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AI Watch
Road to the Adoption of Artificial Intelligence by the Public Sector

*A Handbook
for Policymakers, Public Administrations
and Relevant Stakeholders*

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Abstract

This handbook has been developed within the context of the *Artificial Intelligence (AI) Watch*, the European Commission's knowledge service to monitor the development, uptake and impact of AI for Europe, which was launched in December 2018 as part of the *Coordinated Plan* adopted by EU Member States and Associated Countries. As part of the *AI Watch* initiative, a specific task addresses the role of AI in the public sector, which sets out to provide actionable guidelines to promote the adoption of safe, lawful, inclusive and trustworthy AI by public sector administrations in the EU.

The purpose of this handbook is threefold:

— present an updated state of play of AI approaches applied by the public sector in Europe, including encountered benefits and criticalities;

— identify key common issues to be addressed by the relevant stakeholders both, at the policy and operational levels, as well as at different governance levels, ranging from international organisations, to national, regional and local administration levels;

— provide policymakers and interest operational parties and practitioners with a set of recommendations to address identified areas of intervention and promote the adoption of AI by the public sector in the EU.

Building on a two-year state-of-the-art analysis of public sector approaches, including the priorities identified within the AI national strategies of EU Member States and Associated Countries, and drawing on feedback from stakeholders' representatives, this handbook presents 16 recommendations clustered in four areas of intervention, accompanied by a number of actions to foster the adoption of AI in the public sector, at different operational levels.

This handbook is the first endeavour at the European level to outline possible avenues to promote AI in support of public services. The recommendations and the actions included in this handbook are formulated in compliance with EU values and digital principles, and intend to provide a **multi-level and multidimensional actionable plan** to foster citizen-centric and inclusive AI adoption and use by the public sector, as a safe, lawful and trustworthy driver to achieve common good and wellbeing in the European society at large.

Acknowledgements

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Executive summary

Objectives

The administration of public governance is undergoing an unprecedented revolution. From a democratic management perspective, the principle is swiftly shifting from digitalisation of functions and services, to the management of governance supported by emerging technologies such as Artificial Intelligence. There are great potential benefits in exploiting AI-based systems by governments and their public administrations, for the governance of the common good throughout Europe.

This unprecedented opportunity at the same time calls for reassurance on the side of citizens that AI is deployed in the most efficient and safest possible way, and in full compliance with and respect of European values and human rights. Reassurance of compliance, and of respectful and lawful use of AI-based services is very important, and it is instrumental to increase users' trust in such intelligent systems, especially when these are deployed by the public sector and have a direct impact on individuals, communities and society at large, including the environment.

In order to develop fair, non-discriminatory, transparent and trustworthy AI-enabled public services, as defined in the Council communication,1 focus should be put primarily on its use within very different yet related contexts, rather than on specific technologies and/or individual components.

The purpose of this handbook is to provide recommendations to policymakers and relevant stakeholders on the sensible adoption and use of AI in and by the public sector in Europe. Recommendations and actions provided in this handbook are intended to support forward-looking managers, practitioners and innovators throughout the public services delivery chain and at European, national and local governance levels. These recommendations stand to support the joint commitment taken by the European Commission, Member States, and Associated Countries, as outlined in the Coordinated Plan on Artificial Intelligence 2021 Review ("AI Coordinated Plan").2

Research and policy context

This handbook is published in the context of AI Watch, the European Commission's knowledge service to monitor the development, uptake and impact of AI for Europe, which was launched in December 2018 as part of the *Coordinated Plan on the Development and Use of Artificial Intelligence* Made in Europe. As part of the AI Watch, a specific Task addresses the role of AI for the public sector, and it is set out to provide actionable guidelines for the adoption of AI in the public sector in the EU.

The public sector deserves special attention in this regard, as it differs from the private sector in a number of ways and features. First of all, the public sector mandate is the protection and sound management of citizens and public good, and it is administered by the rule of law. Based on these two fundamental principles, public sector administrations differ from private organisations in a number of characteristics underpinning their values, determining their objectives, instruments, roles and relationships with other actors. It is therefore likely that the conditions of adoption and use of AI technology in the public sector, cannot be modelled simply around those of private enterprises, and this in terms of aims, needs, operations, instruments and processes.

Existing empirical research from a variety of disciplines investigating the adoption of AI in the public sector highlights a number of key potential benefits, including: the increase of internal efficiency, improving public administration decision-making, and improving citizen/government interactions.

However, as with all emerging technologies, AI embodies a dual dimension, by providing potentially significant benefits and opportunities, while putting forward high impact and a number of potential risks and unwanted consequences associated with its use. As such, despite the many potential benefits, public administrations often shy away from AI due to such potential risks associated with its deployment, including: algorithmic bias and opacity; job loss; privacy infringement; societal fragmentation; and damage to the natural environment.

In addition to the necessary efforts to mitigate such risks, there are also a number of barriers to be addressed to foster the adoption of AI in the public sector, including: inadequate data management; insufficient access to large volumes of high-quality data; unsatisfactory sharing of data across organisational boundaries; underdeveloped data governance; conflicting organisational culture; lack of skills and expertise; increasing global competition; scattered laws and regulations; lack of trust; and insufficiently known impacts.

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1 https://www.consilium.europa.eu/media/45910/021020-euco-final-conclusions.pdf
2 https://digital-strategy.ec.europa.eu/en/library/coordinated-plan-artificial-intelligence-2021-review

EU policy initiatives in relation to AI adoption in the public sector have been numerous, kick-started in 2018 with the Commission's Communication "Artificial Intelligence for Europe" (COM/2018/237), and leading to the most recent Proposal for a Regulation of the European Parliament and of the Council Laying Down Harmonised Rules on Artificial Intelligence (AI Act) (COM/2021/206 final) in 2021.[3] Moreover, the Digital Europe Programme[4] recently approved, as well as the EU Recovery and Resilience Facility (RRF)[5] programme, include funding opportunities for AI in the public sector.

At the national level, an analysis of AI strategies throughout Europe shows that prevailing approaches to AI in the public sector relate to policy themes and actions around the following key issues:

— raising awareness on the benefits of AI;

— improving data management, building internal capacity, learning by doing;

— fostering the underpinning conditions to nourish a dynamic ecosystem;

— promoting dedicated programmes and funding at all operational levels;

— developing dedicated procurement guidelines and applying ethical and legal AI frameworks;

— identifying impact assessment models, indicators, influencing factors and framework conditions in support to a favourable environment to AI adoption by the public sector.

The analysis of national strategies on AI also reveals **three generic approaches**, depending on the breadth and depth of the policy actions described, namely:

— Artificial Intelligence for Government (AI4GOV) front-runners;

— the private sector leadership;

— the data-focussed approach.

Areas of Intervention and Recommendations

In order to develop fair, non-discriminatory, transparent and trustworthy AI-enabled public services, a focus should be put on its use, rather than on the specific technology and its components.

Based on the analysis of the state-of-the-art of policy and research, and drawing on feedback from Member States through an EU-wide online survey and two peer-Learning workshops, this handbook presents 16 recommendations for the adoption of AI in the public sector, classified in **four Areas of Intervention**:

Intervention Area 1: Promote an EU value-oriented, inclusive, human-centric and trustworthy AI in the public sector

— Recommendation 1.1: Harmonise and complement EU regulations to promote human-centric and trustworthy AI-enabled public services for all citizens.

— Recommendation 1.2: Promote the adoption of ethical principles, the development of guidelines, and the identification of mitigating measures to minimize the risks of deployment of AI by the public sector.

— Recommendation 1.3: Develop and promote dedicated AI-enabled solutions based on co-creation approaches to increase citizens' and businesses' relevance trust and confidence in the use of AI by the public sector.

Intervention Area 2: Enhance coordinated governance, convergence of regulations and capacity building.

— Recommendation 2.1: Create an EU-wide network of governance bodies for a streamlined management of AI in the public sector.

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[3] European Commission (2021). Proposal for a Regulation laying down harmonised rules on artificial intelligence (Artificial Intelligence Act). https://digital-strategy.ec.europa.eu/en/library/proposal-regulation-european-approach-artificial-intelligence

[4] https://eur-lex.europa.eu/eli/reg/2021/694/oj

[5] https://ec.europa.eu/info/business-economy-euro/recovery-coronavirus/recovery-and-resilience-facility_en. 20% of the EUR 672.5 billion of the Recovery and Resilience Facility (RRF) funding for "digital target" to build data, cloud, computing infrastructures, and networks (e.g., 5G) to further research excellence, to support innovation, testing and experimentation.

— Recommendation 2.2: Design national and European capacity-building programmes for public sector innovators aiming to develop and/or adopt AI in support of the digital transformation of public services.

— Recommendation 2.3: Build upon and promote the use of regulatory sandboxes for public administrations, allowing experimentation of AI-enabled solutions in controlled environments.

— Recommendation 2.4: Optimise funding in support of AI in the public sector to promote the spreading and scaling of reusable solutions.

— Recommendation 2.5: Promote the development of multilingual guidelines, criteria and tools for public procurement of AI solutions in the public sector throughout Europe.

Intervention Area 3: Build a shared and interactive AI digital ecosystem.

— Recommendation 3.1: Support multidisciplinary research and knowledge creation amongst European universities and Research and Development (R&D) institutions around AI for the public sector.

— Recommendation 3.2: Build a common European Data Space for public sector bodies and their operators, drawing from the compilation of relevant AI datasets and related Registries throughout Europe.

— Recommendation 3.3: Reinforce and advance existing initiatives on open data and interoperability.

— Recommendation 3.4: Share reusable and interoperable AI components at all operational levels of European public administrations.

— Recommendation 3.5: Create a European marketplace for GovTech solutions in support of public sector digital transformation.

Intervention Area 4: Apply and monitor sustainability through value-oriented AI impact assessment co-created frameworks.

— Recommendation 4.1: Set up an EU observatory on AI, built on a pan-European network of AI national observatories, to gather, share, and collectively manage best practices and experiences learned from different stakeholders in the public sector throughout Europe.

— Recommendation 4.2: Develop and apply umbrella impact assessment frameworks based on key influencing factors to measure the use and impact of AI in the public sector.

— Recommendation 4.3: Promote AI in the public sector in support of sustainability while developing sustainable AI, in compliance with environmental principles, and leveraging on civic engagement and participation.

Annexes:

In its annexes, the handbook provides a mapping of the different Recommendations articulated into Actions and their **competence at the operational level by the different stakeholders** operating in this domain. The mapping of recommendations versus stakeholders are summarised in a self-explanatory table articulated around the selected areas of interventions and different operational levels.

This is with a view to help the different actors to gain an overall view of the **operational coverage of the recommendations** and related possibility of manoeuvre, while helping them to identify what can be done with respect to each Area of Intervention, with whom and at what level (political, operational, scientific and international vs local level).

The mapping of actors' competence versus operational levels is accompanied by an additional annex **charting the recommendations** presented in this handbook towards relevant **supporting sources**. This is to document and substantiate the underlining research and reasons for the selection and formulation of these recommendations and proposed actions.

Additionally, the handbook benefits from an **outline of the National Strategies on AI for the Public Sector** which is summarised in another table, helping the reader to skim through the different national approaches to AI deployed in the public sector in Europe.

Finally, an **extract of findings from the survey** on the *Use and Impact of AI in the public sector* carried out in the initial phase of this phenomenon **underpinning some of the recommendations** is provided in the last annex.

Conclusions and next steps

The recommendations and related actions provided by this handbook highlight **specific requirements** to be put in place swiftly, and common issues to be addressed at early stages of design and development of AI-based solutions by the public sector in Europe.

Times are ripe for the public sector to engage with AI with the aim to develop a **value-based approach** to this emerging technology, and favour Europe's sovereignty in this important sector while leading by example.

It is time to develop an EU umbrella narrative with a shared vision and approaches around common values and digital principles, while addressing issues like interoperability and standards, sustainability, ethics, and trustworthiness necessary to **host a favourable AI ecosystem dedicated to public sector** specific needs.

There is a need to provide a shared, **concrete and actionable approach** based on replication of good practices, and leadership of governance, where each actor operating in the ecosystem provides added value, carries a clear role, and identifiable responsibilities.

This handbook represents just the beginning of such a journey towards a **shared vision and common values** with the ultimate aim to foster a safe, lawful, trustworthy and sustainable adoption of AI by the European public sector.

To be helpful, the handbook needs to be kept up to date and, to this end we count on the **continuous mutual support and consolidated collaboration** between the services of the European Commission, relevant international organisations, and stakeholders from all European countries representing the institutional, scientific, economic, operational bodies, and communities of practices in this area throughout Europe.

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1   Introduction

The European Union aims to become a strategic leader in high-impact sectors where Artificial Intelligence (AI) can boost the European socio-economic ecosystem and help to improve the living conditions of European citizens.

In the recently updated **AI Coordinated Plan**, the European Commission (EC), European Union (EU) Member States and Associated Countries have committed to new actions to create EU global leadership on trustworthy AI. These include accelerating investments in AI technologies, facilitating the uptake of new digital solutions, fully implementing AI strategies, and aligning AI policy to remove fragmentation. In the new Coordinated Plan, the public sector is expected to become a trailblazer for using AI.

Existing studies highlight the difficulties public administrations are facing in adopting and using innovative technologies. In many instances, **the potential of AI is overlooked, or its risks are magnified**, and government is often only regarded as a regulator or a facilitator of AI take-up often only in the private sector (Misuraca & van Noordt, 2020).

While technological developments in the field of AI rapidly improve, a large gap remains between the development in the private sector and that in the public sector, and, even more, between development and its uptake and use by the public sector at different operational levels.

The ambition of this handbook is to support the EU public sector on its way towards wider implementation and use of AI-based systems and solutions in government. In doing so, the handbook proposes a set of **policy recommendations based on the analysis of the state of play of AI use in Europe and worldwide**.

The underlying work was carried out in the context of the **AI Watch** initiative, jointly handled by the JRC and DG CONNECT of the European Commission.

With this in mind, the document aims to update and complement the provisions included in the *Coordinated Plan on AI*, and the resulting national AI strategies dedicated to the public sector as formulated by the EU Member States and Associated Countries, with a particular focus on digital transformation.

The handbook is in line with the principles of the **Tallinn Ministerial Declaration** *on eGovernment*,[6] the **Berlin Declaration**[7] *on Digital Society and Value-based Digital Government*[8] that was signed by EU Member States to acknowledge the importance of creating value-oriented, human-centric AI systems for use by the public sector, and the **Lisbon Declaration**,[9] aiming to strengthen the human dimension in the digital eco-system and representing a kick-start of a Charter on Digital Rights.

While the *Coordinated Plan* seeks to grant Europe's public sector access to adequate funding, upskilling and empowerment of its workforce to conduct strategic and sustainable purchasing and adoption of AI-based systems, the European Commission plans to launch the **Adopt AI programme** aimed at improving AI adoption by the public sector by financing its procurement, and the designing of a public procurement data space to analyse public procurement data.

In addition, the European Commission's **Artificial Intelligence Act**[10] (currently under discussion) proposes harmonised rules on AI, and aims to increase the trust of European citizens in AI by following a risk-based approach. As an example particularly suited to the application of AI in the public sector, within the proposed classification, a few forms of AI bearing unacceptable risks for citizens are deemed to be banned (e.g. systems that allow social scoring). As a consequence, AI systems classified under this category, such as those used in essential public services like law enforcement, justice and democratic processes, will be subject to stricter requirements and obligations in order to minimize potential harm and/or unwanted consequences.

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[6]   https://digital-strategy.ec.europa.eu/en/news/ministerial-declaration-egovernment-tallinn-declaration
[7]   https://digital-strategy.ec.europa.eu/en/news/berlin-declaration-digital-society-and-value-based-digital-government
[8]   https://data.europa.eu/en/news/berlin-declaration-digital-society-and-value-based-digital-government
[9]   https://www.2021portugal.eu/en/news/lisbon-declaration-on-digital-rights-is-the-kick-start-for-an-international-charter/
[10] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0206

As a result, the recommendations and related actions included in this handbook are formulated in compliance with the EU values and digital principles expressed in the above policies and are intended to provide a **multi-level and multidimensional actionable plan to support the adoption and deployment of AI by the public sector, as a safe and lawful driver to achieve common good and well-being in society.**

1.1 Objectives of this handbook

The purpose of this handbook is to provide the reader with a better understanding of the main features, needs and opportunities of AI in the public sector, and to deliver a set of possible actions to be carried out at the European, national and local levels, in prioritised areas of intervention to support the joint commitment by the European Commission, the Member States and Associated Countries outlined in the *Reviewed Coordinated Plan on Artificial Intelligence 2021* (updating the agreements undertaken between the Commission and Member States established during the 2018 Coordinated Plan[11]).

Despite the many efforts at all levels, there is still a gap between the intentions to deploy AI in support of public sector administrations and its concrete implementation and use in their operation and service delivery. In actual fact, there are several Europe-wide policy initiatives in support of the preconditions for materialising a wider deployment of AI, yet they are difficult to undertake for individual countries.

