022	Ergonomics of human-system interaction - Part 380: Survey result c	This document provides information based on a study of the	Technical report	2022-06	Extended Reality	interaction, user acceptance and values	ISO TC 159 SC 4
ISO/TR 9241-393:2020	Ergonomics of human-system interaction - Part 393: Structured liter	This document gives the scientific summaries of visually induced	Technical report	2020-03	Extended Reality	interaction, user acceptance and values	ISO TC 159 SC 4
ISO/TS 9241-430:2021	Ergonomics of human-system interaction - Part 430: Recommendat	This document provides guidance on the design, selection and	Technical specification	2021-12	Extended Reality	interaction, user acceptance and values	ISO TC 159 SC 4
ISO 14739-1:2014	Document management - 3D use of Product Representation Comp	ISO 14739-1:2014 describes PRC 10001 of a product representation	Standard	2014-12	Representation & Modelling		ISO TC 171 SC 2
ISO 19444-1:2019	Document management - XML Forms Data Format - Part 1: Use of	This document specifies an XML format for representing forms data and	Standard	2019-08	Representation & Modelling	interoperability	ISO TC 171 SC 2
ISO 32000-1:2008	Document management - Portable document format - Part 1: PDF 1	ISO 32000-1:2008 specifies a digital form for representing electronic	Standard	2008-07	Extended Reality, Representation & Modelling		ISO TC 171 SC 2
ISO 32000-2:2020	Document management - Portable document format - Part 2: PDF 2	This document specifies a digital form for representing electronic	Standard	2020-12	Representation & Modelling		ISO TC 171 SC 2
ISO/TS 24064:2023	Document management - Portable document format - RichMedia ar	This document specifies how to extend the ISO 32000-2 specification	Technical specification	2023-03			ISO TC 171 SC 2
ISO 10303-1:2021	Industrial automation systems and integration - Product data	This document is the first of a family of standards. This document	Standard	2021-03	Data, Visualisation Data	interoperability	ISO TC 184 SC 4
ISO 10303-21:2016	Industrial automation systems and integration - Product data repres	ISO 10303-21:2016 specifies an exchange format that allows product	Standard	2016-03	Data, Multimedia Coding, Representation & Modelling	interoperability	ISO TC 184 SC 4
ISO 10303-225:1999	Industrial automation systems and integration - Product data	This part of ISO 10303 specifies the use of the integrated resources	Standard	1999-12	Data, Visualisation Data	computation, interoperability	ISO TC 184 SC 4
ISO 10303-46:2022	Industrial automation systems and integration - Product data	ISO 10303-46 specifies the integrated resource constructs for Visual	Standard	2022-12	Data, Visualisation Data	computation, interoperability	ISO TC 184 SC 4
ISO 14306:2017	Industrial automation systems and integration - JT file format	ISO 14306:2017 defines the syntax and semantics of a file format for	Standard	2017-11	Computer Graphics, Representation & Modelling	computation, interoperability	ISO TC 184 SC 4
ISO 17506:2022	Industrial automation systems and integration - COLLADA (TM)	This document describes the COLLADA schema. COLLADA is a	Standard	2022-03	Data, Representation & Modelling, Visualisation Data	computation, interoperability	ISO TC 184 SC 4
ISO 23247-4:2021	Automation systems and integration - Digital twin framework for mar	This document identifies technical requirements for information	Standard	2021-10	Data, Digital Twins, Networks	interoperability	ISO TC 184 SC 4
ISO 8000-1:2022	Data quality - Part 1: Overview	This document is the first of a family of standards. This document	Standard	2022-04	Data	computation	ISO TC 184 SC 4
ISO/AVI 8000-220	Data quality - Part 220: Sensor data: Quality measurement	This deliverable specifies quality measures for quantitatively measuring	Standard	Under development	Data, Internet of Things (IoT)	computation	ISO TC 184 SC 4
ISO/CD 8000-210	Data quality - Part 210: Sensor data: Data quality characteristics	This deliverable specifies quality characteristics of data that is recorded	Standard	Under development	Data, Internet of Things (IoT)	computation	ISO TC 184 SC 4
ISO/TR 24464:2020	Automation systems and integration - Industrial data - Visualization	This document analyses visualization elements that are key	Technical report	2020-11	Avatars, Data, Digital Twins, Visualisation Data	computation, interoperability	ISO TC 184 SC 4
ISO/TS 23301:2021	STEP geometry visualization services	This document defines a set of metadata to support the audit trail of the	Technical specification	2021-12	Representation & Modelling	interoperability	ISO TC 184 SC 4
ISO 19101-1:2014	Geographic information - Reference model - Part 1: Fundamentals	This document is the first of a family of standards. ISO 19101-1:2014	Standard	2014-11	Geospatial Systems		ISO TC 211
ISO 19103:2015	Geographic information - Conceptual schema language	ISO 19103:2015 provides rules and guidelines for the use of a	Standard	2015-12	Geospatial Systems		ISO TC 211
ISO 19104:2016	Geographic information - Terminology	ISO 19104:2016 specifies requirements for the collection, management	Standard	2016-10	Geospatial Systems		ISO TC 211
ISO 19105:2000	Geographic information - Conformance and testing	This International Standard specifies the framework, concepts and	Standard	2022-07	Geospatial Systems		ISO TC 211
ISO 19106:2004	Geographic information - Profiles	ISO 19106:2004 is intended to define the concept of a profile of the ISO	Standard	2004-07	Geospatial Systems		ISO TC 211
ISO 19107:2019	Geographic information - Spatial schema	This document specifies conceptual schemas for describing the spatial	Standard	2019-12	Geospatial Systems		ISO TC 211
ISO 19108:2002	Geographic information - Temporal schema, with technical	ISO 19108:2002 defines concepts for describing temporal	Standard	2002-09	Geospatial Systems		ISO TC 211
ISO 19109:2015	Geographic information - Rules for application schema	ISO 19109:2015 defines rules for creating and documenting application	Standard	2015-12	Geospatial Systems		ISO TC 211
ISO 19110:2016	Geographic information - Methodology for feature cataloguing	ISO 19110:2016 defines the methodology for cataloguing feature types.	Standard	2016-12	Geospatial Systems		ISO TC 211
ISO 19111:2019	Geographic information - Referencing by coordinates	This document defines the conceptual schema for the description of	Standard	2019-01	Geospatial Systems		ISO TC 211
ISO 19112:2019	Geographic information - Spatial referencing by geographic	This document defines the conceptual schema for spatial references	Standard	2019-02	Geospatial Systems		ISO TC 211
ISO 19115-1:2014	Geographic information - Metadata - Part 1: Fundamentals	This document is the first of a family of standards. ISO 19115-1:2014	Standard	2014-04	Geospatial Systems		ISO TC 211

