Policy Cloud

Cloud for Data-Driven Policy Management

CLOUD FOR DATA-DRIVEN POLICY MANAGEMENT

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D7.7 STANDARDISATION PLAN AND ACTIVITIES

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Abstract: This report will detail all engagement with standardisation bodies or similar and the corresponding potential contributions. An updated version of the report will be provided in M36.

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Abbreviations and Acronyms

Abbreviation/Acronym	Definition
AI	Artificial Intelligence
BDVA	Big Data Value Association
CERIF	Common European Research Information Format
CRS	Common Reporting Standard
EBDVF	European Big Data Value Forum
EC	European Commission
EC DGA	European Commission - Data Governance Act
CEN	European Committee for Standardization
EUOS	European Observatory for ICT Standardization
EOSC	European Open Science Cloud
EOSC DIH	European Open Science Cloud Digital Innovation Hub
XACML	Extensible Access Control Markup Language
XML	Extensible Markup Language
GDPR	General Data Protection Regulation
GA	Grant Agreement
MAG	Gruppo Maggioli
H2020	Horizon 2020
ICT	Information Communication Technology
ICTLC	ICT Legal Consulting
ICB	Impact Creation Board
ICCS	Institute of Communication and Computers System
IEEE	Institute of Electrical and Electronics Engineers
IDSA	International Data Spaces Association
IoT	Internet of Things
CRS	Common Reporting Standard
JDBC	Java DataBase Connectivity
JSON	JavaScript Object Notation
JSON-LD	JavaScript Object Notation for Linked Data
MSP	Multi-Stakeholder Platform
NGO	Non-Governmental Organization
Open API	Open Application Programming Interface
OASC	Open & Agile Smart Cities
OS	Open Source
OSS	Open-Source Software
OECD	Organisation for Economic Co-operation and Development
OKS	OKYS
RDF	Resource Description Framework
SME	Small-Medium Enterprise
SDO	Standards Developing Organization
TWG	Technical Working Group
OWL	Web Ontology Language
WP	Work Package

W3C	World Wide Web Consortium

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Executive Summary

Via four strategically designed pilot use cases coordinated in **Bulgaria, Italy, Spain and the United Kingdom**, PolicyCLOUD is delivering a unique, integrated environment of curated datasets and data manipulation and analysis tools of fundamental importance to stakeholders across Europe. The aim of Policy Cloud is to harness the potential of digitisation, big data, and cloud technologies to improve the modelling, creation, and implementation of policy.

The digitisation of the global economy and society affects all sectors, is at the heart of the EU's political agenda and is necessary if we are to maintain our competitiveness. Having common ICT standards is one of the measures needed to ensure that European industries are at the forefront of developing and exploiting ICT technologies: they ensure interoperability and guarantee that such technologies work smoothly and reliably together. This will become increasingly important as in the future many more devices will be connected to each other, as defined in the EC Rolling Plan for ICT Standardisation.

The European Commission proposes to focus standard-setting resources and communities on five priority areas: 5G, Internet of Things, cloud computing, cybersecurity, and data technologies, all essential for wider EU competitiveness, as defined in its 2021 Rolling Plan for ICT Standardisation[1] PolicyCLOUD has defined a dedicated task on standardisation, contributing to European ICT standardisation.

After a State-of-the-Art Landscape analysis of standardisation in the Context of EU policymaking in the ICT fields related to the PolicyCLOUD project. The document proceeds with the mapping of partners' use of standards related to their work in PolicyCLOUD, their engagement in relevant Standards Developments Organisations or related initiatives.

This Standardisation Plan and Activities document details the specific activities to be implemented and the stakeholder groups to be targeted to foster the PolicyCLOUD alignment with global standards.

Standards and Open-Source development are both processes widely adopted in the ICT industry to develop innovative technologies and facilitate their adoption in the market. Open Standards can play a critical role in ICT technologies by enabling the achievement of paramount objectives in view of a more digitized and competitive European industry sector. This document investigates the use of and OS technologies in PolicyCLOUD and the contributions of partners to OS communities and OS standards. Overall the full width of all Policy Cloud stardardisation plan and activities are the collaborations between PolicyCLOUD and other players who are relevant for ICT standardisation activities in the fields related to PolicyCLOUD.

[1] EC ICT Rolling Plan https://ec.europa.eu/growth/single-market/european-standards/ict-standardisation_en, retrieved 2021-12-20

1 Introduction

With the ICT Standardisation Priorities, the European Commission proposes to focus standard-setting resources and communities on five principal priority areas. PolicyCLOUD is active in the area of cloud computing, one of the areas essential for wider EU competitiveness.

Europe's competitiveness in the domain of cloud computing depends on its ability to embed digital capabilities (e.g., IoT and AI) in the operations of both competitive industries and services, and public administrations. To achieve this, it needs to increase performance while guaranteeing other crucial attributes such as fairness, interoperability, trust, security and reliability in data sharing.

Due to the critical role played by standards, efforts to improve cooperation in standardisation activities in ICT are already in place within PolicyCLOUD. The project has defined a dedicated task on standardisation and aims to strengthen the cooperation with relevant SDOs and EU-funded projects and initiatives operating in the standardisation area, like StandICT.eu 2023, EOSC and BDVA, and to contribute to European ICT standardisation.

The EU Rolling Plan for ICT Standardisation[1] provides an overview of the needs for ICT standardisation activities to be undertaken in support of EU policy activities, and is drafted by the EC in collaboration with the European Multi-Stakeholder Platform (MSP). The 2021 rolling plan contains several topics relevant to PolicyCLOUD's work: Cloud and Edge Computing; Big Data, Open Data and Public Sector Information; E-Government; and Smart Cities and Communities. These topics are outlined in more detail in the chapters below.

The PolicyCLOUD task on Standardisation Strategy and Activities aims to:

1. Ensure PolicyCLOUD work uses and is in line with the relevant global standards.
2. Identify appropriate sections of the research that are brought into the standardisation process fostering dialogues with relevant bodies to share potential findings and innovations made by Policy Cloud that could contribute to standards.
3. Work towards generating or contributing to representative standards and proposing and promoting them to the appropriate standardisation bodies.
4. Identify the relevant standardisation bodies and standardisation projects on a global level. Engage with the most important European and International standardisation organisations as listed in Section 2.2.3 of the GA.

This deliverable **D7.7 Standardisation Plan and Activities**, the first iteration of two versions the second of which will be delivered in Month 36, defines exactly those activities to contribute to the above set of objectives.

1.1 Purpose and Scope

The scope of the present deliverable, which has public dissemination level, is to provide an overview and analysis of European standardisation activities relevant to the PolicyCLOUD project, to map relevant standardisation players in the standardisation ecosystem, highlight PolicyCLOUD's contributions to standards as of Y2, and outline PolicyCLOUD's collaborations with other relevant players for standardisation. Finally, the report outlines the next steps to be taken to follow up on the work that has been carried out so far.

1.2 Related deliverables

This deliverable is released in two iterations. The second version of this deliverable is the **D7.15: Policy Cloud standardisation plan and activities M36**, which will be released in the final month of the project, December 2022. Given the more advanced state of the project in that period, we expect the following iteration of this deliverable to include matured results from the ongoing collaborations of the PolicyCLOUD Consortium with global standardisation initiatives. Moreover, the inputs of the Landscape Report & Gap Analysis described in Section 3.2 will also feed into the next iteration of this deliverable.

1.3 Structure of the document

This Standardisation Plan and Activities document details the specific activities to be implemented and the stakeholder groups to be targeted to foster the PolicyCLOUD alignment with global standards.

Section 1 gives and overview of this document.

Section 2 will illustrate the EC landscape of Standardisation in the Context of EU policymaking in the ICT fields related to the PolicyCLOUD project.

Section 3 maps partners' use of standards related to their work in PolicyCLOUD, their engagement in relevant Standards Developments Organisations or related initiatives.

Section 4 provides the strategy and plan of activities to maximise PolicyCLOUD's alignment with global standards and engage with the target stakeholders for standardisation, while also highlighting PolicyCLOUD's contributions to standards as of Y2.

Section 5 investigates the use of and OS technologies in PolicyCLOUD and the contributions of partners to OS communities and OS standards.

Section 6 outlines the various collaborations between PolicyCLOUD and other players who are relevant for ICT standardisation activities in the fields related to PolicyCLOUD.

Section 7 gives the conclusions and next steps for PolicyCLOUD's involvement in and contribution to ICT standards.

2 State of the Art landscape analysis

This chapter will provide the European context to the PolicyCLOUD Task 7.4 on Standardisation Strategy and Activities. It will illustrate the EC landscape of Standardisation in the Context of EU policymaking and how PolicyCLOUD will contribute via its strategy and activities defined for 2021 and 2022.

2.1 ICT Standards

Digital technologies and the new business models of digital transformation do not fit easily into the traditional regulatory framework regulators use to intervene in markets. Reactive measures cannot hope to be effective in the era of advanced digital transformation. Governance rules and regulatory approaches for new technology and processes of innovation need to be more agile, flexible, and resilient through the development of experimental regulation such as regulatory sandboxes, anticipatory approaches, multistakeholder use of guidelines and standards, and the promotion of international initiatives.[2]

Even though recent years have seen a rise of standards setting activities related to digital technologies, it still falls short of meeting the needs of producers, consumers and regulators and remains fragmentally concentrated at the national level, leaving plenty of work for international exploitation and harmonisation.

The digitisation of the global economy and society affects all sectors. It is at the heart of the EU's political agenda and is necessary to maintain competitiveness. Having common ICT standards is one of the measures needed to ensure that European industries are at the forefront of developing and exploiting ICT technologies as standards ensure interoperability and guarantee that such technologies work smoothly and reliably together.