In support of existing initiatives and with the view to offer practical guidance to all European countries in their journey along the *Road to the adoption and use of Artificial Intelligence by the public sector* set forth through this handbook, the Joint Research Centre (JRC) of the European Commission together with the Directorate General (DG) CONNECT have undertaken a number of actions over the last couple of years aiming to:

— provide an updated state of the art with an overview of different approaches applied by the European Commission, the EU Member States and Associated Countries, through the AI Coordinated Plan, in support of AI adoption and use in and by the public sector in Europe;

— outline priorities, needs and opportunities, identified by the countries themselves, and through research, while mapping them towards supporting EU policies and guidelines;

— outline a dedicated framework of actions in support of AI adoption for the public sector, underpinned by a set of recommendations addressed to key stakeholders (policymakers, practitioners, third sector organisations, Communities of Practices and scientific communities).

Building on this basis, this handbook presents the first endeavour at the European level to outline a possible path and an **actionable plan to concretely address a prioritised set of interventions** by governments, policymakers, public administrators and practitioners, at all operational levels (EU/international, national, regional and possibly local level), including a list of EU policies, initiatives and guidelines in support of their efforts.

1.2 Content and methodology

The work that is presented here started with a European-wide landscaping exercise in the context of the ***AI Watch initiative***, aiming at identifying national strategies addressing the adoption of AI specifically by the public sector (Misuraca & van Noordt, 2020). The initial exercise, was complemented and duly updated with further research, and the collection and analysis of case studies across Europe throughout 2021, which not only allowed the identification of the main features, needs, opportunities and trends, but also to identify the different approaches by European countries, and to prioritise areas of interventions.

The preliminary results from the analysis of the collection of features, needs, opportunities, national strategies and related areas of interventions were presented, discussed, validated and further reflected into this handbook. This took place in full concert with representatives of European governments and public administrations, scientific and technical experts of the area, representatives of relevant stakeholder communities (civil society, Communities of Practices, and interest groups), and from different European institutions, all actively participating in **peer-learning workshops** jointly organised by JRC and DG CONNECT of the European Commission throughout 2020 and 2021 (van Noordt et al., 2020; van Noordt & Pignatelli 2020, van Noordt et al, 2021, Medaglia et al. 2021).

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[11] https://knowledge4policy.ec.europa.eu/publication/coordinated-plan-artificial-intelligence-com2018-795-final_en

The **Areas of Intervention** and **recommendations** presented in this document reflect the results of the analysis and the comments received, with the purpose to collectively identify priorities for continued coordination and joint actions by European governments and the European Commission, paving the way to a lawful, safe and effective AI deployment in the European public sector.

The recommendations are based also on the outcomes from a two-round survey addressed to practitioners of public administrations at central, regional and local levels that was carried out over the last couple of years.

The **survey** aimed to:

— compile a representative collection of cases of AI-enabled solutions used by public sector administrations and complement the national strategies (existing and/or planned), where possible;

— analyse the drivers, obstacles, opportunities and influencing factors of AI adoption and use by European public sector administrations;

— identify the perceived impacts of AI-enabled solutions on the different beneficiaries/users of services provided by public sector administrations.

The survey covered the following dimensions:

— the purpose of AI-enabled solutions (e.g., policymaking, enforcement, regulation monitoring, service provision and engagement, internal management (HR, procurement, ICT systems, adjudication, etc.), areas of application (health, defence, education, environment, social protection, taxes, etc.));

— the degree of automation (decision-making advice, permission, veto, etc.);

— the stage of adoption (design, development and deployment);

— factors influencing adoption (operational and legal conditions, human resources, financial resources, IT resources);

— perceived risks (ethics, privacy, trust, bias, costs, jobs loss, resistance to change, etc.);

— perceived impacts on operational efficiency, services outreach, openness, and inclusiveness;

— the likelihood of permanently implementing AI solutions.

Findings from the survey are presented in **Annex 4**.

The resulting handbook therefore provides:

— a distilled outline of the approaches and practices by European governments to AI for the public sector, including the current state of play in its use and definition (as it is understood by users);

— the perceived benefits, encountered barriers and risks associated with its adoption and use;

— a set of prioritised interventions, supported by a number of actions addressing the different stakeholder communities at different operational levels.

1.3 Definition of Artificial Intelligence

The purpose of this handbook is not to regulate specific aspects of AI, but rather to provide hands-on guidance to stakeholders and foster its development and use by the public sector at different levels. While there are multiple definitions of AI (Samoili et al., 2020), for the purpose of this handbook we draw on the recent definition provided in the AI Act:[12]

"Artificial intelligence system' (AI system) means software that is developed with one or more of the techniques and approaches listed in Annex I[13] and can, for a given set of human-defined objectives, generate outputs such as content, predictions, recommendations, or decisions influencing the environments they interact with."

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[12] European Commission (2021). Proposal for a Regulation laying down harmonised rules on artificial intelligence (Artificial Intelligence Act). https://digital-strategy.ec.europa.eu/en/library/proposal-regulation-european-approach-artificial-intelligence

[13] Annex I of the AI Act recites: (a) Machine learning approaches, including supervised, unsupervised and reinforcement learning, using a wide variety of methods including deep learning; (b) Logic- and knowledge-based approaches, including knowledge representation, inductive (logic) programming, knowledge bases, inference and deductive engines, (symbolic) reasoning and expert systems; (c) Statistical approaches, Bayesian estimation, search and optimization methods.

1.4 The unique role of the public sector

In this context, it needs to be noted that public sector administrations[14] are unique actors operating within highly diversified and **complex political, cultural and socio-economic ecosystems**. Public administrations differ from private sector organisations in a number of fundamental characteristics underpinning their values, determining their objectives, instruments, roles and relationships with other actors. It is therefore likely that the adoption and implementation of AI technology, its use and purpose in the public sector, cannot simply be modelled around those of private enterprises.

The public sector, in fact, is driven by the *rule of law*. It aims at achieving the **public good** for its diverse communities, its mandate being the protection of citizens and promotion of well-being at large.

In both roles of **user and producer of AI-based solutions**, the public sector's choices are determined by specific policies and it operates within and in compliance with the given legal mandates provided by the *rule of law* (e.g. understanding scrutiny and accountabilities, apply equity, transparency, consistency in decisions and redress whenever needed)..

The legal and administrative nature of the public sector also makes it radically different from the private sector when it comes to technology adoption. For example, the focus of public services on vulnerable groups that count nowadays for more than one third of the EU population (more than 150 million citizens), indicates that the public sector's use of technology addresses the most critical segments of society, creating value rather than profit.

For the delivery of its services, public administrations **strongly rely on collaboration** with many diversified actors (e.g., intermediaries, NGOs and the civil society), operating at different levels (international, national, regional and local level), all belonging to a complex ecosystem and calling upon intertwined dynamics in a complementary fashion. This calls upon specific organisational and collaborative strategies based on a multichannel delivery of services determined by diversified alliances, therefore requiring dedicated AI solutions to address complex needs and different objectives in multidimensional environments.

More importantly, governments do not just provide services, they also regulate the activity of citizens and the use of public power and coercive force (e.g., taxation, licensing, law enforcement, forms of detention, etc.). It is in the exercise of functions like these, directly affecting people's legal status, rights and interests, that administrative decision-making principles raise particular issues that are unique to the public sector. This means that the exercise of such power needs to be controlled through **public administrative law**.[15]

Public agencies and their administrators may exercise only those functions that have been granted to them through legislation. **The ultimate aim of administrative law is good government according to law**.[16]

While the administrative law developed over many centuries is essentially *principles-based*, it is nevertheless interlinked with the evolution of key socio-economic phenomena like the industrial and technological revolutions. In this context, while technological change would not impact fundamental administrative law principles, new technologies play an important role in the interpretation and application of such principles into practice, thereby affecting and controlling the adoption and use of machine technology by government decision-makers.

Conversely, any use of machine technology by government must therefore be considered from an administrative law perspective, including ethical and human rights perspectives. This is especially true when talking about AI.

Besides providing services, governments also regulate most of socio-economic activities of citizens, and can apply and enforce rules, for instance through taxation and law enforcement. Consequently, the exercise of such powers requires that the public sector **conform to administrative law, and to ethical and human rights principles** (Leslie et al., 2021).

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[14] Public administration comprises all organisations of the executive power at central, regional, and local level involved in the design, regulation or enforcement of public policies. It is governed by special rules for recruitment, functioning and accountability https://ec.europa.eu/info/supporting-public-administrations-eu-member-states-deliver-reforms-and-prepare-future_en

[15] https://www.britannica.com/topic/administrative-law

[16] https://www.ombo.nsw.gov.au/news-and-publications/publications/reports/state-and-local-government/the-new-machinery-of-government-using-machine-technology-in-administrative-decision-making

It is for the above reasons, which are specific to the public sector, that the dual nature of AI in bringing forth benefits and opportunities together with potentially high impact and risks, needs to be taken into consideration very carefully when it comes to its use. A focus must be put on the proportionality between benefits and risks while taking **ethics** into full account. In this context, ethics should be seen **as a *resource*** to be used to uncover and understand both the ethical values to be respected and the potential risks associated with AI-based technologies and systems.

As highlighted also during the discussions at the *High-level Forum on: the EU vision for Trustworthy AI in the World* event held in Dubai on 15 and 16 March 2022[17] on the occasion of the EXPO 2020, **ethics in AI is a dynamic concept** that changes and evolves according to the use of AI within very different and fast changing socio-technical-economic environments, at different operational levels, and at different life-cycles (from design to use). For this reason, regulation through checklists of technologies and systems is not enough, and would need to be complemented with assessment tools and models taking into account both, technologies and the different framework conditions for their specific use in given environments (administrative organisation, specific laws and regulations, etc.), allowing in this way for the replication of good practices, as well as contextualisation of shared methodologies and guidelines.

1.5 Emerging uses of AI for and by the public sector

Public administrations play a crucial role in ensuring that the application of new technologies, such as AI, creates public value, in leading by example (by using ethical AI, and pulling innovation to the market through its purchasing power, which is a considerable share of the European GDP.[18]

AI-enabled public services aim to support a range of context-specific **public values**, which can be drawn into three main categories:

— **operational public value** (including collaboration, effectiveness, efficiency, user-orientation);

— **political public value** (including accountability, economic development, equity in accessibility, openness, citizen participation, transparency);

— **social public value** (including inclusiveness, quality of life, self-development, environmental sustainability, trust) (Barker et al., 2021).

Emerging examples of the use of AI show that public sector organisations can benefit greatly from its deployment by:

— **enhancing decision-making processes and outcomes** in policymaking (e.g., by detecting social problems faster than using traditional techniques, by using AI to monitor the implementation of policy or to enhance citizen participation);

— **improving the delivery of public services and citizen/government interaction**, by providing more efficient and effective, or altogether new, citizens' services, increasing trust and participation by citizens in public sector activities;

— **optimising internal management,** for example, by better allocating human and financial resources or improving the security of public administrations.

In particular for the area policy/decision-making that is a critical dimension for the public sector, AI can help to:

— **bringing together data from different domains** to see the impacts of decisions in an integrated manner and to understand the impacts of past decisions;

— **collect, analyse and monitor data of daily uses and processes** for efficiency gains (e.g., energy consumption of public buildings or traffic flow data);

— **create future scenarios for simulation in support of decision-making**. This is particularly relevant for instance, in integrated urban sustainable planning.[19]

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[17] https://excellenceandtrust.intouchai.eu/
[18] https://www.oecd-ilibrary.org/docserver/gov_glance-2017-59-en.pdf?expires=1640020784&id=id&accname=oid031827&checksum=EDB4930B3CF6C114C855C2FF2F12DE73
[19] https://smart-cities-marketplace.ec.europa.eu/media/2521

The take-up of **AI at the local level** is increasing, for example in Smart Cities, due to large amounts of data generated through sensors, the Internet of Things (IoT), citizens, etc. For example, many cities are setting up their AI-enabled local digital twins, in support of Green Deal objectives, focusing on a single domain (e.g., the LEAD project on urban logistics[20]). Some cities and regions are piloting cross-domain applications (e.g., the DUET project in the city of Pilsen, Czechia[21]) and cross-regional cooperation (e.g., the FinEst Twins project[22] will develop the Digital Twins of Helsinki and Tallinn as a joint effort). Most recently, Luxembourg and the Netherlands have begun work on their national digital twins, each exploring how to best address data sharing between their local/regional and thematic digital twins. They are planning to develop components on their own to be able to accomplish their national objectives. Several cities are building their digital twins linked to their High Performance Computing (HPC) centre (e.g., Herrenberg, Bologna, Barcelona and the DUET project).

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[20] https://www.leadproject.eu/
[21] https://www.digitalurbantwins.com/pilsen-twin
[22] http://www.finesttwins.eu/en

2   State of play

The following sections draw on the state of the art of the scientific literature from the fields of public administration, digital government, general management and Information Systems (IS), to map the potential benefits of AI adoption in the public sector, its risks and barriers to its adoption and use.

The section on potential benefits of AI in the public sector (2.1.1) is presented at a higher level of generality, because details and examples of benefits will be further developed as part of the recommendations that this handbook provides (Section 3). The sections on risks and barriers (2.1.2, 2.1.3), conversely, are presented with a higher level of granularity.

2.1   State of Play

Benefits, risks, and barriers of AI in the public sector

The following sections draw on the state of the art of the scientific literature from the fields of public administration, digital government, general management and Information Systems (IS), to map the potential benefits of AI adoption in the public sector, its risks and barriers to its adoption and use.

The section on potential benefits of AI in the public sector (2.1.1) is presented at a higher level of generality, because details and examples of benefits will be further developed as part of the recommendations that this handbook provides (Section 3). The sections on risks and barriers (2.1.2, 2.1.3), conversely, are presented with a higher level of granularity. Section 4

2.1.1   Potential benefits of AI in the public sector

The **capabilities** of AI in the public sector are featured in each of the four steps in which AI can be implemented:

— **information processing** (i.e., collecting and interpreting inputs in the form of data);

— **perception of the environment;**

— **decision-making** (i.e., taking actions with a certain level of autonomy);

— **achievement** of specific goals (Samoili et al., 2020).

Opportunities coming from the use of AI in the public sector can be mostly identified in three areas:

— **Improving the internal efficiency of public administration;**

— **Improving public administration decision-making;**

— **Improving citizen/government interaction,** including the provision of better and more inclusive services, and the enhancement of citizen participation in the activities of the public sector (Medaglia et al., 2021).

Improving internal efficiency. Regarding implications on the inner workings of government, AI applications have the capabilities to work in specified tasks (such as speech recognition, machine translation or visual form completion checking) (Tolan et al., 2021) and consequently free up precious cognitive resources of public workers, which can then be allocated to tasks of higher added value. This reallocation allows government to focus scarce resources on tasks in which human workers perform better than machines, such as problem-solving activities that require empathy, creativity and innovation. The capability of AI technologies to relieve public workers from mundane tasks and to augment their skills by complementing them can then translate into budgetary savings (Eggers et al., 2017).

Improving public administration decision-making. Algorithms are, in essence, a series of steps to process information. As such, they are embedded logics that can support decisions where the input data are a representation of the reality of the phenomenon to be tackled, and the output is a course of action to tackle the phenomenon, for example, by (i) understanding the impacts of past decisions; (ii) collecting, analysing and monitoring data of daily uses and processes for efficiency gains (e.g., energy consumption of public buildings or traffic flow data; and (iii) creating future scenarios. AI-powered algorithms thus carry the potential to improve public decision-making in any policy field where the output is not fully determined by the application of legal rules on input data, and staff finds it too difficult or time-consuming to externalise implicit knowledge

applied. However, risks of harm may be higher than benefits when AI is applied to areas like social welfare (Alston, 2019) or law enforcement (Miron et al., 2021).

A natural potential benefit of applying AI techniques (such as machine learning) to public administration decision-making resides in the number of variables that AI algorithms can consider, and in the granularity and accuracy of the actions that can be recommended by an AI system. An example would be fraud detection systems that process data on financial activities to learn patterns associated with, for example, tax evasion. Other examples include immigration policies or environmental policies, where AI systems can model and forecast the consequences of specific policy actions based on input data such as immigration trends over time, workforce occupation, etc., or environment indicators, such as greenhouse gas emissions or energy consumption over time.

Although this is more a double-edged sword, for the sake of completeness, we cautiously mention potential benefits that may reside in a perceived **impartiality** that decisions delegated to AI-powered algorithms can potentially provide. On the one hand, AI may be perceived as not having the same biases as humans do. The Weberian principle of impartiality and professionalism that is at the core of modern public administration is, in reality, an ideal that is seldom, if ever, realised. Public administrations are, in fact, organisations made of humans that respond to incentives, and such incentives are not always aligned with the principles of impartiality that demand equal treatment of citizens under equal conditions, in the provision of services. Street-level bureaucrats in public administrations relish levels of discretion that open their decisions up to be influenced by different factors, for instance through corruption (Bertot et al., 2010; Nam, 2018), organisational politics, and personal biases of any type, e.g., gender, race, socio-economic status (Oschinsky et al., 2021).

Delegating whole or parts of decision-making of such bureaucrats to AI-enabled solutions has the potential to reduce such biased human influences. However, AI-based systems can inherit human biases through the data they are trained on, or the systems in which they are embedded. In fact, AI-based systems can have their own AI-specific biases, which can be harmful especially to groups in a society at risk of marginalisation (Tolan, 2019).

In sensitive areas where fundamental human rights may be at stake, such a delegation from human to AI-enabled solutions would have to come with necessary precautions, rules and regulations,[23] in order to avoid a potentially deeper systematisation and perpetuation of existing biases.