- **350+ records:** standards, technical reports, technical specifications, recommended practices, guides and frameworks
- **50+ SDO committees / working groups**

Sample Output: Landscape Report on CitiVerse Standards

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4. Landscape of Standards

4.1 Information

4.1.1 Data

Standard | ISO 23247-4:2021 Automation systems and integration - Digital twin framework for manufacturing - Part 4: Information exchange

This document identifies technical requirements for information exchange between entities within the reference architecture. The requirements for information exchange in the following networks are within the scope of this document:

- (1) user network that connects the user entity and the digital twin entity;
- (2) service network that connects sub-entities within the digital twin entity;
- (3) access network that connects the device communication entity to the digital twin entity and to the user entity; and
- (4) proximity network that connects the device communication entity to the observable manufacturing elements.

- OTHER VERTICALS:** Digital Twins, Networks
- ENABLERS:** interoperability
- COMMITTEE:** ISO TC 184 SC 4
- PUBLISHED:** 10/2021
- URL:** <https://www.iso.org/standard/78745.html>

4.2 Platform

4.2.1 Digital Twin

OTHER

Standard | ISO 23247-4:2021 Automation systems and integration - Digital twin framework for manufacturing - Part 4: Information exchange | [See 4.1.2 Data](#)

4.2.2 Internet of Things

OTHER

Standard | ISO/AWI 8000-220 Data quality - Part 220: Sensor data: Quality measurement | [See 4.1.1 Data](#)



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