In modern ICT, the service value of a device relies on the possibility (and capacity) to communicate with other devices (best known as the "network effect"). This rule is pivotal in all areas of ICT. Specifications ensure that products made by different manufacturers can interoperate and that users are given a chance to pick among different suppliers, products or services.

With the ICT Standardisation Priorities, the Commission proposes to focus standard-setting resources and communities on five priority areas: 5G, IoT, cloud computing, cybersecurity, and data technologies, all essential for wider EU competitiveness.[3] PolicyCLOUD is active in the area of cloud computing and has defined a dedicated task on standardisation, contributing to European ICT standardisation.

[2] UNIDO, Standards for Digital Transformation https://www.unido.org/sites/default/files/files/2021-10/Standard_digital_transformation_ONLINE_FINAL.pdf, retrieved 2021-12-20

[3] EC, ICT standardization https://ec.europa.eu/growth/single-market/european-standards/ict-standardisation_en, retrieved 2021-12-20

The EU Rolling Plan for ICT Standardisation provides an overview of the needs for ICT standardisation activities to be undertaken in support of EU policy activities, and is drafted by the EC in collaboration with the European Multi-Stakeholder Platform (MSP). The 2021 rolling plan contains several topics relevant to PolicyCLOUD's work: Cloud and Edge Computing; Big Data, Open Data and Public Sector Information; E-Government; and Smart Cities and Communities. These topics are outlined in more detail in the chapters below.

2.1.1 Cloud and Edge Computing

Establishing a coherent framework and conditions for cloud computing was one of the key priorities of the digital agenda for Europe, the importance of which was confirmed by the digital single market strategy, which is driving a shift to cloud in the delivery of digital technologies, enhancing innovation, digital single market, and access to content. Cloud computing is developing fast.

The latest Eurostat data available (end of 2018) shows the current state of play in the European Union regarding the use of cloud computing by enterprises[1]. The main findings are summarised below:

- 26 % of EU enterprises used cloud computing in 2018, mostly for hosting their e-mail systems and storing files in electronic form.
- 55 % of those firms used advanced cloud services relating to financial and accounting software applications, customer relationship management or to the use of computing power to run business applications.
- In 2018, many more firms used public cloud servers (18 %) than private cloud servers (11 %), i.e. infrastructure for their exclusive use.
- Compared with 2014, the use of cloud computing increased particularly in large enterprises (+21 percentage points).

The tools and technologies being developed by PolicyCLOUD are created for cloud computing, making standardisation activities around cloud computing of great interest to the project.

2.1.2 Big Data, Open Data and Public Sector Information

With the continuously growing amount of data in existence (often referred to as 'big data') and the increasing amount of open data, interoperability is key to exploiting the value of this data. Standardisation at different levels (such as metadata schemata, data representation formats and licensing conditions of open data) is essential to enable broad data integration, data exchange and interoperability with the overall goal of fostering innovation based on data.

PolicyCLOUD's tools and technologies look to exploit Big Data, including open data and public sector data for a policy lifecycle based on evidence. Standardisation of data is essential importance to the effectiveness of PolicyCLOUD's tools, making the area of great interest to the project.[1]

2.1.3 E-Government

Cross-border interoperability is key to modernising public administrations. At the European level, the Once Only Principle has for the first time been mandated by the inclusion in the forthcoming Single Digital Gateway Regulation.[1] The Once Only Principle entails that citizens and businesses provide specific data only once to public administrations, while public administration bodies internally share and reuse this data – even across borders – while always respecting data protection regulations and other constraints.[1] In addition to the multilingual challenge in Europe, semantic interoperability is compromised by the lack of commonly agreed and widely used data models, divergent interpretations of the same data and the absence of common reference data (e.g., code-lists, identifiers, taxonomies, references to organisations, geospatial references, license collections, etc.). The EC is undertaking several standardisation activities for these two key areas, exchange of data and core vocabularies.

E-Government standardisation activities are of great interest to the PolicyCLOUD project as the four project pilots are working with local government for evidence-based policymaking, and government administrations are the primary stakeholder of the project.

2.1.4 Smart Cities and Communities

Smart urban technologies can make a significant contribution to the sustainable development of European cities. 75% of the EU population lives in urban areas, a proportion that is growing as the urbanisation trend continues, both in Europe and worldwide.[1] A smart city is an entity that uses ICT effectively to integrate the requirements of its urban community, in terms of energy and other utilities, environmental protection, mobility and transport, services for citizens and with proper regard for security, both of individuals and their personal data, and use it as a driver for economic and social improvements.

Smart city standards topics relate to the need to ensure commonalities to enable the city to derive the best horizontal advantage from its overall approach and benefit from interoperability. The core components in such a complex system are the frameworks that assist companies, cities, and other actors in providing appropriate solutions that prioritise economic, social, and environmental outcomes, addressing the whole lifecycle through the seamless transfer of information.

Two of PolicyCLOUD's project pilots are with city municipalities (London Camden, UK and Sofia, Bulgaria), looking to use PolicyCLOUD's innovative tools to harness their data in a smart city approach. Sofia is working for better outcomes for city transport, and Camden is working towards better services for citizens to reduce unemployment. Smart city standardisation is extremely relevant to these two pilots, but also to the wider applications of the PolicyCLOUD platform.

2.1.5 PolicyCLOUD contributions to the Rolling Plan for ICT Standardisation

The Rolling Plan for ICT Standardisation is drafted on a yearly basis by the European Commission in collaboration with the European Multi-Stakeholder Platform on ICT Standardisation. As mentioned in section 2.1, the plan provides an overview of all known areas where ICT standardisation could support EU policy objectives. It also details the requirements for ICT standardisation, translates them into actions and provides a follow-up mechanism for the actions.

The 2021 edition focuses on four main priority areas: (1) Key Enablers and Security, (2) Societal Challenges, (3) Innovation for the digital single market, and (4) Sustainable Growth, each subdivided into technological or application domains. For each priority domain, policy and legislation objectives are defined in Part A of the plan and accompanied by a set of future requested actions in Part B, as well as overview of relevant standardisation activities being carried out by SDOs and other Standard Setting Organisations in Part C. From these four thematic areas, about 180 actions are included under the 37 technological or application domains.

PolicyCLOUD initiated a collaboration with two H2020 Coordination and Support Actions. StandICT.eu[4], working on Supporting European Experts Presence in International Standardisation Activities in ICT, and OntoCommons, contributing to European standardisation in ontologies. Within the context of the collaboration, PolicyCLOUD partners contributed to the Rolling Plan for ICT Standardisation, a new chapter on **Data Economy**, in the final phases of revision for introduction to the 2022 Rolling Plan. This is obviously a tremendous step forward to ensure that future standardisation policy objectives and recommendations are inclusive and duly representative of the requirements for standardised cloud technologies and ethical and legal compliance in data driven policymaking promoted by the PolicyCLOUD project. Moreover, the StandCIT.eu invited Dimosthenis Kyriazis (UPRC), project partner of PolicyCLOUD to play an active role in the Technical Working Group within StandICT.eu around data interoperability.

[4] StandICT.eu, https://www.standict.eu, retrieved 2021-12-20

2.2 The Data Governance Act

In October 2020, the EC approved its new Open Source Software Strategy 2020-2023[5], a part of the overarching Digital Strategy of the Commission and contributing to the Digital Europe programme. PolicyCLOUD will contribute to this strategy through its use and upstream contributions to open source.

Moreover, with the Data Governance Act of November 2020, the European Commission proposed new rules on data governance. Their aim is to **exploit the high amounts of data created every day, but within a trustworthy European framework.** These new rules will allow European data to be harnessed and **allow specific European data spaces to benefit society, citizens, and companies.** The Commission has proposed nine data spaces in February 2020's data strategy, ranging from industry to energy, and from health to the European Green Deal. PolicyCLOUD is exactly the type of instrument that will be able to exploit these large quantities of data to benefit society, citizens, and companies, while protecting the data and ensuring data protection standards are maintained.

2.3 Open Source and Standards

Standards and Open-Source development are both processes widely adopted in the ICT industry to develop innovative technologies and facilitate their adoption in the market.

Open Standards can play a critical role in ICT technologies by enabling the achievement of paramount objectives in view of a more digitized and competitive European industry sector:

- Standards allow industry to provide software and services capable to match customer's needs and requirements (both today and in the future).
- Standards ensure full interoperability and allow technologies to be connected or integrated and work seamlessly together.
- Standards can boost innovation by providing an agreed and trusted basis on top of which innovation can thrive.
- In a networked ecosystem, OS Software and Standards can fulfil the burning need for end-to-end solutions with pieces of software from different vendors to work and function together.

To date, OS components are the pivotal building blocks of the digital transformation. Open-Source software components are developed and adopted by big industry, SMEs and communities, making better code available for sharing and reusing to everyone, so long as they comply with license requirements.

The potential economic impact of Open-Source Software (OSS) on European Industry is massive: it is estimated that companies based in the EU territory and member states invested around €1 billion in OSS

[5] EUROPEAN COMISSION, Open-Source Software Strategy 2020-2023 https://ec.europa.eu/info/departments/informatics/open-source-software-strategy_en , retrieved 2021-12-20

in 2019, which resulted in an impact on the European economy spanning between € 65 and € 95 billion[6]. A widespread and faster adoption of OSS would result in lowering barriers to participation, enabling experimentation and contribution to development of de facto standards for a wide array of industrial stakeholders and speeding up the completion of a fully-fledged "*Digitising European Industry*" strategy.

Section 5 investigates the use of OS technologies in PolicyCLOUD and the contributions of partners to Open-Source communities and Open-Source standards.