Improving policy delivery, public services and citizen-government interaction. AI has the potential to improve citizen/government interaction in two ways: by providing better (and altogether new) interfaces to the citizen; and by increasing trust through higher participation by citizens in public sector activities and decision-making processes.

In this respect, AI can enhance existing service interfaces through applications that are more usable, and thus decrease barriers to use. AI techniques such as speech and image recognition allow the design of digital interfaces that are easier to use. Voice assistants, for instance, can replace text interfaces of public administration websites (Reis et al., 2019), allowing not only easier usage by existing citizen users, but also access to citizens that would not be otherwise able to interact, such as citizens with visual impairments, or senior citizens with less digital literacy. As a result, digital divide issues can also be mitigated by such AI applications.

New services can also be created through the application of AI. For example, pooled data on public transportation from diverse sources (e.g., historical and real-time traffic data) can be processed through machine learning to support passenger applications that can predict demand and ensure that services are available to beneficiaries at the right time (Abduljabbar, 2019).

Even if AI-based solutions are not impartial, they may be perceived as such. AI can potentially **increase citizens' trust** in public sector activities. For instance, workers becoming more aware of their ethical values in decision-making, when they are using algorithmic support. That is a case where a machine functions as a nudging device for humans to consciously think about the value implications of decisions, or when to apply decisions that are perceived as more equitable, fair and legitimate, and where increased trust can be the result (Ranerup & Henriksen, 2020).

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[23] European Commission (2020) White Paper on Artificial Intelligence – A European approach to excellence and trust: https://ec.europa.eu/info/publications/white-paper-artificial-intelligence-european-approach-excellence-and-trust_de

AI also has the potential to improve **citizen participation** in public administration activities. Initiatives of citizen participation are often encumbered by very high coordination costs of collecting input from citizens and of moderating deliberative interactions within large audiences on complex policy issues. AI applications can reduce such costs, for example through the implementation of chatbots as interfaces to collect citizens' opinions (Androutsopoulou et al., 2019). AI can also facilitate deliberative interaction that is required for citizen participation (Savaget et al., 2019). For example, AI-powered simulations can model policies and their effects, and these simulations can be used to support discussions among citizens on which effect different policy proposals would have once implemented.

2.1.2 Potential risks of AI in the public sector

Benefits cannot be assumed to follow as a matter of course. There are a number of sources of errors arising from using machine technology that may result in inaccurate outcomes. It will most likely also result in inaccuracies at a much greater scale with much higher impact than would otherwise occur.

It is therefore important to be realistic about what benefits (and risks) a particular technology will deliver in a given context, and not allow automation strategies to be driven by untested assumptions or utopian beliefs about technology potential, as the impact of the latter goes in both directions.

In fact, together with benefits and opportunities, as with all disruptive technologies, there are potential risks also in relation to AI deployed in the public sector. These risks have the potential to infringe one or several core EU rights, including the "right to human dignity, respect for private and family life, protection of personal data, freedom of expression and information, freedom of assembly and of association, and non-discrimination, consumer protection, workers' rights, rights of persons with disabilities, right to an effective remedy and to a fair trial, right of defence and the presumption of innocence, right to good administration".[24] Below are some explanations with a few non-exhaustive examples (Waller, M. & Waller, P. 2020):[25]

Algorithmic bias. Governments increasingly experiment with AI-based algorithms to improve efficiency through large-scale customisation of public services – a type of task that draws on citizen profiling (Janssen & Kuk, 2016). Examples of such applications include public hospitals using machine learning algorithms to predict virus outbreaks (Mitchell et al., 2016); analytics tools to predict hotspots of crime (Goldsmith & Crawford, 2014; Mejer and Wessels, 2019) and high-risk youth (Chandler et al., 2011); and AI systems used to target health inspections in restaurant businesses (Kang et al., 2013).

While the ability of AI applications to recognise patterns can be beneficial to segment populations, for example, regarding welfare service provision or addressing anti-social behaviour, it can also amplify discriminatory biases that are already present in human-led assessments. Predictive algorithms, in fact, can favour groups that are better represented in the training data of algorithms (Barocas & Selbst, 2016). In fact, as algorithms are increasingly implemented in hybrid socio-technical systems, they also increasingly play a role in the propagation of existing social biases across gender, race, sexuality and ethnicity. Algorithms could thus participate in and potentially obfuscate systematic and unfair treatment of citizens based on social biases (Selbst et al., 2019) – an outcome which is in direct conflict with the mission of governments in the unbiased treatment of citizens under the rule of law. For example, AI may affect individuals differently according to the communities they belong to (Taylor et al., 2016).[26] Solving these issues requires more than a technical fix. In fact, it requires contextualisation, to take into account the entire socio-technical system in which the algorithm is integrated (Selbst et al., 2019).

Algorithm opacity and complexity. The increasing complexity of AI systems, especially deep learning solutions with more and more layers and parameters, reduces the capability of human operators to trace outputs back to specific inputs (Janssen et al., 2020), making it potentially impossible to clearly account for specific AI-driven outcomes, and to correct actions with unintended consequences. The wider consequences of this phenomenon have been referred to as creating a "black box society" (Pasquale, 2015), and have profound implications for governments which, by definition, are bound to citizens' expectations of transparency, "explainability" and accountability (Asatiani et al., 2020). On the other hand, AI systems can remove public

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24   European Commission (2021) Proposal for a Regulation of the European Parliament and of the Council Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) and Amending Certain Union Legislative Acts. COM/2021/206 final.
25   *Why Predictive Algorithms are So Risky for Public Sector Bodies.* http://dx.doi.org/10.2139/ssrn.3716166
26   E.g., the work on group privacy and surveillance by Taylor and Van der Sloot https://link.springer.com/book/10.1007/978-3-319-46608-8

servants from the duty of accountability, exacerbating the phenomenon where citizens are faced with impotence when confronted with "the computer says no" responses (Wihlborg et al., 2016).

The opacity of mechanisms in AI-supported decisions poses challenges not only in the ethical responsibility and legal liability dimensions (e.g., who is responsible for a damage to a citizen stakeholder if the decision has been outsourced to an AI application?), but also to the wider fundamental issue of political accountability of public governance. Moreover, harmful decision outputs cannot be corrected if no one is able to pinpoint how the outputs are linked to the inputs.

Job loss. The other facet of introducing administrative efficiencies in public organisations through automating tasks is that, in the short term, some categories of jobs in the public administration are destined to disappear. The overall impact of AI on job loss is still disputed (Tolan et al., 2021). Although AI technologies are increasingly regarded as potentially, both labour-saving and labour-augmenting (Korinek & Stiglitz, 2018; Acemoglu & Restrepo, 2018), there is a substantial likelihood that they might be relevantly labour-saving in the short term (Mehr, 2017). This is at least until initiatives of job reallocation and re-training of the public sector workforce are put in place to mitigate such risks (Valle-Cruz et al., 2019).

Privacy infringement. The right to control ones' own data that is private, is potentially infringed by the roll out of AI-enabled solutions in the public sector in at least two ways. First, the sheer harvesting of high volumes of personal data that is needed to fuel AI solutions entails the risk of infringing the privacy of citizen users. Any AI algorithm, regardless of its area of application, can produce relevant outputs only if trained with an appropriate amount of data. Such data might be personal, sensitive or inappropriately collected or managed. This risk applies, for example, to traffic management applications, as much as welfare benefit targeting applications. Second, AI applications in the public sector can be explicitly geared towards enhancing surveillance, as in the example of policing applications. In this case, the use of AI in the public sector may entail the risk of massive surveillance and loss of privacy (Agarwal, 2018; Dwivedi et al., 2019).

Societal fragmentation. AI-enabled algorithms have proven tremendously effective at micro-targeting content and at fostering the creation of groups of like-minded actors in the public space, such as social media platforms (Sunstein, 2017). Such groups function as echo-chambers, where citizens are sealed off from the diversity of other political opinions and social representations. This challenge affects the context in which public governance is exercised – that is the sphere of public opinion formation at large and thus, indirectly, the ability of government to both be seen as legitimate by citizens and to formulate policy actions that draw on a perceived common good. The ability of algorithms to provide personalised content by filtering out inputs that do not match pre-existing user preferences (in e.g., news, entertainment, political discourse) is potentially bringing about societal fragmentation, polarisation, and radicalisation, with the creation of digital echo chambers (Medaglia & Zhu, 2017). Governments that fail to mitigate such disaggregating forces enabled by AI systems will potentially lose the capability to be perceived as legitimate and to formulate policy actions that can be met by sufficient public opinion support. For example, the effectiveness of science-based public health initiatives, such as the ones rolled out to combat the COVID-19 pandemic, is weakened when dealing with citizen groups that unknowingly share misinformation in digital echo chambers, where distrust towards institutions is easily exacerbated.

Damage to the natural environment. AI technologies, such as machine learning and deep learning, are computationally very intense. They require large training datasets and draw on large numbers of hyper-parameter experiments to train the intended models. As such, AI requires large amounts of energy, which makes this technology a significant emitter of carbon. For example, the carbon footprint of training a single big language model has been shown to equal around 300,000 kg of carbon dioxide emissions – a rough equivalent of 125 round-trip flights between New York and Beijing (Dhar, 2020; Strubell et al., 2019). Unfortunately, existing practices of development of AI seem to prioritise the accuracy of algorithms over their energy efficiency (Schwartz et al., 2019), and the development of accurate metrics for measuring the environmental impact of AI technologies is still in its infancy (Lacoste et al., 2019; Lannelongue et al., 2021).

Research is underway, whereby such established phenomena are being reshuffled and, in some cases, even reversed from sustainable AI, to AI for sustainability (e.g., with the creation of new jobs and better working conditions, or energy consumption savings from AI-enabled data centres). This could be done by identifying and applying **emerging innovative governance models** that would completely reshape the way public governance is managed, and the ways to deploy AI-based solutions that would counterbalance unavoidable risks and environmental damage.

2.1.3 Potential barriers of AI in the public sector

In reaping the benefits of AI in the public sector, there are several important barriers. These include barriers related to data management, organisational culture, skills and expertise, global competition, laws and regulations, lack of trust, need for standards and dedicated impact assessment frameworks:

Inadequate data management. The majority of AI solutions are data-intensive solutions, with the exception of applications developed based on small data modelling and non-data driven models. The implication of this is that AI applications are usually only as good as the input data. Systems with learning capabilities need to be fed with larger and higher-quality data in order to refine their algorithms and improve the accuracy and the reliability of their outputs (van Noordt & Misuraca, 2020b).

Insufficient access to large volumes of high-quality data. Public administration of smaller countries, as constituencies of small size, do not have access to the volume of data that is needed to train AI algorithms, and thus face difficulties in providing the AI-based services they might need. For instance, AI-powered chatbots are hard to train appropriately in official languages that have few speakers and thus fewer written documents to train the natural language processing algorithms. Similarly, AI applications in the medical area cannot function appropriately if the pool of patient data is of insufficient volume (Sun & Medaglia, 2019).

Unsatisfactory sharing of data across organisational boundaries. The need to share data stems not only from trying to achieve high volumes, but also from the requirement of combining different types of data on key thematic issues as input for AI-enabled solutions. For instance, public mobility applications might need source data from transportation agencies, policing, weather forecast organisations, urban planning agencies, etc.

Many public sector organisations lack an elementary understanding of their data. Barriers to data sharing include **absence of data standards** to control in what format they are stored (Campion et al., 2020), leading to the absence of data integration; the siloed nature of IT systems in the public sector; lack of interoperability due to a lack of technical standards in the AI industry; hardware and software variations creating a fragmented technology ecosystem both across public organisations and between public and private organisations (Kankanhalli et al., 2019); and organisational resistance, emerging when individual organisations willingly oppose sharing data because of the fear of losing a valuable asset in a competitive environment (Sun & Medaglia, 2019).

Underdeveloped data governance. Government agencies do not typically possess appropriately curated data resources (Mehr, 2017). Large volumes of valuable data from diverse sources require complex, negotiated agreements between different stakeholders on how to control which data are collected, how they are collected, in which format they are stored, and who has access to it (Harrison & Luna-Reyes, 2020; Medaglia et al., 2021). The aspects of data governance implied in AI solutions are thus manifold. The most cited barriers in this respect are the governance of personal data which, if inappropriately devised, can result in infringing privacy (Agarwal, 2018; Dwivedi et al., 2019) and data security.

Conflicting organisational culture. As a potentially disruptive technology, the innovation potential of AI can only be realised if accompanied by a transformation of organisational processes and routines, but also norms and strategic vision – in other words, by a transformation of the organisational culture. Lack of leadership support, resistance to organisational change, resistance to knowledge, resource and data sharing, for example, can hinder the successful adoption of AI.

Lack of skills and expertise. AI solutions require not only technical skills to be envisioned, implemented and managed, but also socio-technical skills that combine management capabilities with an understanding of the technology and its potentials (Mergel et al., 2019). Employees often do not possess the necessary AI and data management skills, and public administrations struggle to find and attract talents with the required skills in the market (Mergel, 2019).

AI professionals are relatively scarce in the global market, as the **demand outweighs the supply.** In addition, such professionals tend to prefer engagement in the private sector, given its higher benefits (Wirtz et al., 2020). The higher salaries expected by AI experts is also one of the main variables behind the high cost of adopting AI solutions in the public sector (Bughin et al., 2017).

Increasing global competition. The European approach to AI is often mentioned in the context of the "global AI race", where major players are the United States and China (Craglia et al., 2018). These players compete in investments, research, training, education and on attracting talents in AI. Successful deployment of AI is in fact seen as key to dominate the AI arena (Makridakis, 2017).

The competitive nature that the AI global scenario is taking, as opposed to that of cooperation, represents a relevant barrier in the development of AI-enabled solutions in the public sector in Europe. Lack of global standards for data sharing is one instance. Also, there is growing suspicion surrounding attempts to build digital infrastructures to support the future development of AI-enabled solutions across borders – e.g., the ongoing controversies surrounding Chinese telecom companies winning bids to establish 5G networks in other countries. For example, foreign healthcare applications working with patient data are seen by policymakers as being in conflict with principles of national security that demand sensitive data remain within national borders (Sun & Medaglia, 2019). Moreover, the global nature of competition in AI can be an advantage for large incumbent IT players, and negatively challenge smaller companies, such as EU GovTech, if not properly supported.

Scattered laws and regulations. As with any emerging technology, legal frameworks struggle to catch up with the pace of its evolution and diffusion. As a result, for AI-enabled solutions in the public sector, laws and regulations are in flux, possibly generating uncertainty and barriers to the realisation of AI adoption goals. For example, AI can be developed in-house, originate in the private sector or be the result of hybrid constructions (public-private partnerships or part of pre-procurement activities). Established procurement processes do not explicitly address the risks embedded in the use of AI in the public sector by, for instance, requiring vendors to assess the risk that their products pose to portions of the population (Chowdhury & Sloane, 2020; Moe et al., 2017).

Lack of trust. AI poses a twofold challenge in terms of gaining trust from users (citizens and businesses alike). First, as a general emerging technology, it is still in the diffusion phase. Thus before users acquire familiarity with it, their levels of trust in its potential impacts can be expected to be low (Aoki, 2020). Second, due to its specific characteristics, AI touches on sensitive issues that need to draw on trust to be dealt with. In particular, the shift of agency from human to machine entailed by AI applications is potentially unsettling.

Moreover, the harvesting of data required by AI applications touches upon the issue of the extent to which governments can be trusted with managing **large amounts of sensitive data** (Medaglia et al., 2021). This is further exacerbated by the fact that such applications are frequently developed in partnership with private companies, if not completely outsourced. Lastly, lack of digital literacy in the citizenry also leads to low levels of trust which, in turn, can lead to resistance to use.

Insufficiently known impacts. Societal, organisational and economic impacts of AI development, adoption, implementation and use are largely unexplored. There is an emerging, value-laden vision of AI, and its impact assessment (ex-ante assessments and ex post) is still immature, and should be further developed (Treasury Board of Canada, 2021). Impact is very difficult to assess, especially within the public sector, as it does not adhere exclusively to the standard rules of business, as the private sector tends to do.

Informed analyses need time to produce reliable results based on the collection of data that has been empirically validated; whereas, AI application in the public sector's operational environment is a relatively new practice (van Noordt & Misuraca, 2020a). Consequently, there are very few examples to assess the impact of AI in this area of application, except for some initiatives to measure the economic impact, and hardly any are able to measure the social impact, since most soft and hard issues are closely entangled with the specific ecosystem characterising this sector.

2.1.4   EU policies and initiatives

With respect to the last recommendation by OECD, the Data Governance Act proposed by the European Commission in November 2020 aims at making more quality data available for AI, and calls for the creation of a European Data Innovation Board that would support cross-sectoral standardisation and interoperability of high-quality data. This initiative could also be explored to enhance data availability for the public sector.

It is of the utmost importance that AI-enabled solutions are applied within public sector ecosystems **in full compliance and alignment with European values and the resulting digital principles** recently identified by the Public Consultation[27] exercise launched by the EC in 2021. The results will be fed into a proposal from the Commission for a joint inter-institutional solemn declaration on digital rights and principles of the European Parliament, the Council, and the Commission. These principles will echo and complement existing rights that already protect and empower Europeans online such as the protection of their personal

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[27] https://digital-strategy.ec.europa.eu/en/consultation-results-europeans-express-strong-support-proposed-digital-rights-and-principles

data and privacy, freedom of expression, freedom to set up and conduct a business online or the protection of their intellectual creations.

Efforts to comply with the above values and principles have, for some time, been translated into a number of EU initiatives that have contributed to the shaping of current state of play both, at the international as well as at national levels. Each initiative builds on a number of principles encompassing such a complex area: from the promotion of AI uptake, to the regulation of AI technologies and their use; from the promotion of cooperation frameworks between the different actors operating in specific ecosystems and amongst the EU Member States, to the support of value-oriented, human-centric AI systems, etc., all with the view to lay the foundations of a European vision in terms of principles and policies in support of European values.

Building on the **Declaration of Cooperation on AI**[28] adopted by all EU Member States, Norway, Switzerland and United Kingdom on 10 April 2018, aiming to boost Europe's technology and industrial capacity in AI and its uptake, the **Communication "Artificial Intelligence for Europe"** of 25 April 2018 (COM/2018/237)[29] endorsed by the European Council in June 2018, proposed an overall strategy on AI for Europe. This communication set out the European vision and laid the policy foundations in this domain. In particular, the Communication aimed to create the ideal conditions for the development of AI in Europe and to allow civil society and the private sector to benefit from the opportunities it could offer.

The strategy was followed by the Communication on a **Coordinated Plan on the Development and Use of Artificial Intelligence** COM(2018) 795 final,[30] which provided a shared policy collaboration framework and encouraged all Member States to develop their own national AI strategies.

It has been widely acknowledged that the uptake of AI by the public sector is essential in ensuring value from AI itself and moving towards the EU-wide inception of the concept of "Government as a Platform". With this in mind, the **High-Level Expert Group (HLEG) on AI** put forward several recommendations[31] to develop, use and scale trustworthy AI, leading to AI-based public services that are human-centric and safeguard the fundamental rights of the beneficiaries of the new AI-based public services.

The **Berlin Declaration** on Digital Society and Value-based Digital Government[32] and the **Lisbon Declaration** aim to strengthen the human dimension in the digital eco-system. They represent the kick-start of a Charter on Digital Rights, also acknowledging the importance of creating value-oriented, human-centric AI systems for use by the public sector. The declarations stress the importance of ensuring responsible, accountable, transparent and explainable use of AI, and that unlawful discrimination by AI used in the public sector should be minimised. Globally, the public sector is seen as a catalyst for sustainable growth and innovation, and the strategic use of public procurement to fund innovation is part of this view. The **Digital Europe Programme**,[33] as well as the **EU Recovery and Resilience Facility (RRF)**[34] programme include funding opportunities for AI in the public sector.

The **White Paper on Artificial Intelligence** – A European approach to excellence and trust (COM/2020/65)[35] presents policy options to ensure that the development of AI is trustworthy, secure and in line with the values and rights of EU citizens. In doing so, it introduces the concepts of "ecosystem of excellence" along the entire value chain of AI adoption, and "ecosystem of trust" to give citizens, businesses and public organisations the highest possible confidence in using AI. The White Paper includes a specific section dedicated to the adoption of AI by the public sector. From the public consultation on the White Paper, respondents highlighted the importance of the public sector in ensuring trustworthy AI in Europe.

With regards specifically to the public sector, the **Communication on a European Strategy for Data** (COM/2020/66)[36] emphasises the need to capture the benefits brought by data for improving decision-making and public services by updating regulation, and the importance of embracing cloud technologies to deploy AI.

To stimulate the deployment of AI in public administration and to implement some of its recommendations, the European Commission has launched various activities. In 2018, the **AI Watch** initiative[37] was

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[28] https://ec.europa.eu/jrc/communities/en/node/1286/document/eu-declaration-cooperation-artificial-intelligence
[29] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A237%3AFIN
[30] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52018DC0795&from=EN
[31] https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=60343
[32] https://www.bmi.bund.de/SharedDocs/downloads/EN/eu-presidency/berlin-declaration-digital-society
[33] https://digital-strategy.ec.europa.eu/en/activities/digital-programme
[34] https://ec.europa.eu/info/business-economy-euro/recovery-coronavirus/recovery-and-resilience-facility_en
[35] https://ec.europa.eu/info/sites/info/files/commission-white-paper-artificial-intelligence-feb2020_en.pdf
[36] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0066

established as a common knowledge service to monitor the development, uptake and impact of AI in the EU, jointly implemented by the Directorate General Communications Networks, Content and Technology (DG CONNECT) and the Joint Research Centre (JRC).

In April 2021, the European Commission released the Proposal for a regulation of the European Parliament and of the Council laying down harmonised rules on Artificial Intelligence (**Artificial Intelligence Act**),[38] the first legal framework to regulate AI. The new AI Proposal for a Regulation laying down harmonised rules on Artificial Intelligence, aims to promote transparency and compliance with ethical requirements for systems that interact with humans by following a risk-based approach. The proposal suggests banning a few forms of AI, for example, systems that allow social scoring by governments. AI systems classified as high-risk, such as those used in essential public services, law enforcement, justice and democratic processes, will be subject to strict requirements and obligations to minimise harm.

Following this, the **Adopt AI programme** will aim to support the public procurement of AI, and the change of public procurement processes by assisting Member States in overcoming common challenges in the public procurement of AI systems.

The **Digital Europe Programme**[39] includes support for the experimentation with AI within cities, such as the Large-Scale Pilots initiative (LSP). This should help validate the Data Ecosystem for climate-neutral and smart communities by enabling the experimentation of portable, AI-enabled, cross-sectoral, cross-city urban data services. In addition, the setup of AI-powered Urban Digital Twins within European cities will be stimulated.

The **European Digital Innovation Hubs** (EDIHs)[40] are also expected to play a crucial role in supporting public administrations in moving forward with the use of AI by assisting in the experimentation and deployment of the *Common Services* promoted within the European Digital Government Eco-System, and helping cities and communities implement AI-enabled urban digital services and urban digital twins, on top of interoperable urban digital platforms.

The new **Coordinated Plan on Artificial Intelligence 2021 Review**[41] updates the previous 2018 *Coordinated Plan on AI* and puts forward new actions to create EU global leadership of trustworthy AI. These include accelerating investments in AI technologies, facilitating the uptake of new digital solutions, acting on AI strategies and implementing them fully, and aligning AI policies to remove fragmentation.

In the new *Coordinated Plan*, the public sector aims to become a trailblazer for using AI. On this basis, the European Commission has put forward measures to support the uptake of AI technologies in the public sector, articulated in four sets of actions:

— enable conditions for AI development and uptake in the EU;

— make the EU the place where excellence thrives from the lab to the market;

— ensure that AI works for people and is a force for good in society;

— build strategic leadership in high-impact sectors.

Finally, the European vision and initiatives on AI are also aligned with the **Organisation for Economic Co-operation and Development (OECD) principles** and recommended actions set out for the public sector,[42] namely to:

— facilitate public and private investment in R&D to spur innovation in trustworthy AI;

— foster accessible AI ecosystems with digital infrastructure, technologies and mechanisms to share data and knowledge;

— ensure a policy environment that will open the way to deployment of trustworthy AI systems;

— empower people with the skills for AI and support workers for a fair transition;

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[37] https://knowledge4policy.ec.europa.eu/ai-watch/about_en#:~:text=AI%20Watch%20monitors%20industrial%2C%20technological,economy%2C%20society%20and%20public%20services.

[38] https://digital-strategy.ec.europa.eu/en/library/proposal-regulation-european-approach-artificial-intelligence

[39] https://digital-strategy.ec.europa.eu/en/activities/digital-programme

[40] https://digital-strategy.ec.europa.eu/en/activities/edihs

[41] https://digital-strategy.ec.europa.eu/en/library/coordinated-plan-artificial-intelligence-2021-review

[42] https://www.oecd.org/going-digital/ai/principles/

— co-operate across borders and sectors in order to achieve progress on responsible stewardship of trustworthy AI.

With respect to the last recommendation by OECD, the *Data Governance Act*[43] proposed by the European Commission in November 2020 aims at making more quality data available for AI, and calls for the creation of a **European Data Innovation Board**[44] that would support cross-sectoral standardisation and interoperability of high-quality data. This initiative could also be explored to enhance data availability for the public sector.

2.1.5 AI strategies dedicated to the Public Sector throughout Europe

From the last two-years of research in this area, a number of policy initiatives have been identified in several EU Member States and Associated Countries specifically addressing AI adoption by the public sector (Misuraca & Van Noordt, 2020) that are outlined in Annex 3, *Summary table of AI national strategies*. From this preliminary analysis, the predominant approaches emerging from European national strategies to stimulate AI in government are outlined and grouped according to the following policy themes and actions:

Stimulating awareness and potential of AI

These initiatives focus on stimulating awareness among civil servants of AI, in order to share their understanding and provide opportunities to detect in which areas AI could be valuable for their work.

Building internal capacity on AI

Every technology offers limited value when not used at its full potential. For AI, this is no different. Public institutions need to have civil servants with the right capacities and skills to develop and/or use AI in their operations.

In this respect, some strategies focus on enhancing the internal capacity in public administrations with regard to AI-related skills.

Learning by doing

Since AI is a relatively new set of technologies, there is still a limited understanding of the way in which it is developed and applied, especially in public sector contexts. Therefore, a variety of countries have mentioned some AI flagship projects which will be used as examples to learn from AI implementation and its effects in real-world contexts.

Developing ethical and legal AI frameworks

As there are many ethical concerns especially with the use of AI, and this is of particular relevance when it comes to public services, many strategies are exploring the ethical implications of using AI. Some strategies intend to develop ethical frameworks to act as guidance specific to the use of AI by the public sector. Such frameworks could assist in establishing trust – among both civil servants and citizens – and ensure that the AI used in government is of high quality and in line with ethical values.

Improving data management for AI

These initiatives aim to improve the quality, availability and accessibility of public sector data for both internal and external use by public administrations.

Allocating funding and promoting procurement

This set of policy actions has the goal to stimulate the development and uptake of AI by providing adequate funding and mechanisms in support of innovation in the public sector. In fact, innovation in the public sector is often hindered due to a lack of appropriate funding schemes. Therefore, some strategies highlight the need to establish funding programmes earmarked to support experimentation and the deployment of AI dedicated to the public sector.

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[43] https://www.consilium.europa.eu/en/press/press-releases/2021/11/30/promoting-data-sharing-presidency-reaches-deal-with-parliament-on-data-governance-act/
[44] https://ec.europa.eu/commission/presscorner/detail/en/QANDA_20_2103

2.1.6 Outline of predominant approaches at the country level

Based on the preliminary review of the AI national strategies, three generic approaches in AI strategies can be identified, depending on the breadth and depth of the policy actions described therein to facilitate the uptake of AI in the government sector.

While this handbook outlines the broad features of these approaches, they will be further articulated, explained and detailed in a forthcoming report dedicated to national strategies and use cases.

AI4GOV front-runners

This group of countries describes a wide range of initiatives to boost the uptake of AI within their governmental organisations. In particular, these countries stand out as they:

— have a large amount of policy initiatives to facilitate the uptake of AI in government.

— dedicate funding for piloting and implementing AI in the public sector.

— take actions to ensure that internal expertise in AI is improved.

— intend to actively participate in international events on AI in government.

Monitoring the uptake of these strategies is extremely important. Member States can and should learn from the successes and failures of these policies. If some of these initiatives have been successful, such as different forms of procurement processes or some training programmes, it is highly recommended that these insights could be shared and facilitate policy learning.

As early adopters, it is important that these countries continue to lead, allowing other countries participating in the Coordinated Action Plan to learn from their results. Similarly, these countries could still learn from each other's approaches to further improve their own policy actions.

Private sector-led AI

The second group of countries – while recognising that the public sector should not only use but also develop AI to improve public services – still rely heavily on the private sector, mainly due to a lack of dedicated internal resources in terms of capacity and competences. For these reasons they prefer strategies aiming at fostering relations with the private sector creating a cooperative environment around AI. Consequently, as an example, these countries put an emphasis on how to enhance procurement processes, and in particular:

— place strong emphasis on stimulating the local GovTech ecosystem, thus assisting start-ups and other companies to emerge and to develop AI for usage in the government sector;

— acknowledge that existing procurement processes limit the adoption of innovative technologies within the public sector and take actions to improve collaboration between the public and private sector;

— rely on Digital Innovation Hubs as catalysts for sharing expertise from the private sector for usage in the public sector, and act as hubs to initiate projects, networking activities and testing areas for AI.

Compared to the front-runner category, the strategy of this cluster of countries displays a limited number of policy initiatives aiming to address internal capacity-building within the public sector, or to overcome the expertise gap between the public and the private sector. While it is understandable that the public sector may not be able to compete with the private sector in the development of AI, it may still be very much required to:

— ensure that enough internal capacity and expertise on AI is present to detect opportunities where AI may improve work relations;

— ensure that there is enough knowledge to guarantee effective procurement or collaboration;

— make sure that civil servants can work with the procured AI solutions.

Similarly, by placing a strong focus on the private sector as the leader in the development of AI, it may be seen merely as a technological instrument limiting its integration as a core part of public service delivery. For a successful implementation of AI in the long term, public organisations need to include AI within their strategies and work practices. This requires internal awareness and the ability to see how AI could fit the overall organisational goals. Private partners may assist by making solutions available, but it is not in their mandate to decide how AI will fit the overall aims and goals of the public organisation.

Data-focused strategies

The third group of countries could be described as those aiming primarily to facilitate the availability and quality of data in order to stimulate AI adoption and use. Their strategies describe initiatives to tackle various data-related barriers that hinder the development and uptake of AI in the public sector. A strong focus is placed on improving both the data infrastructure as well as the technical ecosystem, either by the private sector or by the public sector itself.

In essence, actions of these countries aim at:

— making more public data sets available for the development of AI and facilitating data sharing among public institutions;

— improving interoperability, data governance, data standards and data collection practices to increase availability of data;

— ensuring that overall connectivity and high-performance computing power is made available to develop AI applications.

Overcoming data-related barriers is fundamental for moving ahead with AI in government. However, data-related barriers are not the only factor that limit the uptake of innovative technologies within the public sector as many organisational and environmental factors play an equally important role in the adoption and use of AI by the public sector.

3 Recommendations and areas of intervention

As with other emerging technologies, digital transformation through AI is a result of several concurrent elements, where technology is an enabler among an array of influencing factors and framework conditions. These include legal, organisational, resource-related, environmental, ethical and societal aspects that are often overlooked.

The crucial relevance of most of such elements for the success or failure of AI-enabled solutions applied by the public sector has become part of the empirical research activities within *AI Watch*, from a multi-level perspective.

One of the objectives of this handbook is to outline a set of priorities for addressing such framework conditions common to many stakeholders, to allow alignment and coordination between EU Member States and the European Commission at different operational levels.

For this purpose, Annex 1, ***Mapping of the Recommendations in relation to stakeholders***, provides a detailed overview of the role that stakeholders are envisaged to play in implementing each of the recommendations provided in this handbook at different operational levels

3.1 Priority setting

In line with the general analytical approach applied by *AI Watch*, the proposed interventions try to broaden the perspective and address most of the influencing factors and framework conditions.

At the **international level**, the main objective would be promoting coordination to create the next generation of European public services, based on shared, interoperable data sources and cross-border implementation and use. Better coordination at the international level can also trigger a cascade effect by improving policymaking at the national and local levels, and lead to better management of common resources and challenges (e.g., by agreeing on a common climate model that would link to climate policies from the different European countries).

At the **national level**, the experimentation and sharing of relevant, successful cases and the establishment of a common operational basis, would foster the development of targeted solutions and their faster scaling and reuse, while saving considerable time and resources for all actors involved.

At the **regional and local levels**, a stronger operational capacity would create the basis for effective and adaptable ecosystems, able to interact with each other, while maintaining their contextual dimension and high user-centricity.

3.2 Areas of Intervention

The recommendations of this handbook are clustered within four key *Areas of intervention* that have been identified both in the course of the past years' research dedicated to this domain and as priorities put forward within AI national strategies targeting a few key objectives similar to most European Countries.

These areas of interventions are:

1. **Promote an EU value-oriented, inclusive, human-centric and trustworthy AI in the public sector**.

The use of AI in the public sector must be safe, lawful, trustworthy and effective. Consequently**,** actions under this area of intervention are to ensure that the use of AI within the EU public sector enhances the social good, while mitigation measures are identified so that risks related to AI applied in the public sector are minimised.

2. **Enhance coordinated governance, convergence of regulations and capacity building.**

These recommendations aim to strengthen the internal capacity of the European public sector to develop, integrate, use and procure AI technologies.

3. **Build a shared and interactive AI digital ecosystem.**

These actions aim to reinforce the AI digital ecosystem where public administrations operate by strengthening collaboration between public administrations and consolidating alliances with research actors, private organisations and other intermediaries operating throughout the value chain.

4. **Apply and monitor sustainability though value-oriented AI impact assessment co-created frameworks.**

These actions complement the measures undertaken in other areas. They aim to identify, experiment and deploy impact assessment frameworks, and to promote and monitor co-creation approaches amongst all societal actors for AI applied by public administrations both in support of sustainability, as well as to promote sustainable AI in compliance with EU values and principles. This will lead to positive impacts and socio-economic value for citizens, society and the natural environment

3.3 Recommendations: from opportunities and challenges to recommendations and implementation options

The **recommendations** regrouped under each area of intervention aim to create and nurture AI ecosystems where public sector organisations operate. They address policymakers and stakeholders at different operational and governance levels, which may need to be adapted to match countries' specific political, administrative, territorial, economic social, cultural and organisational dimensions.