[6] PUBLICATIONS OFFICE OF THE EUROPEAN UNION, The impact of Open-Source Software and Hardware on technological independence, competitiveness and innovation in the EU economy: https://op.europa.eu/en/publication-detail/-/publication/29effe73-2c2c-11ec-bd8e-01aa75ed71a1/language-en

3 Framework to capture EU contributions in Standards

In the scope of task 7.4 "Standardisation Strategy and Activities", PolicyCLOUD leverages relevant ongoing efforts and works closely with standardisation initiatives to ensure alignment and, where possible, influence work on emerging Cloud Computing and Public Sector Information standards.

To achieve this objective, the PolicyCLOUD team is consolidating its dialogue with relevant stakeholders in the international standardisation field in the second year of the project. With the aim to get in contact with relevant players of the standardisation ecosystem, the team has focused its effort on the actions described in the following sections.

3.1 Mapping of EU and international standardisation initiatives

The table below lists the relevant EU and international initiatives currently mapped, related to Digital Transformation standardisation. The mapping is a continuous activity, the current overview is listed in the table below.

Number	Organisations related to Standards efforts	Type of collaboration
1	BDVA /DAIRO	• ATOS will present and contribute to BDVA policy development use cases, along with relevant data analytics techniques. • Collaboration with the BDVA e-governance task force at the EBDVF2020 session "Smart government: co-creating services with the use of AI and Data" • Collaboration with the BDVA Standardisation Task Force is conducted via Ray Walshe, onboarded to the PolicyCLOUD Impact Creation Board
2	CEN - European Committee for Standardization	• OKYS will share best practices for the adoption of the PolicyCLOUD methodology and tool by municipalities across Europe
3	EOSC - European Open Science Cloud	• There is a close connection with Policy via individuals and organisations participating in both. EGI (member of the PolicyCLOUD Consortium) is an EOSC Association member.

		• Suzanne Dumouchel, EOSC Association director joined the PolicyCLOUD Event as a keynote speaker: "Evidence Based Policymaking in Europe Summit 2021." • Silvana Muscella and Sara Pittonet Gaiarin both of Trust-IT, are members of the EOSC Task Forces on engagement and the sustainability of EOSC. • PolicyCLOUD joined the EOSC hub week 2020 with a poster.
4	European Multi Stakeholder Platform on ICT Standardisation	• The PolicyCLOUD consortium has contributed content to the new chapter "Data Economy" within the ICT Standardisation rolling plan 2022 in November 2021.
5	IEEE - Institute of Electrical and Electronics Engineers	• UPRC presented and published its paper "An Evaluation of Neural Machine Translation and Pre-trained Word Embeddings in Multilingual Neural Sentiment Analysis"[7] at the 2020 IEEE International Conference on Progress in Informatics and Computing (PIC) • UPRC presented and published its paper "An Optimized KDD Process for Collecting and Processing Ingested and Streaming Healthcare Data" at the 12th International Conference on Information and Communication Systems (ICICS 2021)
6	OECD	• The *Common Reporting Standard (CRS),* developed in response to the G20 request and approved by the OECD Council on 15 July 2014, which specifies guidelines for obtaining information from financial institutions and automatically exchanging that information in an interoperable way. • Collaboration with the OECD was initiated in the context of the Data Driven Policy Cluster (see section 6), where OECD representative Alan Paic, senior Policy Analyst, gave a presentation on **Open research data for better policymaking** • PolicyCLOUD aims to continue this collaboration in the Data Driven Policy Cluster context
7	OASC – Open & Agile Smart Cities	• Collaboration with the OASC was initiated in the context of the Data Driven Policy Cluster (see section 6), where OASC representative Michael Mulquin, MiM ambassador, gave a presentation on **MIMs supporting evidence-based policy.** • PolicyCLOUD aims to continue this collaboration in the Data Driven Policy Cluster context.

[7] G. Manias, A. Mavrogiorgou, A. Kiourtis and D. Kyriazis, "An Evaluation of Neural Machine Translation and Pre-trained Word Embeddings in Multilingual Neural Sentiment Analysis," *2020 IEEE International Conference on Progress in Informatics and Computing (PIC)*, 2020, pp. 274-283, doi: 10.1109/PIC50277.2020.9350849.

8	StandICT.eu	• PolicyCLOUD will provide key insights on appropriate and pertinent gaps, recommendations and priorities in ICT Standardisation around Big Data for Smart Cities. • PolicyCLOUD onboarded StandICT.eu Expert Advisory Group Member Ray Walshe to the PolicyCLOUD Impact Creation Board. • PolicyCLOUD and StandICT.eu organised a joint internal workshop to initiate collaboration. • PolicyCLOUD may publicise the opportunities offered to its stakeholders by the StandICT.eu Open Calls and encourage applications. • PolicyCLOUD may also take part in webinars and events organised by StandICT.eu and vice versa. • StandICT.eu is about to launch a new Technical Working Group on Big Data and Smart Cities which will include experts from PolicyCLOUD and ultimately yield a Gap Analysis Report for ICT standardisation activities in the Big Data for Smart Cities domain and generate timely and pertinent content to feed directly into the StandICT.eu EUOS (European Standards Observatory). • Dimosthenis Kyriazis from UPRC (member of the PolicyCLOUD consortium) is an active member.
9	W3C - World Wide Web Cons ortium	• Maggioli (member of the PolicyCLOUD consortium) will make use of JSON-LD for representing and publishing open linked dataset. PolicyCLOUD will introduce JSON-LD contexts (i.e., metadata & annotation) for all the domains of the project's use cases

TABLE 1 - LIST OF RELEVANT INITIATIVES IN THE DT STANDARDISATION AREA

3.2 Expressing interest in joining the European Observatory for ICT Standardisation (EUOS)

In alignment with the challenges presented in Section 2.2, PolicyCLOUD has collaborated with StandICT.eu in an internal project workshop to identify grounds and the direction for collaboration. PolicyCLOUD expressed the interest to join the European Observatory for ICT Standardisation (EUOS), led by the CSA H2020 project StandICT.eu, and **to support the creation of a Technical Working Group (TWG) focused on Big Data for Smart Cities**.

The StandICT.eu 2023's EUOS is an interactive platform, the key-goal of which is to monitor the global ICT Standardisation landscape, with its ultimate objective to provide the community of ICT experts with the most accurate coverage of relevant and timely ICT Standards, priorities and needs that might affect the key ICT domains of the Digital Single Market and the EU ICT Rolling Plan for Standardisation. The EUOS envisages a series of Technical Working Groups (TWGs), made of selected experts that feature thought leadership personalities in critical ICT sectors, with the ambitious goal to drive forward and elaborate tailored Landscape and Gap Analyses on a given subject area.

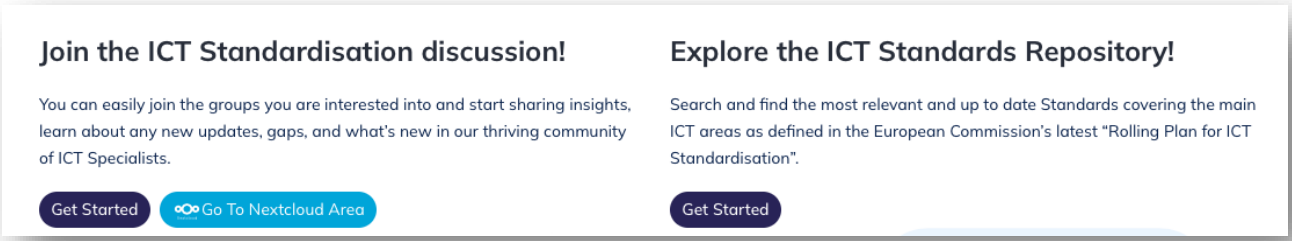

FIGURE 1 - THE EUROPEAN OBSERVATORY FOR STANDARDS

At the current state of the project, the group of experts to join the TWG has been identified and communicated to the StandICT.eu team, which is setting up the group:

- Panayiotis Michael (ICCS), the technical coordinator of PolicyCLOUD
- Konstantinos Oikonomou (UBITECH), technical partner
- Ana Georgieva, Sofia Municipality, Urban policy making through analysis of crowdsourced data pilot lead
- OKYS, the SME established as an independent research, innovation, and technology hub

The outcome of the collaborative work carried out by the experts will be a dedicated White Paper, that will feed into the PolicyCLOUD next iteration of this deliverable.

4 PolicyCLOUD contributions to standards

Intending to map the awareness of partners of standards related to their work in PolicyCLOUD, their use of standards and identification of possible new ones, the WP7 team surveyed PolicyCLOUD project partners working on the technical components of PolicyCLOUD. The survey gave a general introduction to what ideas partners have about standards, significantly how we can help them.

4.1 Methodology

WP7 sent out a survey to all PolicyCLOUD project partners, with the aim to map:

- partners' use of global standards in PolicyCLOUD activities, we tried to map the activities in which the partners use the standards.
- partners' awareness of and involvement in Standardisation Bodies and initiatives, and development of ICT Technical Specifications.
- partners' use of OSS,

The following seven partners have provided their answers to the survey between March and June 2021:

- Institute of Communication and Computers System (ICCS)
- Ubitech Limited
- OKYS
- Atos Spain S.A.
- LeanXcale
- IBM Israel - Science and Technology Ltd

In PolicyCLOUD they represent research and academia as well as the technology and cloud providing industry.