Recommendations are, in turn, articulated into a number of **actions** that likewise can be implemented by stakeholders at different operational levels (international, national, regional/local levels), and with different roles and responsibilities (e.g., *leading* vs. *contributing*).

Time wise, actions are suggested that can be implemented either upon existing conditions, or in the medium-long term, with the ***Digital Decade 2030* as the time horizon**, according to the level or urgency or their role as prerequisites to allow other conditions and related actions to take place (see section 3.4).

In addition to dedicated research and analysis of EU Member States' and Associated Countries' national strategies dedicated to the promotion of AI by the public sector, these recommendations take into account the state of the art of relevant scientific literature, existing policies, regulations and initiatives at the EU and international levels (see Annex 2 – Sources in support of the Recommendations).

Figure 1. Areas of intervention.

Area 1
Promote an EU value-oriented, inclusive, human-centric and trustworthy AI in the public sector

1.1 Harmonise and complement EU regulations to promote human-centric and trustworthy AI enabled public services for all citizens.

1.2 Promote the adoption of ethical principles, the development of guidelines and the identification of mitigating measures to minimize the risks of deployment of AI by the public sector.

1.3 Develop and promote dedicated AI-enabled solutions based on co-creation approaches to increase relevance of services, and citizens' and businesses' trust and confidence in the use of AI by the public sector.

Area 2
Enhance coordinated governance, convergence of regulations, and capacity building

2.1 Create an EU-wide network of governance bodies for a streamlined management of AI in the public sector.

2.2 Design national and European capacity-building programs for public sector innovators aiming to develop and/or adopt AI in support of the digital transformation of public services.

2.3 Build upon and promote the use of regulatory sandboxes for public administrations, allowing experimentation of AI-enabled solutions in controlled environments.

2.4 Optimise funding in support of AI in the public sector to promote the spreading and scaling of reusable solutions.

2.5 Promote the development of multilingual guidelines, criteria, and tools for public procurement of AI solutions in the public sector throughout Europe.

Area 3
Build a shared and interactive AI digital ecosystem

3.1 Support multidisciplinary research and knowledge creation amongst European universities and Research and Development (R&D) institutions around AI for the public sector.

3.2 Build a common European Data Space for public sector bodies and their operators, drawing from the compilation of relevant AI datasets and related Registries throughout Europe.

3.3 Reinforce and advance existing initiatives on open data and interoperability.

3.4 Share reusable and interoperable AI components at all operational levels of European public administrations.

3.5 Create a European marketplace for GovTech solutions in support of public sector digital transformation.

Area 4
Apply and monitor sustainability through value-oriented AI impact assessment co-created frameworks.

4.1 Set up an EU observatory on AI, built on a pan-European network of AI national observatories to gather, share, and collectively manage best practices and experiences learned from different stakeholders in the public sector throughout Europe.

4.2 Develop and apply umbrella impact assessment frameworks based on key influencing factors to measure the use and impact of AI in the public sector.

4.3 Promote AI in the public sector in support of sustainability while developing sustainable AI, in compliance with environmental principles, and leveraging on civic engagement and participation.

AI solutions by the public sector are meant to improve organisational efficiency and the quality of the final service delivered to enhance public good and well-being, while trying to mitigate risks associated with its use.

In order to develop fair, non-discriminatory and transparent AI-enabled public services, focus should be put primarily on its use, rather than on the specific technology and its components.

To this end the following recommendations are suggested that are articulated in a number of possible actions:

Recommendation 1.1

Harmonise and complement EU regulations to promote human-centric and trustworthy AI-enabled public services for all citizens

The public sector is driven by the *rule of law* and aims at achieving the public good. AI applied by the public sector, like any other technology involved in the digitalisation of the public sector, should always take in the highest possible consideration basic principles aimed at respecting human rights and creating public value. **In their roles of both users and producers of AI-based solutions**, governments' choices are determined by specific policies and operate within and in compliance with the given **legal mandates** provided by the *rule of Law*.

This means that the exercise of such powers be controlled through public administrative law. Further, public agencies and their administrators may exercise only those functions that have been granted to them through legislation. Also, the public sector is required to **conform to administrative law, and to ethical and human rights principles.**

Under these conditions, there are a number of delicate issues associated with the use of by AI in public sector, for example:

— the potential for unfair and discriminatory practices and the lack of transparency due to the difficulty in explaining algorithm-based public decisions;

— the power of AI to identify data patterns and to recommend choices based on them, can result in an amplification of societal biases and discrimination against some social groups;

— AI can also lead to black-boxed decisions taken by public authorities when the inner workings of the algorithms are not explained. This element can lead to a loss of accountability of public decision-makers and a lack of liability for public authorities.

As the design, development and use of AI technologies unavoidably imply ethical and socio-economic risks for both business and citizens, especially when applied by the public sector, effective regulation must be in place that can unleash the potential of AI, while mitigating its risks and removing barriers.

To this purpose:

✓ to develop fair, non-discriminatory and transparent AI-enabled public services, **focus should be put primarily on the use of AI**, rather than on the specific technology and its components.

As a matter of fact, there are already a vast number of laws and regulations both at the national and supra-national levels that, while addressing other technologies either directly or indirectly, cover AI and its applications in different domains. Much support in understanding how to cope with privacy issues, for example, is already provided for by the EU's General Data Protection Regulation (GDPR), which also contains limitations (Art. 22(1)) on automated decision-making. Moreover, the experience with numerous past waves of digital technologies which have impacted the public sector (e.g., EDI, web 2.0, cloud computing, block chain, etc.), provide evidence that key issues are often shared across different types of technologies, calling for increased coherence to foster EU values and digital rights consistently.

The emergence of a new technology in itself, however, does not necessarily call for additional regulation, especially when its potential impacts are already covered by existing ones. An array of ethical and regulatory guidelines already exist (e.g., HLEG Ethics Guidelines for Trustworthy AI, the GDPR, UNESCO recommendations on AI ethics, etc.).

These, and other forthcoming initiatives and regulations (such as the proposed AI Act), should be regarded as starting points for further contextualisation, and to this end the following actions could be considered to facilitate the implementation of this recommendation:

> ✓ Existing regulations at the EU level should act as springboard for **alignment at the national level** and, at the same time, these would need to be **contextualised and enriched by the experience** of their concrete implementation in specific contexts in order to allow for further improvements without over-regulating.

Additional caveats to be taken into account when tackling the need for regulation of AI-enabled public services include the fact that new regulations might take a long time to be developed, and might not be able to keep up with the pace of development of a rapidly evolving sector such as AI. Moreover, over-regulating may lead to constraining innovation.

> ✓ Efforts should therefore be concentrated on streamlining and making sense out of the vast portfolio of existing relevant regulations, rather than developing additional ones.

Recommendation 1.2

Promote the adoption of ethical principles, the development of guidelines and the identification of mitigating measures to minimise the risks of deployment of AI by the public sector

In the EU vision for the promotion of trustworthy AI, **ethics** should be seen **as a *resource*** to be used to uncover and understand both the ethical values to be respected and potential risks associated with AI-based technologies and systems. Likewise, **ethics in AI is a dynamic concept** that changes and evolves according to the specific use of AI within very different and rapidly changing socio-technical-economic environments, at different operational levels and at different life cycles (from design to use).

Accordingly, when planning, piloting or using AI-enabled technologies, public administrations should make sure that ethical, legal and administrative principles identified at the EU level are followed, and that deployed AI-based solutions are aligned with such values, including related digital principles. This would require a number of **fundamental factors** to be taken into account:

- the identification of criteria for the application and use of AI in compliance with EU principles and values, in addition to those used for the assessment of enabling underlying technologies;

- the need to identify and focus on potential areas where risks associated to the deployment of AI applications are likely to occur the most, or cause the most damage;

- the need to collect and scrutinise both good and bad practices in order to acquire experience and identify the necessary validation tools, methodologies and relevant processes;

- the need to carefully look into existing guidelines, complement them only when necessary and, above all, identify and apply mitigation measures (meaning preventive measures that avoid the occurrence of negative impacts and thus avoid harm or produce positive outcomes), relevant to their contexts and specific use;

- the need for constant monitoring over time supported by continued feedback from user communities, be they citizens, businesses or public administration operators.

In fact, the number of existing initiatives addressing compliance with fundamental human rights, ethics and inclusiveness, provide a solid basis with extensive opportunities to identify both the risks associated with AI deployment, as well as suitable mitigation measures.

However, there is a gap between the availability of guidelines, their interpretation and their practical application in specific contexts, as actual effective deployment would be successful when done not only *for* the beneficiaries but also *with* them. In this respect, the dichotomy of *global regulation* versus *local implementation* faced by politicians and stakeholders at all levels is addressed, taking into account political, technical, socio-economic and scientific dimensions. All of these seem to point firmly in the direction of maintaining EU umbrella values and digital principles, while applying a **contextualised implementation approach.**

This is especially true in **critical areas**, such as healthcare, where data are very sensitive and where the impacts of AI can be assessed only after deployment. To limit risks and damage associated with AI in this area, procurement through **_sandboxing_** and, more specifically, where dedicated forms of it, like pre-procurement and pre-commercial-procurement (PCP) could be a possible solution[45]. Such approaches would allow for monitoring experimentation of AI based solutions in a highly controlled environment and well before their wider deployment, thereby limiting risks on a larger scale.

Recommendation 1.3

Develop and promote dedicated AI-enabled solutions based on co-creation approaches to increase relevance of services and trust in citizens' and businesses' to stimulate confidence in the use of AI by the public sector

It is important that the use of AI by public administrations meets the highest possible level of transparency. Citizens and businesses need to be able to understand when, where and which AI based solution is used, and to which extent AI use has influenced any decisions affecting them. Equally importantly, they need to understand where AI systems are used by their government, and for which purpose.

Trust is not only essential to avoid potential negative responses by citizens and businesses, but also to ensure that AI-enabled public services are used by them confidently. With this in mind the following action should be considered:

> ✓ To improve citizen's trust and confidence in AI, **co-creation and iteration-based development approaches** should be promoted to stimulate and reinforce active citizen involvement.

This should be considered throughout the evolution process, from design to development, from testing to use, up to evaluation to allow iterative feedback in view of continuous improvement.

By allowing **citizen participation** at early stages of development, potential biases in data could be identified quicker, the attractiveness of AI-enabled public service improved, and higher and more confident use of public services enhanced.

Over the last 15 years, we have witnessed government strategies moving from mere digitalised public services, to interactive transactions. Governments now need to move towards more evolved, user-centric, inclusive and intelligent forms of government, whereby public services go beyond _one-stop-shop_ approaches, towards more advanced form of **_proactive government_**, based on iterative improvements of AI-enabled solutions through the systematic and mutual exchange of information approaches.

To boost the development of innovative forms of collaborative governance, the mainstreaming of **_co-creative iterative approaches_** along the whole value chain is needed. In particular, AI initiatives in support of the achievement of the United Nations' Sustainable Development Goals (SDGs) would greatly benefit from the application of co-creation approaches. This is due to their complex dimension, which also involves a wide range of stakeholders. Moreover, co-creation approaches should draw on established practices like the ones of **Citizen Science**, where evidence suggests that policy value, scientific value and societal value are delivered through citizen involvement (Linders et al., 2018).

The **engagement of beneficiaries** in the deployment of AI-enabled solutions from design and development to delivery and use, from central to local public administrations, are fundamental. Government strategies should envisage the adoption of such approaches **especially at the local level**, where contributions from civic engagement are more likely to happen, and where constructive dialogue with and the active involvement of civil society is key to achieving relevance of intervention and effectiveness of action.

Initiatives in general, and in particular those based on **co-creation**, should always be contextualised. Citizen involvement might not always be desirable or feasible, depending on the stage of development (e.g., design, testing, adoption, implementation, use), on the policy area addressed (e.g., health, welfare services, urban management, etc.) and on the strategic goal of an AI-based initiative (e.g., increasing administrative efficiency, improving service quality, improving government/citizen relations). Moreover, the design of co-creation processes needs to be carefully prepared. In particular, the representativeness of samples of citizens

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[45] See, for example, AI4CITIES, a consortium of cities that aim to get breakthrough AI solutions developed to help cities reach their climate neutrality ambitions. https://ai4cities.eu/

involved in co-creation needs to be appropriately considered, in order to avoid input from samples of citizens that are biased.

There is a strong need to promote the internal capacity of public administrations in terms of organisational, structural, human and financial resources, to develop, experiment, implement and monitor AI within organisational processes. This intervention should start with the setting up of a coordinated governance approach to identify, discuss, regulate and implement underpinning common values, needs and issues of interest to all stakeholders.

This would allow better application and further improvement of existing regulations (such as the GDPR) for AI in the public sector, while paving the way for more specific regulations and contextualised implementation according to various operational environments.

In this respect, the following recommendations and possible actions would need consideration by the related stakeholders' communities:

Recommendation 2.1
Create an EU-wide network of governance bodies for a streamlined management of AI in the public sector

In order to allow coordination amongst the different actors, achieve complementarity of efforts, and improve alignment of relevant EU regulations on AI already in existence, the following action could be taken into consideration:

- ✓ Setting up a **European registry of AI algorithms** by federating and promoting the creation of national registries to monitor the development and market around AI and help in meeting the relevant criteria set down by EU regulations.

A number of initiatives are envisaged to support governments' capacity, and adequate funding to help meet relevant criteria set down by EU regulations to foster the deployment of AI by the public sector. In order to orchestrate such wide a spectrum of opportunities, build economies of scale, avoid duplication of efforts, minimise information and transaction costs, facilitate exchange of information, and create synergies among the different actors at the international and national levels, the setting up of joint governance mechanisms and coordination frameworks is needed.

With this in mind, the following action could be considered:

- ✓ Setting up an **Artificial Intelligence *Working Group* at European level** specifically dedicated to the public sector.

The dedicated Working Group would facilitate the coordination of policies and initiatives amongst EU institutions and European countries on the development and uptake of AI in the public sector. The mandate could include coordination with institutional data governance bodies, mobilisation and sharing of resources amongst actors, and the transposition of ethical principles and regulations. The Working Group would act at the interface between the national actors and the EU/international institutions (e.g., OECD, UNESCO, UN), by suggesting policy initiatives to further stimulate the use of AI in the public sector, and by proposing concrete actions to overcome barriers or associated risks in the operationalisation of related policies in the different political, geographical, cultural and socio-economic contexts.

Accordingly, the following actions are suggested:

- ✓ **Member States should identify organisations at the national level** to represent AI in the public sector within the EU Working Group. These bodies would act as both coordinators amongst national public administrations within their country and as the interface between national governments and EU institutions.

At the local level,

✓ it is also recommended to identify **AI champions**[46] who would raise awareness, provide advice and assistance to local administration in a given geographical context and on specific topics (e.g., coordination of AI procurement, collaboration in upskilling, etc.).

Such AI *champions* could also be represented by the (European) *Digital Innovation Hubs*[47] identified in the different countries, focusing on the provision of support specifically to the public sector. These bodies could also provide experimentation facilities and training opportunities, and represent an ideal environment for deploying regulatory sandboxing approaches.

Recommendation 2.2

Design national and European capacity-building programmes for public sector innovators aiming to develop and/or adopt AI in support of the digital transformation of public services

AI solutions, especially when there is a need for building them within public administrations,[48] require technical skills, but also competences combining management capabilities with an understanding of technology and underlying opportunities. There is an evident shortage of knowledge and expertise in AI potential which limits in public administrations, resulting in a lack of the ability of governments to identify viable and successful uses of AI within their daily operations. In addition, without adequate internal skills, public administrations may become too dependent on external suppliers and on proprietary technologies.

The following **actions** could be taken to facilitate the implementation of the recommendation:

✓ The development of **dedicated *capacity-building programmes*** would grant an adequate level of independence and higher capability to create relevant solutions for public administrations' specific needs. Capacity-building programmes are being considered Europe-wide.

However, what could provide great value and ensure higher synergy in terms of the exchange of experiences, both throughout Europe and within countries, is the setting up of a ***shared governance mechanism*** for developing and exchanging dedicated learning material around common needs.

✓ This could be done, for example, by developing "train the trainers" schemes within national training plans for civil servants engaged in both the commissioning of and/or direct development of AI solutions,

and through

✓ "***context-related trainings***" **with dedicated modules** organised on topics that would need adaptation and/or transposition to specific contexts and or different operational level (e.g., to support the application of EU regulations into national/local regulations, legal frameworks and laws).

According to the experience of the *EU's Interoperability Academy*[49] that could act as springboard and as an initial reference point, such capacity-building dedicated programmes could include trainings aimed at different civil servant groups on a number of topics and addressing diverse critical processes.

A model of providing capacity-building that draws on a Europe-wide network could be the new *Master in AI for public services* (AI4Gov),[50] launched in October 2021 by a consortium of universities across Member States. The Master's programme promotes the development of advanced digital skills in the public services sector to address the lack of highly specialised digital skills in AI, drawing on blended learning and project-based learning, and could represent the first step towards the creation of an EU-wide ecosystem for capacity-building for AI in the public sector.

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[46] Champions, as both individual and organisations, are also crucial to turn new practices into "business as usual" and, as such, are agents of change. In particular, the roles of an AI Champion are to inform, educate, advise, coordinate, connect and manage change.

[47] European Digital Innovation Hub network: https://digital-strategy.ec.europa.eu/en/activities/edihs

[48] https://hertieschool-f4e6.kxcdn.com/fileadmin/2_Research/2_Research_directory/Research_Centres/Centre_for_Digital_Govern ance/2020-01_Documents/HS_Policy_Brief_English_Final_Version_Print.pdf

[49] https://joinup.ec.europa.eu/collection/digital-skills-public-sector/news/welcome-eu-academy

[50] Master in Artificial Intelligence for Public Services (AI4Gov) https://ai4gov-master.eu/

Recommendation 2.3

Build upon and promote the use of regulatory sandboxes for public administrations, allowing experimentation of AI-enabled solutions in controlled environments

Legal frameworks struggle to catch up with the evolution and diffusion of any emerging technology, and this is even more difficult in the case of such a rapidly evolving area as AI. Yet there is a strong need, especially for the public sector, to create the necessary conditions for applying AI in the right way.

Studies done by the *AI Watch* initiative have shown that several countries have introduced some form of regulatory sandboxing for AI testing.[51] These controlled environments can also be used to try out and assess under real working conditions opportunities for AI applied to cross-border public services, including underlying common aspects like interoperability and other technical, semantic, organisational and legal issues.

Building upon the 2021 *Artificial Intelligence Act* proposal,

✓ It is recommended to reinforce and complement the creation of regulatory sandboxes across the EU and public bodies, and their agencies in all Member States are encouraged to experiment with new AI-enabled applications for public services in these sandboxes to help create a new generation of AI-supported public services (e.g., through the Digital Europe Programme).

The above could be complemented by drawing from existing good practice examples and by the proposed actions:

✓ Establish at the EU level **common criteria for the testing** of AI, following relevant standardisation activities and guidelines.[52]

Since Europe displays a variety of governance realities, with different operational levels, multiple actors and a number of regulations, it is recommended to apply a ***mash-up approach*** in a controlled environment (sandboxing) when experimenting with long-established solutions versus new ones. Similarly, a mixed approach should be used when testing local solutions versus international contexts and related regulations.

✓ This could be done by **interfacing experimenting facilities** at the national and local levels with international/cross-border facilities and networks, which would also require the development of common criteria for cross-operationalisation.

Experimentation activities can draw on resources of Testing and Experimentation Facilities (TEFs), which are technology infrastructures with specific expertise and experience in testing mature technology in a given sector, in real or close-to-real conditions, or make use of the Digital Innovation Hubs dedicated to the support of the digital transformation of the public sector

Recommendation 2.4

Optimise funding in support of AI in the public sector to promote the spreading and scaling of reusable solutions

Lack of funding is one of the most common barriers to AI-enabled public sector innovation. Many projects and plans described at both the EU level and in national strategies need significant funding to boost capacity for designing, testing and experimenting with new innovative AI solutions, especially for replicating and up scaling of good practices.

The *Digital Europe Programme*,[53] as well as the EU *Recovery and Resilience Facility* (RRF)[54] programme include funding opportunities dedicated to AI for the public sector.

The potential benefits from these EU programmes can be boosted by the following action:

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[51] These are environments regulated by law, which can be virtual and/or physical and allow to validate and verify AI solutions both technically and socio-economically, including their ethical implications and associated risks. Commonly, these sandboxes aim to do a quality assessment of AI applications in a safe setting, to gain a better confidence in the performance and capabilities of the solution.

[52] See, for example, the work of the ISO (International Organization for Standardization) on Guidelines on the testing of AI-based systems https://www.iso.org/obp/ui/#iso:std:iso-iec:tr:29119:-11:ed-1:v1:en

[53] https://eur-lex.europa.eu/eli/reg/2021/694/oj

[54] https://ec.europa.eu/info/business-economy-euro/recovery-coronavirus/recovery-and-resilience-facility_en. 20% of the EUR 672.5 billion of the Recovery and Resilience Facility (RRF) funding for "digital target" to build data, cloud, computing infrastructures and networks (e.g., 5G) to further research excellence, to support innovation, testing and experimentation.

✓ Promote the use of international **funding** together with national, regional and local funding in a ***complementary manner***.

Dedicated quotas of different EU programmes could be dedicated to the area of AI for the public sector, for example, for pilot projects aimed at spreading and scaling AI good practices at the national level. Such pilots could be funded by complementing national, regional, and local programmes, allowing the spreading of experiences in similar contexts across the territory (e.g., from local to regional, or the cross-country level), and their scaling at a higher level (from the local administration to central government bodies), while ensuring alignment with European regulations and values. With this in mind, strong consideration should be given to the following action:

✓ Include ***scalability as a formal precondition*** to benefit from EU funding programmes foreseeing AI-related activities.

It is not only the amount of funding, but also how and on what it is spent, that can make a difference. A concrete action to optimise and leverage dedicated funding schemes and initiatives in this direction could be:

✓ Reward the use of instruments that would enhance innovation ***replicability and scalability*** through **spreading and scaling approaches** at the early stages of solution development (i.e., innovation procurement schemes and re-usable solutions).

Recommendation 2.5

Promote the development of multilingual guidelines, criteria and tools for public procurement of AI solutions in the public sector throughout Europe

Public procurement is becoming an increasingly important tool to stimulate the adoption of AI. However, public procurement of AI is more cumbersome than regular public procurement, as it includes a higher variety of challenges especially in relation to compliance with GDPR, ethical principles, and human-centricity aspects that need to be applied into a number of much diversified contexts.

An example could be drawn from the *Pre-Commercial Procurement*[55] instrument (PCP) adopted by the European Commission to help public procurers and suppliers develop innovative solutions addressing societal challenges to the highest possible relevance and contextualisation.

This calls for actions to be carried out on two development levels, namely:

✓ Develop and **align procurement guidelines at the EU level**, providing directions and criteria for developing national guidelines in compliance with EU principles and regulations.

Procurement guidelines should provide information on how to facilitate public procurement processes, empowering procurers and providing guidance on how to mitigate common risks and obstacles when procuring AI. To this end, examples of AI procurement guidelines aiming to assist civil servants when addressing common public procurement challenges have been proposed by a number of international organisations,[56] in different programmes,[57] including the setting up of dedicated platforms[58] for public procurement in an *EU data space*.[59]

In this context, the European Commission's *Adopt AI programme*[60] proposed by the AI White Paper[61] will play a crucial role in strengthening and facilitating the procurement of AI in the public sector.

Similarly, public administrations throughout Europe must be able to access and understand the complexity of AI procurement in all its thematic configurations and specifications. There is therefore a clear need to:

✓ Develop ***multilingual* sets of AI procurement guidelines** in partnership with the national procurement authorities of the EU Member States.

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[55] https://digital-strategy.ec.europa.eu/en/policies/pre-commercial-procurement

[56] World Economic Forum (2020). AI Procurement in a Box. https://www.weforum.org/reports/ai-procurement-in-a-box

[57] European Commission revised Coordinated Plan on Artificial Intelligence of 2021, where European Digital Innovation Hubs (EDIH) are to be used to build a bridge between public procurers and European industry.

[58] Tenders Electronic Daily (TED) portal hosts EU-wide, transparent, non-discriminatory preliminary market consultations, in line with Article 40 of the Public Procurement Directive (2014/24/EU).

[59] Provided for by the Commission's "European strategy for data" (COM(2020) 66 final).

[60] https://digital-strategy.ec.europa.eu/en/policies/european-approach-artificial-intelligence

[61] https://ec.europa.eu/info/sites/default/files/commission-white-paper-artificial-intelligence-feb2020_en.pdf

This could be facilitated by building upon the successful experiences of the European Commission's AI-powered *eTranslation* portal[62] that was set up in November 2018 in EU Member States.

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Intervention Area 3:

Build a shared and interactive AI digital ecosystem

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Public organisations do not operate in isolation and have to collaborate with other actors, such as research centres and academia, the private, and the third sector (intermediaries, charities, NGOs, etc.). Likewise, this applies to public administrations in order to move forward in the development and use of AI in complex and articulated ecosystems. For the development of AI in support of value-driven and human-centric public services, it is crucial that data flow smoothly across and between the different stakeholders throughout the value chain. Academic institutions in particular play an important role within this specific AI digital ecosystem.

Recommendation 3.1

Support multidisciplinary research and knowledge creation amongst European universities and Research and Development (R&D) institutions around AI for the public sector

Existing knowledge on the use of AI in public administration is relatively scarce in comparison with research on the use of AI in the private sector. For innovation advancements to remain open, interoperable and more independent from proprietary policies, there is a need to encourage and support multidisciplinary research and knowledge creation by academies and research institutions on the specific features and needs, and how to stimulate the use and assess the impact of AI in government.

For this purpose it is suggested to:

- ✓ Create an **AI research and knowledge alliance of European universities** and other research and development institutions working with the public sector to promote the development of a common agenda and dedicated curricula for research on applications, crucial challenges, solutions, methodologies and practices addressing the use, drivers, barriers, risks and benefits of AI in the public sector.

- ✓ Such an alliance could also set the foundation for providing guidance on how to produce anonymised data sets and **create registers** upon these sets.

- ✓ To this effect, it is suggested to **earmark funding** and grants to support dedicated research in this area.

Focus should be put on interdisciplinary research, adopting a socio-technical view on AI in the public sector by integrating technical knowledge with approaches from social sciences, including disciplines from public administration studies, management studies, information systems, digital government, sociology, anthropology, psychology and the humanities in general.

Knowledge shared and gained by such an academic alliance (e.g., data, concrete experience from use cases, tools and methodologies) could be reused extensively, and collaboration between the public sector and the scientific community, both public and private, could therefore be enhanced, duplication of efforts avoided and returns amplified.

This could be realised, for example, by building on early experiences of university networks, such as the *Master in AI for public services* that could act as a springboard also for cross-border collaboration.

Another testbed for such an alliance could be provided by:

- ✓ Setting up a ***European federation of business schools and institutes for public administration*** that could be deployed by the different European countries to develop specific curricula, provide training on AI technologies dedicated to the public sector, and act at the interface with similar institutions at the European level.

Recommendation 3.2

Build a common European Data Space for public sector bodies and their operators, drawing from the compilation of relevant AI datasets and related registries throughout Europe

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62   https://webgate.ec.europa.eu/etranslation/public/welcome.html

There is a need to ensure that non-critical public sector datasets which are developed for specific purposes are not only thematically clustered and kept open, but also continuously cleansed and updated, for them to keep relevance and be reusable for new AI applications and by different operators.

This could be realised through the following action:

> ✓ Promote the implementation of a **Common European Data Space**[63] dedicated to public administrations providing not only data collected by the public sector, but also other relevant data acquired from both established and emerging actors within this specific value chain.

A dedicated European Data Space recognising public administrations both as data provider and user would allow to unite efforts and resources, achieve higher relevance on priority topics, avoid duplication, maximise research coverage and optimise related results thereby enabling the exchange of self-generated data among public administrations and, possibly, data acquired from the private sector (B2G data).

Common Data Spaces should not be a central repository, but rather function as an open and interactive window to promote access to non-sensitive data to stakeholders from all over Europe, including access to data to train or run AI applications.

Dedicated European Data Spaces should grant the necessary conditions for data access and governance, i.e. not only does the data need to be there, but is should also be possible to use it in an automatic fashion, with secured and transparent access, and in line with ethics and related access and use conditions.

There are a number of initiatives at the EU and national levels that could be exploited and combined in their different features to optimise the content of such EU Data Space, its quality, use and maintenance. Examples of initiatives supporting availability, processing, as well as sharing of data that could assist in the development of a common Data Space are available through the *Horizon Europe*[64] programme, as well as the *European Cloud Federation*[65] for services related to the public sector, such as transportation and mobility, law enforcement, migration and asylum.

Several regions have their own AI strategy for public governance, and many cities are also front-runners in this area. For example, the recently started *DT4REGIONS* project,[66] with its AI observatory in Barcelona, and the work the city of Amsterdam has developed regarding appropriate contract clauses for procuring fair, transparent and trustworthy AI, and also for setting up and developing an AI registry for transparency purposes.

These good practices now are featured in the *Revised AI Coordinated Plan* as initiatives that deserve scaling up (for example, through the so-called Fair AI Minimum Interoperability Mechanisms (MIMs) for open and agile smart cities[67]).

The 2021 revision of the *AI Coordinated Plan* confirms the planned reinforcement of European capacity for the deployment and scale-up of AI in the public sector and calls for the following action:

> ✓ Create **AI algorithm registries**, using catalogues of AI-enabled applications (for example, through the AI-on-demand platform), and by supporting public administrations in procuring trustworthy AI (activities coordinated by the living-in.EU[68] movement).
>
> ✓ The use of big data and algorithms between cities should not be underestimated, and a successful matching of such resources could be represented by the following action:
>
> ✓ Extend the setting up of the **Networks of Local Digital Twins** to include cities as an impactful exercise in support of public sector resource efficiency.

The Network of Local Digital Twins extended to cities, would respond to the *EU Ministerial Declaration of Digital Day 2021*,[69] where Member States have committed to "work with local authorities and other relevant stakeholders to set up a European network of digital twins of the physical environment".

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63 https://digital-strategy.ec.europa.eu/en/policies/strategy-data
64 https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en
65 https://digital-strategy.ec.europa.eu/en/news/commission-welcomes-member-states-declaration-eu-cloud-federation
66 https://errin.eu/projects/dt4regions
67 https://oascities.org/minimal-interoperability-mechanisms/
68 https://living-in.eu/

Much evidence points to the fact that there are many initiatives addressing common issues related to data management, in particular to the adoption and use of AI by the public sector also within civil society and intermediaries from the third sector (e.g., NGOs, interest groups, communities of practices, etc.). This calls for the following action:

✓ There is also the need to identify and activate **reference organisations for *data trust and data cooperatives*** to accommodate emerging forms of social innovation initiatives stemming from civil society and relevant communities of practices.

In this context, the desired EU Data Space dedicated to the public sector should take into account such **civil society initiatives as *data trusts and data cooperatives*,**[70] as here privacy enhancing technologies become a necessary pre-requisite, and operators are strongly encouraged to envisage the necessary measures to promote them, including research.

Finally, to avoid the creation of small islands of excellence and underuse of dedicated innovative technologies that could suit and satisfy the public sector needs very well, both as a user and consumer, the following action is proposed:

✓ Promote **EU GovTech start-ups**[71] that would bring innovative solutions to public services to boost government efficiency, transparency, responsiveness and citizen trust, and revitalise democracy and governmental services across Europe.

Recommendation 3.3

Reinforce and advance existing initiatives on open data and interoperability

Data management challenges in the public sector are often linked to interoperability and lack of technical standards in the private sector dedicated to AI, while hardware and software variations create fragmented technology ecosystems both across public organisations and between public and private organisations.

The *Data Governance Act* proposed by the European Commission in November 2020 aims at making more quality data available for AI, and calls for the creation of a *European Data Innovation Board*[72] that would support cross-sectoral standardisation and interoperability of high-quality data. This initiative could be explored to enhance data availability also for the public sector.

In addition, the Commission's 2021 *Coordinated Plan for AI* proposes the setting up and improvement of global AI standards in close collaboration with international partners (e.g., ISO, WIPO, IEEE, etc.).

The production of high-quality interoperable data is of outmost importance for the public sector as this would accelerate the digitisation of assets, processes and activities, as well as the storing and sharing of data, solutions and findings from different stakeholders.

Innovative partnerships and EU alliances would strengthen cooperation, exchange of data and the sharing of practices (B2B, B2G, P2P), making the most of diverse experiences and boosting awareness about the benefits of open, cross-border data sharing.

In this picture, the following measures could be envisaged:

✓ Provide dedicated **technical and financial resources** that would support the necessary efforts required for ensuring data quality, updating, accessibility and usability of public sector datasets.

✓ **Raise awareness** to support a better understanding on the part of public service officials of how sharing **open data** can assist society, and that such sharing should not be regarded only as a burden.

Along these lines,

✓ there is a need to **raise awareness** amongst politicians and governments of the value and potential **return on investment** in data infrastructures in terms of socio-economic benefit for society as a whole.

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[69] https://ec.europa.eu/commission/presscorner/detail/en/ip_21_1186
[70] E.g., Uber drivers creating shared knowledge to build a data asset for taxi drivers.
[71] https://www.eu-startups.com/2019/05/govtech-10-european-startups-that-are-making-governments-more-efficient-and-democratic/
[72] https://ec.europa.eu/commission/presscorner/detail/en/QANDA_20_2103

Other incentives that could "close the loop" to acknowledge the added value and promote open interoperable data could be by envisaging some financial or in-kind benefits for opening up service data sets.

In this regard:

✓ Support to API frameworks[73] and web standards could also be considered.

Recommendation 3.4
Share reusable and interoperable AI components at all operational levels of European public administrations

Successful AI applications are often built from a variety of different solutions, datasets and algorithms. However, for many reasons the development of AI in the public sector occurs rather disconnected from other similar initiatives and, as a result, similar solutions may be developed elsewhere and even simultaneously. Moreover, public administrations in one location may be doing the same function but based on different administrative law and policy instruments than others somewhere else, making transfer and interoperability even more complicated.