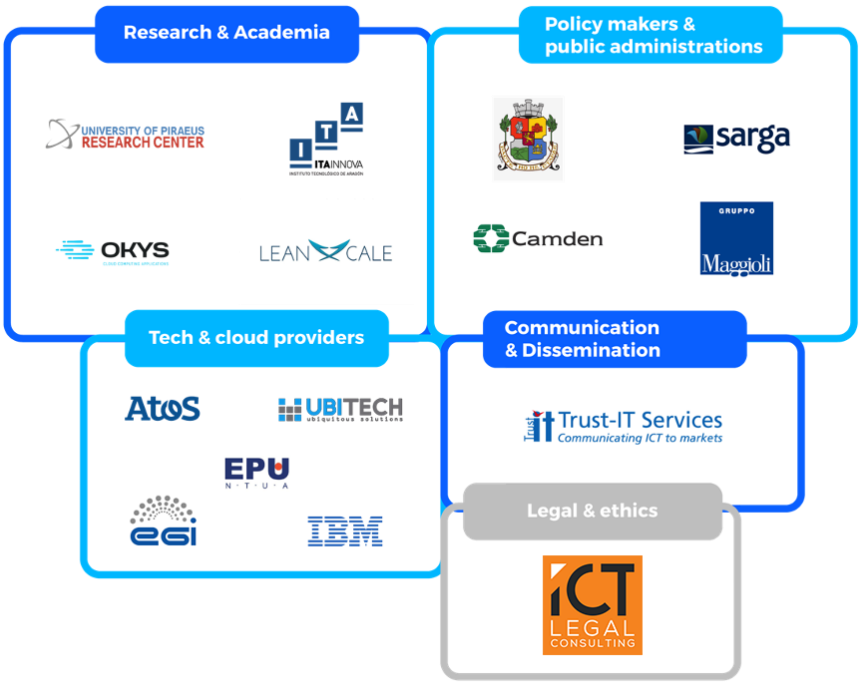

FIGURE 2 - CATEGORISATION OF POLICY CLOUD PARTNERS

In the section below (section 4.2), we map and analyse the answers provided by partners to the internal project survey. In section 5 we map PolicyCLOUD partners' use of Open-Source technologies and contributions to OS communities.

4.2 Mapping standards usage among partners

Partners were asked about their involvement in Standardisation Bodies and work on ICT technical specifications and Standards.

From the answers to question 1 "Are you working on any ICT Technical specifications?"", we can conclude that technical partners are not working on any specifications.

We can see from the answers provided to the second question – "Do you belong to any Standards Development Organization (SDO)" -, that PolicyCLOUD individual partners are not involved in SDOs (see question 2 in figure 3). If we look at this activity on a higher level, beyond the individual respondent, we see that a number PolicyCLOUD partners and the consortium are connected to relevant initiatives in the standardisation ecosystem as described in section 3.

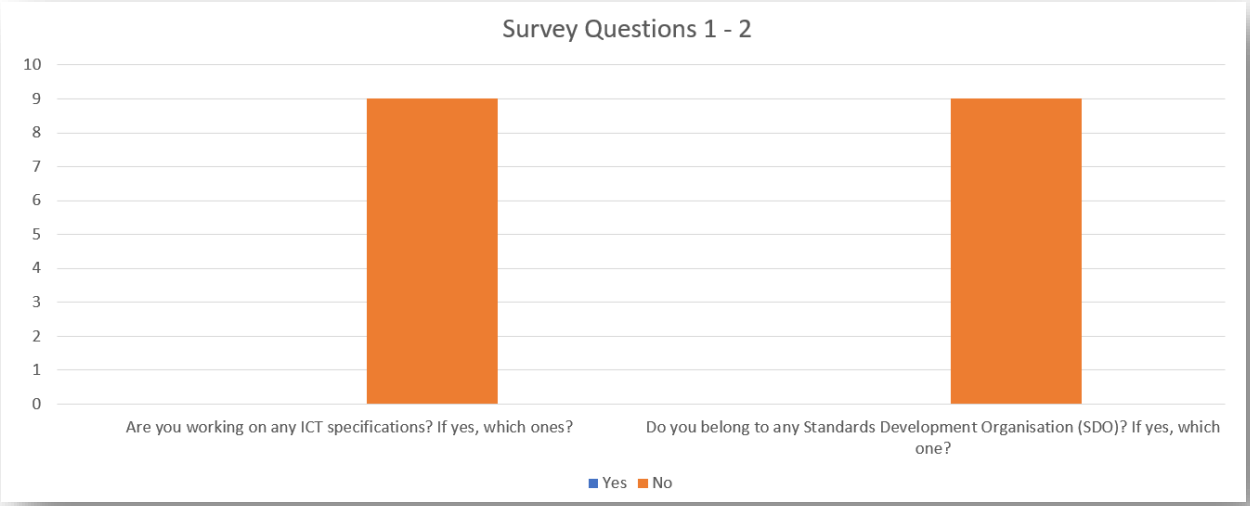

FIGURE 3 - POLICY CLOUD PARTNER SURVEY ON STANDARDISATION RESULTS OF QUESTION 1 "ARE YOU WORKING ON ANY ICT TECHNICAL SPECIFICATIONS?" AND QUESTION 2 "DO YOU BELONG TO ANY STANDARDS DEVELOPMENT ORGANISATION?"

The third question (see figure 4) "Are you using any (global) standards in the development of this technology?" show that 30% of the respondents indicate they are using global standards in the technical work on cloud and data management solutions. A few of the standards used and provided by the partners OpenAPI, XML, OWL, RDFs, JSON - XACML, XML - JDBC,. WP7 believes this question may have not been properly understood by respondents, as the above indicated standards are used in all PolicyCLOUD components. To improve this mapping WP7 will perform individual interviews on standards use in the third year of the project, to be able to provide the full overview of PolicyCLOUD's standard use.

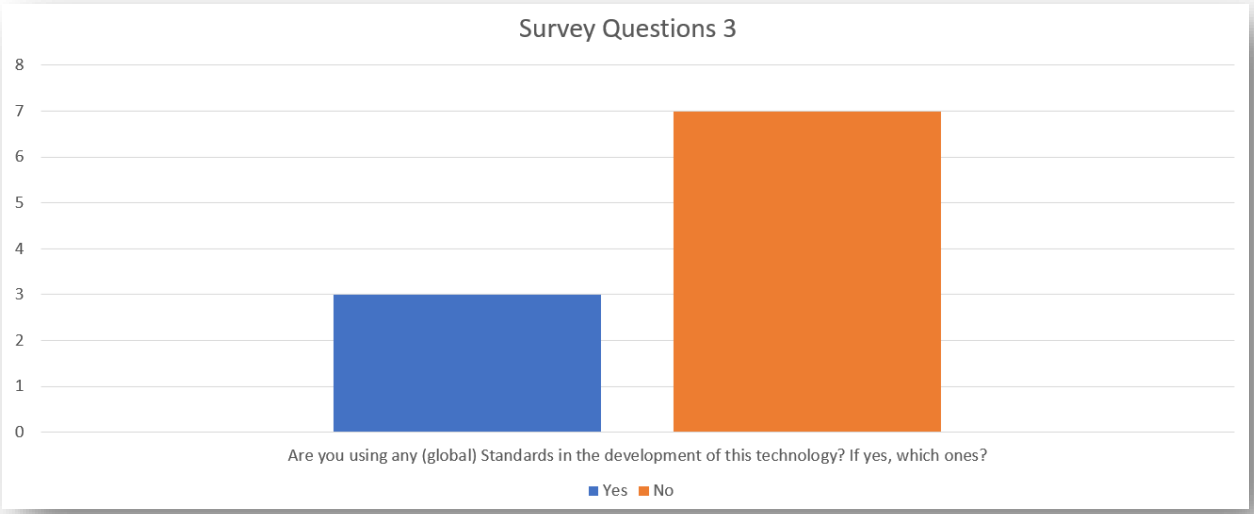

FIGURE 4 – POLICYCLOUD PARTNERS SURVEY ON STANDARDISATION. RESULTS OF QUESTION 3 "ARE YOU USING ANY (GLOBAL) STANDARDS IN THE DEVELOPMENT OF THIS TECHNOLOGY?"

4.3 Mapping awareness of relevant standardisation activities

Task 7.4 Standardisation Strategy and Activities identified StandICT.eu 2023 as a relevant initiative with its open calls for experts, the European ICT Standardisation Observatory and the Technical Working Groups as described in section 3.

The survey also mapped the awareness and interest among partners of existing standardisation initiatives such as StandICT.eu and the EUOS in two questions:

- Are you familiar with EUOS, the European ICT Standards Observatory?
- Do you want to receive more information about EUOS, the European ICT Standards Observatory?

We can conclude that partners were not yet aware of the identified initiative at the time of the survey. With the StandICT.eu collaboration in full swing at the time of writing of this deliverable we can state PolicyCLOUD is now heading one of the StandICT.eu TGWs, to provide contributions to the EUOS in the shape of a white paper on Big Data for Smart Cities as described in section 5.

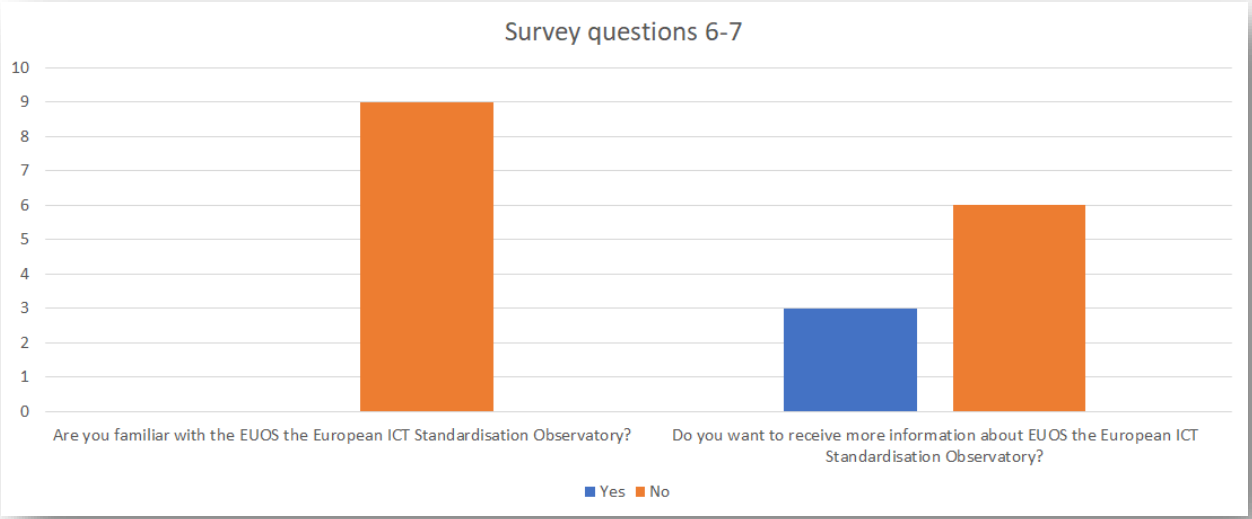

FIGURE 5 – POLICYCLOUD PARTNERS SURVEY ON STANDARDISATION. RESULTS OF QUESTION 6 "ARE YOU FAMILIAR WITH EUOS, THE EUROPEAN ICT STANDARDS OBSERVATORY?" AND QUESTION 7 "DO YOU WANT TO RECEIVE MORE INFORMATION ABOUT EUOS, THE EUROPEAN ICT STANDARDS OBSERVATORY?"