To avoid duplication of efforts and improve the reusability of AI components and related resources, the following actions are proposed:

✓ For the development of AI solutions **reuse and sharing of components** with other public administrations on open repositories should be privileged, following the existing building blocks and guidelines developed within the relevant EU initiatives.

These initiatives are the European Commission's Connecting Europe Facility (CEF),[74] and interoperability solutions provided within the ISA2 Programme,[75] the European Digital Innovation Hubs (EDIH) and the AI4EU[76] initiative, hosting AI components that can be freely reused in AI development. More specifically, the Big Data Testing Infrastructure[77] and Context Broker[78] act as two of the most relevant CEF building blocks.

In this context, the following measures could be envisaged:

✓ **Guidelines** are needed to build reusable components based on common standards and best practices.

✓ Consequently, dedicated national **repositories of standards, guidelines and performance metrics** should be envisaged in combination with the above.

GovTech initiatives working for different public administrations could apply similar approaches leading to the development of solutions that are interoperable and shared from the outset (see also recommendation 3.5) by:

✓ **Aligning components specifications** to the areas they address (e.g., transportation, housing, etc.), so that **dedicated directories** would help operators reuse existing component in other parts of Europe.

The realisation of the above conditions would allow the creation of shared repositories of plug-and-play algorithms, software and experimental applications, thereby promoting the reuse of AI-enabled public service components on a wider scale, with lesser resources, based on the same technical specifications and sound methodologies, and complying with EU regulations. These repositories could:

✓ **Build an EU united AI registry based on national and local AI registries**, adding (when available) the information and linking to the reusable parts involved: algorithms, models and datasets.

Recommendation 3.5
Create a European marketplace for GovTech solutions in support of public sector digital transformation

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[73] https://data.europa.eu/en/news/jrc-proposes-api-framework-governments
[74] https://ec.europa.eu/cefdigital/
[75] https://ec.europa.eu/isa2/home_en
[76] https://www.ai4eu.eu/about-project
[77] https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/big+data+test+infrastructure
[78] https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/Context+Broker

The private sector is often the source of innovative applications and plays a crucial role in the digital transformation of public administrations. In order for the public sector to exploit the innovative potential of the private sector in full, a problem-led procurement vehicle is needed and would give innovative and agile start-ups and small and medium-sized enterprises (SMEs) an advantage with respect to bigger companies and multi-national players.

In this context, consideration should be given to the identification and development of measures to stimulate both the supply and the demand side of the European GovTech ecosystem.

To this end it is suggested that:

✓ Member States join forces and synchronise actions to support innovative **GovTech companies** that can provide innovative AI applications to the European public sector.

Such start-ups could be supported through competitive funding, making it more attractive for entrepreneurs to develop AI for the public sector, and by considering AI projects in **GovTech Incubators**. In this respect, the Commission has proposed to fund a *GovTech Incubator* under the Digital Europe Programme[79] that would enable cross-border and cross-domain experimentation in all related domains.

At the same time, public administrations themselves should envisage ways to become a more attractive market for GovTech companies and start-ups.

✓ Public sector administrations are encouraged to keep abreast of and actively **reach out to innovative companies** whose available AI solutions could be beneficial to them.

Moreover:

✓ Specific **procurement frameworks** and conditions dedicated to support start-ups could be envisaged, as it was done, for example, during the pandemic with the use of Art. 32 of Directive 2014/24/EU.[80]

Intervention Area 4:
Apply and monitor sustainability through value-oriented
AI impact assessment co-created frameworks

Public administrations need relevant information, reliable data and suitable standards in order to identify the best way to use AI within the framework of their function and operations.

Steps should be taken at all operational levels to identify specific examples of "if, where and how" AI is being used successfully. In this regard, impact assessment frameworks need to be developed to guide decision-makers and practitioners to introduce AI in their own organisations, and identify what impact they should expect from their deployment.

This needs to be considered from a **value creation** perspective that goes beyond mere profit of return on investment. Above all, **sustainability** must be taken into account, including optimisation of savings in terms of human, financial and environmental costs, increased efficiency, enhanced effectiveness in service delivery, service quality and trustworthiness, improved relevance and contextualisation.

Recommendation 4.1
Set up an EU observatory on AI, built on a pan-European network of AI national observatories, to gather, share, and collectively manage best practices and experiences learned from different stakeholders in the public sector throughout Europe

✓ An **EU observatory on AI dedicated to the public sector** could be set up. It would act as central hub of expertise to establish a community of practice, while joining up national observatories around Europe to collect both success and failure stories.[81] It would also

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[79] https://digital-strategy.ec.europa.eu/en/activities/digital-programme
[80] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0024 (use of the negotiated procedure without prior publication of specific cases and circumstances).
[81] These success/failure cases would need to have fully enforced transparency procedures – see, e.g., the UK transparency standard https://www.gov.uk/government/collections/algorithmic-transparency-standard

> monitor the current implementation and use of AI in the public sector throughout Europe, including descriptions and information sources.

Such an observatory would act as a one-stop shop/central repository where public bodies and agencies from all over Europe could monitor the advances and benefit from knowledge and experiences shared within the community of practice to which they belong.

The observatory content should be collectively owned and, as such, it would be in the interest of the different stakeholders to keep it updated by conveying state-of-the-art information to the observatory's managing authority on a regular basis. The observatory should be **interactive and open** to the community to allow for comparison, and avoid duplication of efforts in the creation of added value content.

The observatory should not only gather and keep track of the development and use of AI-enabled solutions for public administrations, but also of emerging technologies displaying potential application and impact when associated to AI. This would include information relating to any other cross-cutting issue such as interoperability, standards, data management, legal and ethical frameworks, and regulations.

In its mandate, the observatory could also include the identification of needs and main barriers to AI adoption in the Member States' public sector, the sharing of methodologies and approaches for gathering, comparing and assessing cases across Europe, including the identification of indicators and key influencing factors for impact assessment of AI-enabled solutions on both the public administrations themselves and their service end-users. To this end:

✓ EU Member States could identify relevant bodies that would act as **AI national observatories** to represent their country, and actively participate in the activities of the EU Observatory established at the European level acting as a central hub of expertise on AI in public administrations.

✓ This would pave the way to the creation of a ***pan-European network of AI observatories*** dedicated to the public sector.

Initiatives like the forthcoming Local and Regional Digital Indicators (LORDI) framework to measure take-up of digital technologies at sub-government level[82] could be identified and promoted in the coming years, to monitor that the use of AI-enabled services by public administrations, businesses and citizens be executed in full alignment with European values and digital principles.

These observatories could build upon and draw from the:

✓ Setting up of a ***European registry of AI algorithms*** by uniting and promoting the creation of **interoperable national registries** to monitor digital transformation of both the public sector and the market around AI, to share relevant information and help to meet the relevant criteria set down by EU regulations.

Existing experiences of registries of algorithms, such as those in the cities of Amsterdam and Helsinki, can provide guidance for establishing a united registry at the EU level. A key requirement for creating an EU-wide registry is also the establishment of common standards (vocabulary/ontology), for which it could prove useful to draw on the federated catalogue and experiences of the INSPIRE initiative.[83]

The registries of algorithms could coincide and/or be hosted by the AI observatories themselves.

Finally, attention should be given to:

✓ **Coordination with international organisations** already operating in this area (e.g., OECD[84], UNESCO[85]) on critical topics like ethics and trustworthiness, and any other cross-cutting issues influencing directly or indirectly impact on AI users and beneficiaries.

This would be necessary to avoid duplication, while increasing synergy and complementarity of efforts to the benefit of value and quality of information provided by the observatory to its community of stakeholders.

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82 https://living-in.eu/groups/commitments/monitoring-measuring
83 https://inspire.ec.europa.eu/
84 OECD.AI Policy Observatory https://oecd.ai/en/
85 https://en.unesco.org/artificial-intelligence

Recommendation 4.2

Develop and apply umbrella impact assessment frameworks based on key influencing factors to measure the use and impact of AI in the public sector

In response to the need for actionable and measurable guidelines, there have been many developments on algorithmic audits, data impact assessments and algorithmic impact evaluations. Through the Assessment List for Trustworthy AI (ALTAI),[86] for example, developers and users of AI can directly assess whether their solution is in line with EU regulations, values and principles, in order to avoid common ethical risks and recurrent bias.

Public bodies and agencies need to be assisted when evaluating their AI systems, whether to assess the achievement of intended goals, to gauge encountered unintended effects, or to take stock of potential negative consequences. Only then can they find their way through the web of entangled hard and intangible issues embedded into very specific ecosystems which characterise the operationalisation of the public sector.

Impacts of AI-based solutions and systems occur under different perspectives and levels, from design to use, and are hard to grasp as they span through technical, societal, organisational and economic dimensions.

To this effect, it is suggested to develop

✓ **Umbrella impact assessment frameworks** that would be adapted and **contextualised** across different countries and sectors, based on key influencing factors, underpinning quantitative as well as qualitative indicators characterising the impact in the specific public sector ecosystem.

Generic, yet adaptable, impact assessment frameworks should be used as basic tools to be further contextualised and made more relevant by stakeholders according to specific areas of application in the political, cultural and operational environments.

Generic AI impact assessment frameworks for the public sector would:

— represent a common reference point for identifying and better understanding the underlying pillars for relevant and meaningful assessment in this area (what needs to be assessed, why, and how), including more specific influencing factors, possible variables, and their correlations in specific environments (e.g., at the local level);

— allow coherent data gathering necessary to build and improve AI-dedicated solutions, to enable a certain degree of comparison with respect to methodologies, operational structures and processes, cultural, geographical and socio-economic environments;

— provide a guidance framework to key stakeholders, from civil servants to practitioners, AI developers and users communities, on how to trigger impact, increase use and, ultimately, create value in specific contexts.

These frameworks should improve, amongst others, the understanding of the several facets to be assessed (e.g., data governance, technologies used, degree of interoperability, possible risks, etc.), related outcomes and actual outreach of the scrutinised AI-based solutions.

In this process, impact should be regarded from both the technical dimension (e.g., in terms of technical standards, robustness, life expectancy, cost, service level agreements, external sourcing, etc.) and the functional dimension (e.g., trust of general public for use of AI solutions).

Finally, it is recommended that:

✓ Umbrella AI frameworks should **link impact assessment indicators to internationally recognised value-based principles,** especially regarding ethics and a trustworthy use of AI (e.g., EU,[87] OECD,[88] UNESCO[89]), and take into account emerging impact assessment

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86 https://digital-strategy.ec.europa.eu/en/library/assessment-list-trustworthy-artificial-intelligence-altai-self-assessment
87 https://wayback.archive-it.org/12090/20201227221227/https://ec.europa.eu/digital-single-market/en/news/ethics-guidelines-trustworthy-ai
88 https://oecd.ai/en/ai-principles
89 https://unesdoc.unesco.org/ark:/48223/pf0000377897

Data generated by such frameworks could also be used for monitoring purposes by both the public administrations themselves and relevant authorities at the national and international levels.

Recommendation 4.3

Promote AI in the public sector in support of sustainability while developing sustainable AI in compliance with environmental principles and leveraging on civic engagement and participation

There is an impelling need not only to promote *AI for sustainability* but also and, above all, *sustainable AI,* as there are rising concerns regarding the environmental footprint of the growing use of AI.

The *UN Conference on the Human Environment* organised in 1972[91] in Stockholm, was the first world conference to make the environment a major issue. The participants adopted a series of principles for sound management of the environment including the *Stockholm Declaration and Action Plan for the Human Environment*[92] and several resolutions. The conference discussed **environmentally sound technologies** for the first time, meaning that such technologies need to support the environment, while being themselves environmentally sound.

Currently, digital solutions stand not only in support of public sector management and service provision, but also to enable it to operate in compliance with environmental sustainability principles, in particular in alignment with the **European Green Deal**,[93] and **United Nations' Sustainable Development Goals** Nos. 7 (affordable and clean energy), 11 (sustainable cities and communities), 12 (responsible consumption and production), and 13 (climate action).

The catalyst role of disruptive technologies and, in particular, of AI when tackling environmental challenges is not in question. A clear example of AI functioning in support of environmental sustainability is provided by the use of AI in the *EU Data Centres*, which increased exponentially the effective management of energy consumption all over the 300 centres distributed in throughout Europe.[94] A specific role for AI is envisaged as a critical enabler for attaining the sustainability goals of the European Green Deal.

It is therefore strongly encouraged, to

- ✓ Promote a catalyst role of **AI for environmental sustainability** to allow other examples of beneficial use of AI in different application areas.

In this context, the JRC Code of Conduct of Data Centres[95] should represent a useful reference for developing *ex ante* and *ex post* impact assessment indicators and frameworks. However, this is not enough. Public administrations should play a leading role in ensuring that, while promoting AI-based solutions to enable public sector environmental policies, the use of AI within their organisations does not lead to environmental damage. In fact, the environmental impacts of AI initiatives, including but not limited to the carbon footprint of the intensive computing required by AI algorithms, needs to be better captured through the development of a **holistic approach** taking into account different *purpose driven measures*.

These measures should allow quantifying environmental impacts spanning across the AI value chain (design, implementation, use), and should be easily shareable across different stakeholders to enable benchmarking and goal-setting when developing ***AI for sustainability versus sustainable AI***.

Currently, most of the IT infrastructure and software used by the public sector is provided by private organisations through procurement. In this context, how do we individuals/citizens know that an organisation or public administration is applying compliance models for sustainable AI? How can *ex ante* impact assessment rules be applied to solutions to be procured? How and to what extent can procured solutions providers be held accountable? These are key questions at the basis of a much wider issue of impact and consequences on environmental sustainability stemming from AI applied by the public sector.

90 https://futurium.ec.europa.eu/en/european-ai-alliance/best-practices/ai-impact-assessment-code-conduct
91 https://www.un.org/en/conferences/environment/stockholm1972
92 https://documents-dds-ny.un.org/doc/UNDOC/GEN/NL7/300/05/IMG/NL730005.pdf?OpenElement
93 The European Green Deal (COM/2019/640 final) https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1576150542719&uri=COM%3A2019%3A640%3AFIN
94 https://ec.europa.eu/jrc/en/news/eu-code-conduct-data-centres-10-years-improved-energy-efficiency
95 Data Centres Energy Efficiency https://ec.europa.eu/jrc/en/energy-efficiency/code-conduct/datacentres
   DCEE Code of Conduct https://e3p.jrc.ec.europa.eu/communities/data-centres-code-conduct

With this in mind, it is recommended that:

- ✓ **_Sustainable AI_ is promoted as a mandatory prerequisite in AI strategies** of public administrations and governments, both at the international and national levels, including in public procurement frameworks in compliance with EU values and environmental sustainability principles.

This could be done by

- ✓ Developing and applying **_certification_ and _labelling_ approaches** based on common sustainability principles aligned with the EU environmental policies, such as the Green Deal and the United Nations' Sustainable Development Goals.

As an example, the _AI4CITIES_ pre-commercial procurement by six cities within the project is addressing AI-enabled solutions for reducing GHG emissions. In this context, the report by the OECD, _Towards Green ICT Strategies_, published in 2009[96] and providing recommendations on greening ICT, is still a quite relevant document and should be used as a starting point for further investigations.

Finally, the involvement of the public, be it represented by businesses or citizens, is crucial for the effective achievement of environmental goals and their sustainability. This is why, for example, Citizen Science and, more widely, Citizen Generated Data approaches, being an established practice of public engagement for the management of common good, can be directly deployed as an important contribution to _ex ante_ and _ex post impact assessment_ exercises, and is instrumental to increase mutual trust between governments and citizens.

To this end, it is strongly recommended to:

- ✓ Promote **active civic engagement**, expressed under different forms of involvement of citizens in the management of public good when addressing common challenges and fundamental civil rights.

This would be an indispensable resource in order to integrate institutional sources of information and good practices, thereby allowing for the maximisation of resources, higher relevance of interventions and shared ownership of results.

Citizen participation and pro-active involvement in public deliberation, is especially important when there is a need to establish **_if and when to deploy AI_**, not only to address environmental issues, but also in any decision to be taken by public administrations involving the use of AI-based technologies. In fact, there are instances where after proper assessment, based on deep knowledge of the issue at stake and fundamental data and information gathered through public consultation and participation, it would be more appropriate and/or environmentally sound to choose alternative paths, rather than AI-based solutions.

In order to help strike a balance between the benefits and environmental risks associated with the use of AI, there is the need and it is recommended to:

- ✓ Develop **impact assessment frameworks in support to sustainable AI**, built on participatory practices and co-creation approaches, drawing from the knowledge and pro-active involvement of citizens and their _communities of practices_ operating at the targeted level of intervention.

In this context, Citizen Science approaches are now widely applied by a number of EU policies and Research and Innovation funded programmes spanning across different thematic domains. Benefits of using Citizen Science approaches are, as an example, articulated in the Staff Working Document developed by the European Commission of Best Practices in _Citizen Science for Environmental Monitoring_.[97]

[96] https://www.oecd.org/sti/ieconomy/towardsgreenictstrategies.htm
[97] Best Practices in Citizen Science for Environmental Monitoring SWD(2020) 149 final: https://ec.europa.eu/environment/legal/reporting/pdf/best_practices_citizen_science_environmental_monitoring.pdf

4 Perspective timing for interventions

The focus of the above recommendations is provided in the timeline presented in Figure 2.