At the time of the survey (M16-M18), partners were asked about their level of awareness of the StandICT.eu initiative, as described in section 3 as relevant for PolicyCLOUD. Partners were also asked the following 3 questions:

- Are you aware of the StandICT2023 open calls?
- Do you want to receive more information about the StandICT2023 Open Calls?
- Would you like to ask our standards Expert?

All three questions show partners want to be more engaged the StandICT.eu initiative, a key player in the field of European standardisation. At M23, T7.4 organised an internal PolicyCLOUD and StandICT.eu workshop for both projects to get acquainted with their activities and identify areas for collaboration. StandICT.eu presented its calls and EUOS and how this is relevant for H2020 research and Innovation projects. A detailed description is given in section 5 on further collaboration between StandICT.eu and PolicyCLOUD.

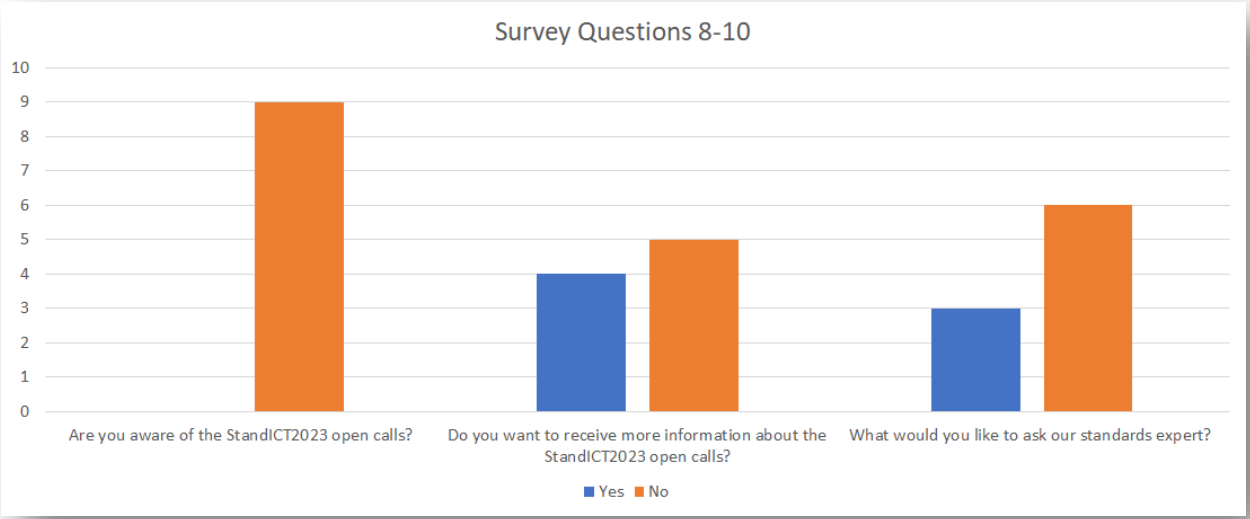

FIGURE 6 – POLICYCLOUD PARTNERS SURVEY. RESULTS OF QUESTION 8 "ARE YOU AWARE OF THE STANDICT2023 OPEN CALLS?" QUESTION 9 "DO YOU WANT TO RECEIVE MORE INFORMATION ABOUT THE STANDICT2023 OPEN CALLS?" AND QUESTION 10 "WOULD YOU LIKE TO ASK OUR STANDARDS EXPERT?"

4.4 Standards for PolicyCLOUD

4.4.1 Interoperability for Policy Datasets

Among the main value propositions of the PolicyCLOUD environment and tools for policy development and management will be its ability to integrate, link and unify the datasets from diverse sources, while at the same time enabling analytics over the unified datasets. As a key prerequisite to providing this added value, the interoperability of diverse datasets should be ensured. Currently, a wide array of data representation standards in various domains have emerged as a means of enabling data interoperability and data exchange between different systems. Prominent examples of such standards in different policy areas include:

- The *INSPIRE Data Specifications*[8] for the interoperability of spatial data sets and services, which specify common data models, code lists, map layers and additional metadata on the interoperability to be used when exchanging spatial datasets.
- The *Health Level 7 (HL7)*[9] electronic message format for the exchange of electronic health information, include interfaces for accessing these data in a unified and interoperable manner.[10]

[8] EC INSPIRE KNOWLEDGE BASE, Data Specifications https://inspire.ec.europa.eu/data-specifications/2892 , retrieved 2021-12-20

[9] HL7, project homepage, http://www.hl7.org, retrieved 2021-12-20

[10] HL7, Interfaceware Overview https://www.interfaceware.com/hl7, retrieved 2021-12-20

- The *Common European Research Information Format (CERIF)* [11] for representing research information and supporting research policies.
- *Internet of Things ontologies and schemas*, such as the W3C Semantic Sensor Networks (SSN) ontology [12] and data schemas developed by the Open Geospatial Consortium (e.g., SensorML)[13].
- The *Common Reporting Standard (CRS),* developed in response to the G20 request and approved by the OECD Council on 15 July 2014, which specifies guidelines for obtaining information from financial institutions and automatically exchanging that information in an interoperable way.
- Standards-based ontologies appropriate for describing social relationships between individuals or groups, such as the *The Friend Of A Friend (FOAF) ontology* [14]and the *Socially Interconnected Online Communities (SIOC) ontology*[15]. The latter are instrumental for analysing social media information.

These standards provide the means for common representation of domain-specific datasets, which provide the means for data interoperability (including in several cases semantic interoperability) across diverse databases and datasets. Nevertheless, these standards are insufficient for delivering the promise of PolicyCLOUD for several reasons, including:

- *Lack of semantic interoperability in the given domain.* For example, compliance to ontologies about IoT and sensor data fails to ensure a unified modelling of physics and mathematics, which are at the core of any sensing task. Hence, in several cases, there is a need for extending existing models with capabilities for linking/relating various quantifiable and measurable (real-world) features to define, in a user understandable and machine-readable manner the processes behind single or combined tasks in the given domain.
- *Lack of semantic interoperability across datasets from different sectors.* There is not easy way to link related information elements stemming from datasets in different sectors, which typically comprise different schemas. For example, environmental datasets and transport datasets contain many related elements, which cannot however be automatically identified and processed by a system due to the lack of common semantics.
- *Lack of process interoperability.* PolicyCLOUD deals with data-driven policy development and management, which entails the simulation and validation of entire processes. Especially in the case of multi-sectoral considerations (e.g., interaction and trade-offs between different policies) process interoperability is required to assess the impact of one policy on another.

[11] CORDIS, Cerif http://cordis.europa.eu/cerif, retrieved 2021-12-20

[12] W3, Incubator https://www.w3.org/2005/Incubator/ssn/ssnx/ssn, retrieved 2021-12-20

[13] OPEN GEOSPATIAL, Standards http://www.opengeospatial.org/standards/sensorml, retrieved 2021-12-20

[14] FOAF, project homepage, http://www.foaf-project.org, retrieved 2021-12-20

[15] SIOC, project homepage http://sioc-project.org , retrieved 2021-12-20

In section 4.4.2, the multi-layer framework for interoperability is described for interoperability across diverse policy-related datasets, which will facilitate semantic interoperability across related datasets both within a single sector and across different policy sectors.

4.4.2 Multilayer framework for Interoperability

Interoperability of data as well as data sharing services between different sectors and domains and building on existing European, international, or national standards is one of the vital parts of the European Commission's data strategy[16] [17][18].

The PolicyCLOUD project has very much focused on public administrations need for more specific guidance on how to improve governance of their interoperability activities to establish cross-organizational relationships, streamline processes, and support end-to-end digital services[19]. More specifically PolicyCLOUD partners have worked on how to further improve end-to-end integration and automation, making better use of reliable sources of information, and openly publishing public data while ensuring that citizens' and businesses' records are treated in accordance[20].

[16] EUROPA.EU, Strategy for Data | Shaping Europe's digital future, https://digital-strategy.ec.europa.eu/en/policies/strategy-data, retrieved 2021-12-20

[17] COM(2020) 767, "Proposal for a Regulation of the European Parliament and of the Council on European data governance", available at: EUR-Lex - 52020PC0767 - EN - EUR-Lex (europa.eu)

[18] COM (2017) 134, "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. European Interoperability Framework – Implementation Strategy", available at: https://ec.europa.eu/isa2/eif_en

[19] COM (2017) 134, "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. European Interoperability Framework – Implementation Strategy", available at: https://ec.europa.eu/isa2/eif_en

[20] Policy Cloud, Deliverable D6.6 v. 2.4 "Integration Plan" available at: https://newrepository.atosresearch.eu/index.php/apps/files?dir=/PolicyCLOUD/02%20Final%20Deliverables/D6.6%20Integration%20plan%20M20

4.4.2.1 A THREE-STAGE APPROACH SETTING THE GROUND FOR STANDARDIZATION OF ITS PROCESSES.

PolicyCLOUD supports the key role of the Commission and the Member States in fostering better cooperation across all levels of public administrations in the Union, especially by breaking down the organizational and digital silos.

These efforts are being performed by PolicyCLOUD partners through the following three-stage approach, with the name "**end-to-end legal and ethical assessment"**, which was developed jointly by a team consisting of the Legal, Use Case and Technology partners of Policy Cloud. ***This three-stage approach can set the ground for standardizing the related processes.***

The **first stage** examines available data from a legal and ethical perspective as they reside in their original data repository (e.g., publicly available website, or a site with authorized access), without performing any data movement or processing. This data examination itself is covered by a legal umbrella, enabling the view of the data by authorized teams of legal and technology consultants. This authorization is given by the owner (public administration) of the data.

The **second stage** creates a technology workplace, with the name Interim Repository. Interim repository makes data available to PolicyCLOUD Gateways for data ingestion for the datasets it stores during **the third stage** of the end-to-end legal and ethical assessment approach.

The **difference between the second and third stages** is the fact that datasets during the second stage are visible by collaborators, and they are not hidden by the complex engineering mechanisms of the third stage, which are required for a cloud environment to perform. Still, during the second stage, discussions and agreements at political and legal levels are performed, guiding the technology steps that will take place at the third stage, which includes methods such as data anonymization and aggregation.

Especially for the second stage of the end-to-end legal and ethical perspective approach followed, and as defined in the respective deliverable of the PolicyCLOUD project, Interim Repository is a temporary data storage used to store information received from different use cases. Datasets in the interim repository are audited for their usage from a legal and ethical perspective. In that sense interim repository is covered by a legal umbrella.

The interim repository legal umbrella makes individual datasets accessible, associating each one of them with a respective legal assessment and recommendations document related to data protection. This second stage comes before the sophisticated process of ingesting data into the cloud environment and aims to:

- Remove data/information silos.
- Provide an introductory stage in enabling data interoperability.
- Provide a legal "umbrella" for the data stored in the repository.
- Provide safe and authorized access to data owned by the Use Casesto the Gateways of PolicyCLOUD.
- Provide datasets that will be used for cross-domain evidence-based policymaking.

- Provide datasets that will be used for the replication through learning of Policy Makers from best practices applied to other use cases on a common (horizontal) domain of interest (e.g., environmental protection).

4.4.3 On the need for a Policy Model standard

In addition to the need of finding and using common standards for data production and management within the EU, there is a need to create and use common standards for policymaking based on the use of information derived from these data. This dimension has not yet received the attention it deserves, but it is necessary to record the long journey from data management to reality-based decision-making.

The concept of the policy model is central to this transition. Its usefulness has been demonstrated in the previous Horizon 2020 project CrowdHEALTH[21][22] where it referred to Health policies and has been extended to PolicyCLOUD for policies of any scope. Standardizing the policy model can lower the communication barrier to policy decision-making by speeding up processes such as comparing policy-making processes, finding similar approaches between European Community countries, comparing effectiveness and versioning during their implementation. The proposed policy model of PolicyCLOUD, simple in its basic design but with the option of adding additional semantic levels, can provide a "fingerprint" of the purpose, need, stakeholders and monitoring indicators that lead to a policy decision.

Additionally, although it is essential to standardize the structure of a policy model, so that there is a common language in communication between policymakers, and in their accountability to the public, this effort should go even further. The results from the use of Analytical Tools to calculate the Key Performance Indicators (KPIs) that support a policy are also layers of information that also need to be standardized. Each analytical tool that in a given period processes specific data to produce information in the formulation and monitoring of a policy, creates results that are components of a new object (Analytics Result Object). AROs are the building blocks for calculating KPIs, but they are suitable as meta-data for input into other Analytical Tools as well.

The standardization of the policy model in the first phase and the analytic results afterwards, will give an unprecedented momentum to the use of decision support systems for the production and monitoring of policies based on actual data and relative indicators.

[21] K. Moutselos, D. Kyriazis and I. Maglogiannis, "A Web Based Modular Environment for Assisting Health Policy Making Utilizing Big Data Analytics," in *2018 9th International Conference on Information, Intelligence, Systems and Applications (IISA)*, Zakynthos, Greece, 2018 pp. 1-5. doi: 10.1109/IISA.2018.8633625

[22] Moutselos K, Maglogiannis I. Evidence-based Public Health Policy Models Development and Evaluation using Big Data Analytics and Web Technologies. Med Arch. 2020 Feb;74(1):47-53. doi: 10.5455/medarh.2020.74.47-53. PMID: 32317835; PMCID: PMC7164729.

4.4.4 Legal, regulatory, ethical, and societal challenges related to the new Data economy

The current global shift to an ever more interconnected reality has caused a corresponding shift in the way public authorities, organisations and people conceive the world around them.

There is an observable societal trend in transitioning from physical, on-paper tools, products, and activities to their more effective and technologically advanced digital counterparts. In sectors and activities where this transition has not yet been fully achieved, the demand for the ability to harness the computational power of cloud-based systems, capable of processing large amounts of information through meticulously crafted algorithms, is growing[23].

This shift brings about a need to change the ways in which information is collected, used, and managed through technologies such as cloud computing, big data processing and AI. The gains in efficiency and effectiveness brought about by these technologies must be balanced against the potential impact which they may have on the fundamental rights and freedoms of individuals, as well as on the functioning of society at large.

As noted by the European Commission,[16] the European approach towards the use of new technologies and their impact on the rights of individuals should be contrasted to those of other countries, such as the models followed by the USA and China:

1. In the USA, the organization of the data space is left to the private sector, with considerable concentration effects. Indeed, economic research seems to have reach a substantial consensus on the fact that the market share reached by the American big tech corporations is jeopardising the dynamics of free market, also finding that one of the factors that has facilitated the current concentration levels is the absence in the USA of effective personal data protection regulations.[16]

2. On the other hand, China relies on a combination of government surveillance with a strong control of big tech companies over massive amounts of data, without sufficient safeguards for individuals.

The EC underlined the importance for Europe "[…] *to find our European way, balancing the flow and wide use of data, while preserving high privacy, security, safety and ethical standards*".[24]

[23] EUROPEAN DATA PROTECTION SUPERVISOR, Opinion 4/2015, Towards a new digital ethics: Data, Dignity and Technology, https://edps.europa.eu/data-protection/our-work/publications/opinions/towards-new-digitalethics-data-dignity-and_en, retrieved 2020-12-19.

[24] The EU has already taken several steps since 2014. Indeed, with the GDPR, the EU has created a solid framework for digital trust. Other initiatives, such as the regulation on the free flow of non-personal data (Regulation (EU) 2018/1807), the CSA, and the Open Data Directive (Directive (EU) 2019/1024) are all inspired by this vision. EUROPEAN COMMISSION, A European Strategy for Data, https://ec.europa.eu/info/strategy/priorities-2019- 2024/europe-fit-digital-age/european-data-strategy, retrieved 2020-12-18

To remain aligned with the approach advocated by the EC, the design and operation of the abovementioned technologies must therefore be assessed not only from a legal and regulatory perspective to ensure its lawfulness, but also from an ethical and societal perspective to ensure its alignment with ethical and societal values.

To this regard, to ensure ethical, regulatory, and societal sustainability of the data economy, not only statutory regulations are relevant, but also voluntary standard, such as:

1. ISO/IEC 27013:2015, on the integrated implementation of an information security management system (ISMS), as specified in ISO/IEC 27001 and a service management system (SMS), as specified in ISO/IEC 20000-1.

2. The CSA Cloud Controls Matrix, which is a cybersecurity control framework for cloud computing developed by the Cloud Security Alliance (currently on Version 4).

3. The CSA Code of Conduct for GDPR Compliance, which is a code of conduct under Art. 40 GDPR (currently undergoing an approval process with the French Data Protection Authority – the CNIL), designed to provide a consistent and comprehensive framework for cloud service providers to comply with the GDPR.

4. ENISA's European Cybersecurity Certification Scheme for Cloud Services (still in a draft stage at present).

5. EU Cloud Code of Conduct. It consists of requirements for Cloud Service Providers that wish to adhere to the code, plus a governance section that is designed to support the effective and transparent implementation, management, and evolution of the code. The code is a voluntary instrument, allowing Cloud Service Providers to evaluate and demonstrate its adherence to the code's requirements, either through self-evaluation and self-declaration of compliance and/or through third-party certification. The code has been developed to cover GDPR requirements and, following the positive opinion issued by the European Data Protection Board, has been officially approved by the Belgian Data Protection Authority in May 2021.

5 Open Source in Policy Cloud

Showcasing the added value of Open-Source technologies in the Digital Transformation in the Public sector, to which the PolicyCLOUD project contributes we have highlighted relevant studies for our work and activities.

In section 2 we already mentioned the impact of Open-Source Software and Hardware on technological independence, competitiveness and innovation in the EU economy[6] 2021 report.

The JRC published a study on the relationship of open-source software and standards setting at the end of 2019[25]. The objective of the study was to identify possible commonalities and barriers for interaction between standardisation and open source (OSS) processes.

In addition, the Standards and Open Source: Bringing them together OFE report (2019) shows that cloud computing and Open-Source Software (OSS) are two phenomena that have changed the IT landscape in the last 10 or more years in ways that have substantially altered how software and IT solutions are produced and consumed. Both cloud computing and Open Source have a close, and sometimes challenging, intersection with standardisation and standards developing organizations (SDOs). Against these market dynamics, the European Commission committed to support further use of Open Source elements by better integrating OSS communities into standard setting processes of SDOs.

In this chapter, we map the use of Open Source in PolicyCLOUD and its upstream contributions, fostering global interoperability of cloud and data management technologies.

5.1 Using Open-Source Technologies

The survey described in section 4, also asked for partners' use of Open-Source software, and to indicate which OS technology from which OS community.

Policy Cross reference/endnote. work & partner	Open-Source Technology used
University of Piraeus Research Centre **Role in Policy Cross reference/endnote.**: UPRC focuses on research activities related to advanced distributed computing, dealing with topics such as Cloud Computing, Internet of Services and Things, Application Modelling and Analysis and Quality of Service in service provisioning systems. It contributes to cloud provisioning of the PolicyCLOUD infrastructure, the cloud gateways & APIs for efficient data utilisation.	Flask: https://github.com/pallets/flask Gunicorn: https://github.com/benoitc/gunicorn Nginx: https://github.com/nginx/nginx-releases MongoDB: https://github.com/mongodb/mongo WordPress: https://github.com/WordPress/WordPress Python: https://github.com/python PHP: https://github.com/php/php-src Pandas: https://github.com/pandas-dev/pandas NumPy: https://github.com/numpy/numpy

[25] EUROPE.EU, JRC Publications Repository https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/relationship-between-open-source-software-and-standard-setting, retrieved 2021-12-20

	Keras: https://github.com/keras-team/keras spaCy: https://github.com/explosion/spaCy WikiData: https://github.com/Wikidata DBpedia: https://github.com/dbpedia/ TensorFlow: https://github.com/tensorflow/tensorflow Cerberus: https://github.com/pyeve/cerberus Scikit learn: https://github.com/scikit-learn/scikit-learn Loguru: https://github.com/Delgan/loguru
Ubitech Limited **Role in Policy Cloud**: UBITECH provides its expertise on cloud provisioning of the PolicyCLOUD infrastructure, on cloud gateways & APIs for efficient data utilization, and on the creation of the data governance model, protection and privacy enforcement. UBITECH also performs techniques for cross-sector data fusion linking.	WSO2 BALAN: https://github.com/wso2/balana Java- Open JDK: https://jdk.java.net/ Spring Boot: https://spring.io/projects/spring-boot Docker: https://github.com/docker
OKYS **Role in Policy Cloud**: OKYS has a key role on all the policy level activities as well as opinion mining and sentiment analysis, social dynamics, and behavioural data analytics. OKYS supports use case definition, design, implementation, and evaluation and contributes to incentives management, providing knowledge on end user and stakeholder engagement, while also contributing to the ethical and legal compliance framework.	Angular: https://github.com/angular Visual Studio Code: https://github.com/microsoft/vscode NodeJS: https://github.com/nodejs Docker: https://github.com/docker
Atos Spain S.A. **Role in PolicyCLOUD**: Atos coordinates the PolicyCLOUD project and performs situational knowledge acquisition and analysis, opinion mining & sentiment analysis, and activities for the enhanced interoperability and data cleaning, and the optimised analytics techniques decoupled from the infrastructure. Atos leads the incentives management activity as well as the market analysis exploitation of the project assets.	Apache NiFi: https://github.com/apache/nifi
LeanXcale **Role in PolicyCLOUD.:** LeanXcale integrates its big data platform to support the optimization & reusability of analytical tools, as well as the creation of the policy development toolkit including data	Apache Calcite: https://github.com/apache/calcite

visualization. For that reason, LeanXcale focuses on the creation of Policy**CLOUD.**'s big data solution and analytics framework, building upon the ultra-scalable LeanXscale Big Data platform. LeanXcale also has a key role in Cloud Gateways & APIs for Efficient Data Utilization.	

5.2 Contributing to OS Communities

In addition to using OS technologies, partners were asked about their contribution to OS communities in the context of PolicyCLOUD (see figure 7). IBM indicates to be contributing to OS communities Spark and Xskipper.

TABLE 2 - OVERVIEW OF OSS USED IN POLICYCLOUD BY THE TECHNOLOGY PROVIDING PARTNERS

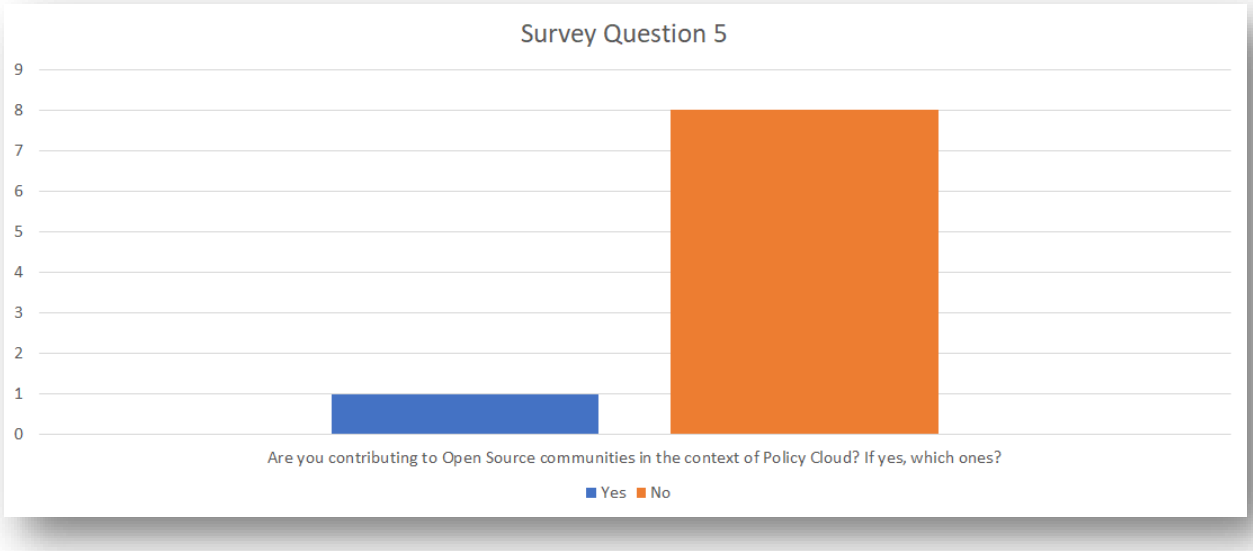

FIGURE 7 – POLICYCLOUD PARTNERS SURVEY ON STANDADISATION. RESULTS OF QUESTION 5 "ARE YOU CONTRIBUTING TO OPEN-SOURCE COMMUNITIES IN THE CONTEXT OF POLICYCLOUD?"

Next steps for T7.4 are to organise an internal PolicyCLOUD workshop to foster knowledge sharing on upstream contributions to OS communities.

6 Ongoing collaborations with relevant projects & initiatives

Since the launch of the project, PolicyCLOUD started a continuous engagement with relevant initiatives in the Digital Transformation ecosystem. The following paragraphs show practical details of some of the initiatives PolicyCLOUD is collaborating with, relevant for the project's work in the standardisation area.

6.1 StandICT.eu

About

StandICT.eu 2023, Supporting European Experts Presence in International Standardisation Activities in ICT, GA No. 951972, is an EU-funded, Coordination and Support Action StandICT.eu 2023 addressing the specific challenges of the topic ICT-45-2020, "Reinforcing European presence in international ICT standardisation", running from September 2020 to August 2023.

Building on the success of the StandICT.eu 2018-2020 precursor Project, StandICT.eu 2023 has a dual objective. The first, **to support the participation of European ICT experts in international SDO Working Groups, through a series of ten Open Calls, which will provide a total of 3 million Euro of funding** over the duration of the Project through the StandICT.eu 2023 Fellowship Programme. The second, to deliver the **"EUOS – The European Observatory for ICT Standardisation", an interactive platform that will monitor the global ICT Standardisation landscape**, with the ultimate goal of providing the community of ICT experts with accurate coverage of relevant and timely ICT Standards into which the results of the fellowships feed and contribute.

Within the EUOS, StandICT.eu has also launched a **series of rotating Technical Working Groups (TWGs) to harness expert advice and stimulate discussion among SDOs, public bodies, academic institutions and acclaimed specialists** to provide an expert overview of documents and activities relevant to standardisation in identified key fields such as AI, Big Data Spaces, Blockchain, Cybersecurity, Data Interoperability, Smart Cities and Trusted Information with a **further dedicated TWG on Big Data for Smart Cities to be launched** in early 2022. Chaired by the PolicyCLOUD project, the output of this group will provide an overview of the diverse array of global standardisation work underway in Big Data for Smart Cities and the various organisations behind it. This information will be updated and evolve via the above mentioned EUOS database and ultimately result in the release of a dedicated White Paper.

Collaboration

The benefits of the collaboration forged between PolicyCLOUD and StandICT.eu 2023 is therefore not only easily discernible but symbiotic with obvious advantages to be gained by both on multiple facets, as outlined below:

- PolicyCLOUD onboarded StandICT.eu Expert Advisory Group Member Ray Walshe to the PolicyCLOUD Impact Creation Board, the project's knowledge and guidance forum, providing advice to the consortium on how to exploit the knowledge created by PolicyCLOUD.

FIGURE 8 - ANNOUNCEMENT OF THE ONBOARDING OF RAY WALSHE, STANDARDS EXPERT ON THE POLICYCLOUD IMPACT CREATION BOARD (ICB)

- Dimosthenis Kyriazis from UPRC, partner in PolicyCLOUD, chairs the StandICT.eu TGWG on Big Data. The group will perform a **Gap Analysis Report for ICT standardisation activities in the Big Data domain** and generate timely and pertinent content to feed directly into the StandICT.eu EUOS.

- As part of future activities, **StandICT.eu** has launched a **new TWG on Big Data for Smart Cities** which will include experts from PolicyCLOUD and ultimately yield a **Gap Analysis Report for ICT standardisation activities in the Digital Transformation for the Public Sector** and generate timely and pertinent content to feed directly into the StandICT.eu EUOS.

FIGURE 9 - STANDICT EUOS TGW ON BIGA DATA FOR SMART CITIES, CHAIRED BY POLICY CLOUD

- **Policy**CLOUD **may also take part in webinars and events organised by StandICT.eu 2023 and vice versa** or contribute to the Standards Assembly foreseen upon conclusion of StandICT.eu. Likewise, **each may bring its use cases to be showcased at events as practical results of the projects** and in the StandICT.eu 2023 EUOS.

Workshop organised by PolicyCLOUD with participation of StandICT.eu

The PolicyCLOUD team has organised one internal workshop with StandICT.eu, in which Francesco Osimanti, StandICT.eu vice-coordinator and Ray Walshe, StandICT.eu Advisory Expert Group Member have joined and presented the potential collaborations between the two projects. The workshop was organised on 17 November 2021; the attendees had the opportunity to learn more about how PolicyCLOUD can liaise with StandICT.eu to create a Technical Working Group for expert's collaboration and consultation on Big Data, Cybersecurity and Smart cities. During the workshop, PolicyCLOUD and StandICT.eu identified the work needed that supports work to fill the gap in Big Data for Smart Cities Standards to support European policy objectives.

Next Steps:

At the time of writing this deliverable, exchanges have gone on with the chairs of the ICT rolling Plan of Standardisation and the PolicyCLOUD partners have provided content to the new dedicated chapter entitled "Data Economy" ready for the ICT Rolling Pan 2022 edition. Moreover, the definition of the

Technical Working Group on Big Data for Smart Cities is being finalised with several key players from PolicyCLOUD consortium to drive this forward.

6.2 BDVA

About

The **Big Data Value Association** – BDVA, is an industry-driven international not–for-profit organisation with more than 230 **members** all over Europe and a well-balanced composition of large, small, and medium-sized industries as well as research and user organizations.

BDVA/DAIRO focuses on enabling the **digital transformation** of the economy and society through **Data** and **AI** by advancing in areas such as big data and AI technologies and services, data platforms and data spaces, Industrial AI, data-driven value creation, standardisation, and skills. BDVA/DAIRO has been the private side of the H2020 partnership **Big Data Value cPPP**, it is a **private member of the EuroHPC JU** and is also one of the **founding members of the AI, Data and Robotics Partnership**. BDVA/DAIRO is an open and inclusive community and is always eager to accept new members who share these ambitious objectives.

The **mission of the BDVA** is to **develop the Innovation Ecosystem** that will enable the **data and AI-driven digital transformation in Europe** delivering maximum economic and societal benefit, and, achieving and sustaining Europe's leadership on **Big Data Value creation** and **AI**.

BDVA **is open to new members** to further enrich the data value ecosystem and play an active role. These include Data Users, Data Providers, Data Technology Providers and Researchers. BDVA enables existing regional multi-partner cooperation, to collaborate at European level through the provision of tools and knowhow to support the co-creation, development, and experimentation of pan-European data-driven applications and services, and know-how exchange.

Collaboration

BDVA Task Forces (TF) are the main centres of activity within BDVA/DAIRO, PolicyCLOUD has initiated collaboration with the TF on Standardisation and TF on Smart Governance and Smart Cities. Below we provide an overview of the collaboration activities relevant for PolicyCLOUD's work on standardisation:

1. **BDVA TF on standardisation** aims to integrate research, technology, development, and innovation with standardisation. The group is engaging with current and future PPP Projects in relation to standards as well as other initiatives across the EU. The goal is to serve as a one-stop-shop for standards advice, support, and operations. This group aims at achieving the European Commission recognition for leadership in Standardization Policy and Strategy. Finally, it works to become an education provider around technology standards and standardisation. PolicyCLOUD

has initiated collaboration via the onboarding of Ray Walshe to the project Impact Creation Board[26].

2. Vega Rodrigalvarez from ITA Innova, part of the PolicyCLOUD consortium, is co-leading the BDVA TF on Smart Governance and Smart Cities.
3. PolicyCLOUD kicked off collaboration with the BDVA TF on Smart Governance and Smart Cities at the EBDVF2020, the Smart Society Parallel Session Smart Government with co-creating services using AI and Data, 3 November 2020. PolicyCLOUD co-organized the session with The BDVA Task Force and the H2020 projects DUET and URBANITE[27].

FIGURE 10 - SMART SOCIETY PARALLEL SESSION SMART GOVERNMENT WITH CO-CREATING SERVICES USING AI AND DATA

4. PolicyCLOUD engaged with the BDVA in a session on "Enabling Data Economy for Local Communities" under the umbrella of the "Data Driven Policy Cluster". To discuss moving from siloed & unconnected initiatives towards interoperability and standardisation of data models and towards open urban data platforms, which are expected to accelerate local economies. The session was held at the EBDVF2021 on 2 December 2021.

[26] POLICYCLOUD.EU, PolicyCLOUD Impact Creation Board: https://www.policycloud.eu/impact-creation-board, retrieved 2021-12-20

[27] POLICYCLOUD.EU, EBDVF2020: https://policycloud.eu/news-events/events/european-big-data-value-forum-2020, retrieved 2021-12-20

FIGURE 11 - DATA DRIVEN POLICY CLUSTER @ENABLING DATA ECONOMY FOR LOCAL COMMUNITIES SESSION (EBDVF2021)

5. During the Evidence Based Policy in Europe Summit, Roberto di Bernardo, BDVA Smart Governance and Smart Cities Task force lead, joined the Plenary Session "From digital disruption to digital adoption" See figure 11, addressing Data Spaces as key enabler for a Data Society.

Next Steps:
At the time of writing this deliverable, exchanges have gone on with the chairs of the ICT rolling Plan of Standardisation and the PolicyCLOUD partners have provided content to the new dedicated chapter entitled "Data Economy" ready for the ICT Rolling Pan 2022 edition. Moreover, the definition of the Technical Working Group on Big Data for Smart Cities is being finalised with several key players from PolicyCLOUD consortium to drive this forward.

6.3 OntoCommons.eu

About

OntoCommons is an H2020 CSA project dedicated to the standardisation of data documentation across all domains related to materials and manufacturing.

OntoCommons lays the foundation for interoperable, harmonised, and standardised data documentation through ontologies, facilitating data sharing and pushing data-driven innovation, to bring out a truly Digital Single Market and new business models for European industry, exploit the opportunities of digitalisation and address sustainability challenges.

Collaboration

PolicyCLOUD collaborated with OntoCommons.eu of a new chapter on **Data Economy**, in the final phases of revision for introduction to the 2022 Rolling Plan. As mentioned in section 2.1.5, this is a tremendous step forward to ensure that future standardisation policy objectives and recommendations are inclusive and duly representative of the requirements for standardised cloud technologies, data management and ethical and legal compliance in data driven policymaking promoted by the PolicyCLOUD project.

OntoCommons **Sustainability Manager Michela Magas** (Industry Commons & Music Tech Fest Labs), was invited to the Evidence Based Policy in Europe Summit 2021, to speak at the plenary session "Form Data to Policymaking", addressing evidence-based policymaking & frontier innovation (see figure 14).

Next Steps:
PolicyCLOUD, OntoCommons.eu and StandICT.eu input to the new Data Economy Chapter for the Rolling Plan for ICT Standardisation is currently under review. The three projects will remain in close contact for the final feedback and inclusion. In 2022 the projects will support the dissemination of the new version of the Rolling Plan among its consortia and stakeholder communities.

As already mentioned in section 3, for PolicyCLOUD, standards-based ontologies appropriate for describing social relationships between individuals or groups are instrumental for analysing social media information. PolicyCLOUD will connect to OntoCommons on this topic in 2022 where relevant.

7 Conclusions

The first PolicyCLOUD Standardisation Plan and Activities has shown how cooperation with relevant SDOs, and other standardisation stakeholders is crucial to facilitate the development and adoption of PolicyCLOUD for data driven policymaking by policymakers and public administrations.

This deliverable has highlighted the critical and complementary role played by cloud and standards in the industrial ecosystem and the aim of PolicyCLOUD to further contribute to the adoption of cloud technologies and OSS in the standardisation field with continuous engagement with standardisation players.

In the months following the release of this deliverable, PolicyCLOUD will maintain and increase its work on standardisation and collaboration with relevant initiatives, through the following planned activities:

1. **Recommendations, gaps and priorities** around the Big Data and Smart Cities domain from a standardisation perspective will also be listed in the **PolicyCLOUD** list of recommendations, to be provided in **the second and final PolicyCLOUD Standardisation Plan and Activities Repor**t, due in M36.

2. The analysis **of PolicyCLOUD pilots** can influence standards from public sector input and how they may become valid use cases as part of EOSC to include in the **EOSC Set up Task Forces**. This work will be proposed from M25, after the development and initial validation of cases have been finalised.

3. Constant monitoring of the **number of applications in the Big Data for Smart Cities domain** that is potentially supported as part of the StandICT.eu project (four applications by M24, as shown in section 3) and the number of active **community members** within the **Working Group of EUOS of StandICT.eu** will be provided in the next iteration of this deliverable.

4. PolicyCLOUD will explore the possibilities to organise an internal workshop to guide partners in the upstream contributing process in OS Communities, via partner already experienced in engaging with Open-Source communities and upstream communities and invited speakers.

Through these concerted efforts, PolicyCLOUD shows how Cloud technologies, data management Open-Source use of technologies and contributions, can support standardisation. By the end of the project lifetime, in December 2022, we aim to showcase relevant results of PolicyCLOUD's work with standards and contributions to standardisation discussions, through the diverse collaborations and mapping exercises. In addition to the technical work in the project, the PolicyCLOUD pilots play a crucial role demonstrating the impact of standards use for improved efficiency, automation, information traceability, representation, and optimised processes thanks to the use of data and models.

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