Figure 2. Interrelations amongst the different recommendations.
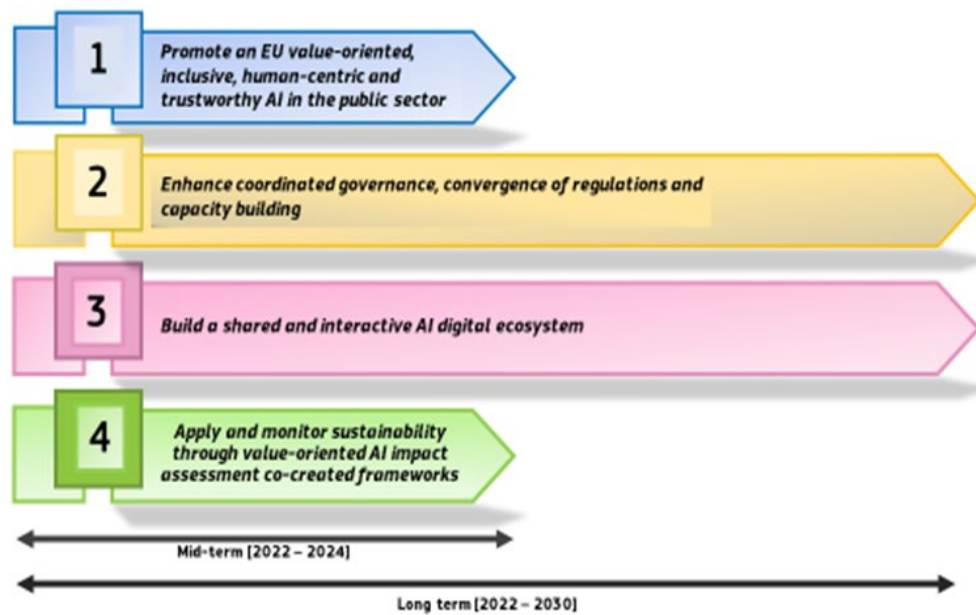
The time is ripe for action (although at different extents, depending on the actors and features involved), hence Figure 2 indicates 2022 as a starting date for all four areas of intervention. By looking at the interrelation amongst the different recommendations:

Areas 1 and 4 are key pre-conditions, therefore these require swift action in the **short term** to allow the other areas to move ahead in the desired direction.

The achievement of **Area 1** is crucial, as AI is now embedded into the governance of public affairs for the common good. It would be extremely important, from a **mid-term** perspective, that all relevant stakeholders (see Annex 1 – Mapping of the Recommendations in relation to stakeholders) carry out a systematic implementation and continuative promotion of underpinning values, such as inclusiveness, trustworthiness and transparency. Any AI project should be selected on the basis of clear pre-requisites and implemented taking into account and incorporating these sets of values at early phases.

Similarly, recommendations related to **Area 4** would need to be implemented within the **medium term**. Trends suggest that before 2024 AI will be even more widespread and some AI systems will already have been implemented in the public sector for a few years. However, while many AI systems are already deployed by public organisations, influencing factors still need to be identified. There is consequently a lack of impact measurement frameworks that could be used as benchmarks for developing more contextualised and relevant models. It is time therefore to use the information available on the underlying framework conditions and influencing factors, and start measuring their impact on AI-enabled public solutions in a systematic fashion.

Area 2 and **Area 3** are expected to span over a **longer term,** in alignment with the **Digital Decade (2020–2030)**. A digital ecosystem as complex as the one under scrutiny, involves a number of operators with many diversified objectives, organisational, structural and human capacity, as well as different financial resources mechanisms. Hence, the creation of new governance models and digital ecosystems that, while revolving around the public sector, would also involve the private sector (big tech companies, SMEs and start-ups), civil society and communities of practices, are expected to require more time to establish.

In particular, for **Area 2** the creation of a proper governance of AI-based systems will require strong coordination among EU Member States and the scaling up of initiatives already in place in order to pursue this transformative process at the European level. If EU Member States intend to benefit from joint initiatives, shared operational environments, common guidelines and technical specifications (e.g., interoperability and standardisation), they should take into consideration the above set of recommendations in support to the achievement of the goals foreseen for the Digital Decade.

5 Conclusions and next steps

5.1 Conclusions

Governments are facing unprecedented socio-economic challenges to which they have to respond in a responsible, accountable fashion. Citizens are looking at them, now more than ever, as fundamental reference points and with high expectations, especially during such difficult times, which are characterised by a strenuous fight against the pandemic. The role of the public sector in responding to societal challenges is therefore even more critical, and a safe and lawful management of public governance is instrumental to meeting citizens' expectations and gain their confidence.

The very peculiar context in which public sector administrations operate, under principle-based conditions, driven by the rule of law, and within administrative law, makes the nature of the public sector distinct form those operating in private and economic sectors. The large body of literature and reports in this area somehow omit to duly take into account these unique features, thereby missing out on a number of key influencing factors, potential benefits and also risks associated to the use of AI-based solutions applied in the public sector.

In fact, although AI is a relatively new application area, a number of potential benefits stemming from the adoption of AI-enabled solutions by governments and their public administrations for the governance of the common good have been widely acknowledged. Reassurance that AI-based solutions are deployed in the most efficient and safest possible way, and in compliance with value-driven and people-centric approaches, is very important and instrumental to increase users' trust in such intelligent systems and in the public authorities deploying them.

Given this need, this handbook serves a threefold purpose: (i) to present the state of play in governmental approaches to AI adoption by the public sector, the perceived benefits and critical issues encountered; (ii) to identify common key issues to be addressed by the relevant stakeholders at different operational levels; and (iii) to provide policymakers and relevant operational stakeholders with recommendations and a number of actions to tackle the identified areas of intervention in order to promote a responsible adoption of AI by the public sector in the EU.

The recommendations and related actions provided by this handbook highlight specific requirements to be put in place over the coming years, and common issues to be addressed at early stages of development of AI-based solutions by the public sector.

To name a few:

- The need for AI-enabled solutions to **fully respect ethical, legal and administrative principles and comply with EU values and in accordance with EU digital principles**, and to develop mitigation measures to minimise unwanted consequences from the use of AI by the public sector;

- The need to **focus regulations on the use of AI, rather than on the specific technology** and its components, in order to develop fair, non-discriminatory and transparent AI-enabled public services;

- The added value in **joining forces and creating alliances** to empower users and enhance their skills, and for **earmarking resources** coherently to achieve **complementarity** of human and financial efforts at all levels;

- The need for **coordinating entities** and for **shared digital infrastructures** where users can exchange information, good practices, dedicated methodologies and replicable models to best address issues common to many operational environments, while developing and sharing **common guidelines** covering cross-cutting challenges;

- The urgency to coordinate efforts amongst stakeholders and regulatory authorities to nurture interoperability, standardisation, scalability and replicability of **reusable components**, for a swift **contextualisation**;

- The importance of **monitoring socio-economic, technical and environmental impacts**, identifying influencing factors and framework conditions underpinning sustainability, fostering **civic engagement**, and nurturing the **role of social partners**.

5.2 Next steps

From preliminary research carried out in 2020, further in-depth analysis of the national strategies has been applied together with a number of consultation exercises with experts in the field. Both, the in-depth analysis and the iterative consultation with related stakeholder communities in 2021 provided an updated picture, valuable feedback and important insights on the different aspects involved in the adoption and use of AI by public sector administrations.

Of particular help was the second peer learning workshop held on 28 October 2021, which brought together representatives from policymakers, practitioners, and the scientific and user communities respectively (Medaglia et al. 2021). The recommendations provided in this handbook were presented, discussed, integrated and further validated to stand as the basis of this work.

The indication is that the time for the public sector to engage with AI is now. To wait "until the dust has settled" means to miss out on the chances that an early engagement can bring for the public sector itself: the development of a value-based approach to the technology, and Europe's sovereignty in this important sector.

Many administrations have already answered the call and are experimenting with a number of sets of policy measures to boost AI in the public sector, thus also providing best practices that other governments can follow. In fact, during the development of this handbook much evidence has been gathered to substantiate our findings and conclusions, together with the indication that much effort has been put in place at the international, national, regional and even more at the local levels. However, as our analysis shows, and as underlined by the feedback received from our consultation with relevant stakeholders, regulations need to be streamlined and made complementary, while initiatives are scattered and would need coordination and support to sustainably become effective and achieve the intended goals.

From this perspective, more can be done at all levels of governance to boost efforts and achieve the intended results.

Policymakers, practitioners and stakeholders operating throughout the public service delivery chain at all levels can **check the strategies and initiatives undertaken by their governments** and territorial organisations, to see how the set of initiatives at the European Commission level, and the recommendations and actions presented in this handbook can serve to assess their AI readiness and foster implementation in their public administrations.

Being inspired by national strategies dedicated to the adoption of AI-based systems by public administrations throughout Europe, **this handbook is also intended as feedback to EU Member States and Associated Countries for future revisions of such strategies** in the years to come.

Finally, this handbook can **give structure to future exchanges and discussions among European public administrations** and governance bodies at large, together with all stakeholders engaged in the governance of public good, on how to cooperate in this area.

This handbook intends to be just the beginning of the journey towards a safe, lawful and beneficial adoption of AI-based solutions by the public sector. To be helpful, the handbook needs to be kept updated. To serve this purpose, we count on the continuous **mutual support and consolidated collaboration between the services of the European Commission and the stakeholders from the European countries** representing institutional, scientific, economic, operational bodies and communities of practices throughout Europe.

With this vision, we look forward to a renewed fruitful collaboration on our journey, paving the way to future research agendas in support of innovative forms of public governance that Artificial Intelligence and other emerging technologies are nowadays making possible.

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List of abbreviations and definitions

AIΓ	Artificial Intelligence
API	Application Programming Interface
B2B	Business-to-business
B2G	Business-to-government
DG CONNECT	Directorate General Communications Networks, Content and Technology
EU	European Union
EIDIHs	European Digital Innovation Hubs
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation
GovTech	Government Technology
HLEG	High Level Expert Group
HR	Human Resources
ICT	Information and Communication Technology
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Organization for Standardization
IoT	Internet of Things
IS	Information System
JRC	Joint Research Centre
NGO	Non-Governmental Organization
OECD	Organisation for Economic Co-operation and Development
P2P	Peer-to-peer
PCP	Pre-Commercial Procurement
R&D	Research and Development
RRF	Recovery and Resilience Facility
SDG	Sustainable Development Goals
SME	Small and Medium Enterprises
TED	Tenders Electronic Daily
UNESCO	United Nations Educational, Scientific and Cultural Organization
WIPO	World Intellectual Property Organization

List of figures

Annexes

Annex 1. Mapping of recommendations in relation to stakeholders

	RECOMMENDATIONS and ACTIONS	STAKEHOLDER groups: LEADING (dark grey) or CONTRIBUTING (light grey) to the Recommendations and Actions				
		EU institutions & international authorities	Central public authorities in European countries	Decentralised public administrations in European Countries	Civil society intermediaries and user representatives	R&D institutions and academia
1	Promote an EU value-oriented, inclusive, human-centric and trustworthy AI in the public sector					
1.1	Harmonise and complement EU regulations to promote human-centric and trustworthy AI-enabled public services for all citizens					
	Focus should be put primarily on the use of AI, rather than on the specific technology and its components	███	███	███	███	░░░
	Existing regulations at the EU level should act as a springboard for **alignment at national level** and, at the same time, these would need to be **contextualised** and enriched by the experience of their concrete implementation in specific contexts	░░░	███	███	███	░░░
	Efforts should be concentrated on streamlining and making sense out of the vast portfolio of existing relevant regulations	███	███	███	░░░	░░░
1.2	Promote the adoption of ethical principles, the development of guidelines and the identification of mitigating measures to minimise the risks of deployment of AI by the public sector					

	Factors to be taken into account: - The identification of **criteria** for EU-compliant applications and use of AI, beyond those applied to the related assessment of enabling underlying technologies; - The need to identify and focus on potential areas where **high risks** of AI applications are likely to occur the most, or cause the most damage; - The need to collect and scrutinise both **good and bad practices** to acquire experience and identify the necessary validation tools, methodologies, and relevant processes; - The need to carefully look into **existing guidelines**, complement them only when necessary and, above all, identify and apply mitigation measures relevant to their contexts and specific use; - The need for constant **monitoring** over time.					
1.3	Develop and promote dedicated AI-enabled solutions based on co-creation approaches to increase relevance of services and citizens' and businesses' trust and confidence in the use of AI by the public sector					
	Co-creation and iteration-based development approaches should be promoted to stimulate and reinforce active citizen involvement at early stage of development process of AI solutions, from design, to development through testing, to use and evaluation					
2	Enhance coordinated governance, convergence of regulations, and capacity building					
2.1	Create an EU-wide network of governance bodies for a streamlined management of AI in the public sector					
	Setting up a **European registry of AI Algorithms** by federating and promoting the creation of **national registries** to monitor the market around AI and help in meeting the relevant criteria set down by EU regulations					
	Set up an **Artificial Intelligence Working Group** specifically dedicated to the **public sector** at the European level					
	Member States to identify organisations at the national level to represent AI in the public sector within the EU Working Group.					
	Identify **AI champions** who would raise awareness, provide advice and assistance to local administration					

2.2 Design national and European capacity-building programmes for public sector innovators aiming to develop and/or adopt AI in support to the digital transformation of public services.	

The development of **dedicated capacity-building programmes** would grant an adequate level of independence, and higher capability to create relevant solutions for public administrations' specific needs.					
"Train the trainers" schemes within national training plans for civil servants engaged in both the commissioning of and/or direct development of AI solutions					
Develop **dedicated training modules** which are context related to support the application of EU regulations, versus national/local regulations, legal frameworks/laws					

2.3 Build upon and promote the use of regulatory sandboxes for public administrations, allowing experimentation of AI-enabled solutions in controlled environments	

Create **regulatory sandboxes** across the EU to help create a new generation of AI-supported public services					
Establish **common criteria** at the EU level for the testing of AI, following recent standardisation activities and guidelines on how to assess and test AI.					
Interfacing experimenting facilities at national and local level with international/cross-border facilities and networks, which would require the development of common criteria for cross-operationalisation					

2.4 Optimise funding in support to AI in the public sector to promote the spreading and scaling of reusable solutions	

Use international **funding** together national regional/local funds in a **complementary manner**					
Apply **scalability** as a formal precondition to benefit from EU dedicated funding to foresee AI-related activities.					
Reward the use of **instruments that would enhance innovation, replicability and scalability** (i.e., innovation procurement schemes and reusable solutions), and that apply spreading and scaling approaches at the early stages of solution development.					

2.5	Promote the development of multilingual guidelines, criteria, and tools for public procurement of AI solutions in the public sector throughout Europe						
		Develop **procurement guidelines** at the EU level, providing directions and criteria for developing national guidelines in compliance with EU principles and regulations					
		Develop of a **multilingual set** of AI procurement guidelines, in partnership with the national procurement authorities of the Member States.					
3	Build a shared and interactive AI digital ecosystem						
	3.1 Support multidisciplinary research and knowledge creation amongst European universities and R&D institutions around AI for the public sector						
		Create an "**AI research and knowledge alliance" of European universities and other research and development institutions** working with the public sector to promote the development of a common agenda and dedicated curricula for research on applications, crucial challenges, solutions, methodologies and practices regarding the use, drivers, barriers, risks and benefits of AI in the public sector					
		Earmark **funding and grants** to support dedicated research and guidance on how to produce anonymised data sets and create related registers.					
		Establish a **European federation of business schools and institutes for public administration** that could be deployed by the different European countries to develop specific curricula, and provide training on AI technologies dedicated to the public sector					
	3.2 Build a common European Data Space for public sector bodies and their operators, drawing from the compilation of relevant AI datasets and related Registries throughout Europe						
		Promote the implementation of a **Common European Data Space** for public administrations not only with data collected by the public sector, but also with other relevant data acquired from both established and emerging actors within the value chain					
		Create **AI algorithm registries**, by using catalogues of AI-enabled applications and by supporting public administrations in procuring trustworthy AI					

	Establish and activate **reference organisations for data trust and data cooperatives** to accommodate emerging forms of social innovation initiatives stemming from the civil society and relevant communities of practices					
	Set up **networks of Local Digital Twins** as an impactful exercise in support of resource efficiency.					
	Promote **EU GovTech start-ups**, bringing innovative solutions to public services					
3.2	Reinforce and advance existing initiatives on open data and interoperability					
	Provide dedicated technical and financial resources that would support the necessary efforts required for ensuring **data quality, updating, accessibility and usability** of public sector datasets					
	Raise awareness to support a better understanding from public service officials of how **sharing open data** can assist society					
	Raise awareness amongst politicians and governments of the value and potential **return of investment in data infrastructures** in terms of socio-economic benefit for society as a whole					
	Consider the support of a dedicated **API Frameworks** and **web standards**					
3.4	Share reusable and interoperable AI components at all operational levels of European public administrations					
	Share components used in the development of AI solutions for **reuse** by other public administrations on **open repositories**, following the existing building blocks and guidelines developed within EU relevant initiatives					
	Envisage **guidelines** to build reusable components based on common standards and best practices					
	Envisage **dedicated national repositories** of standards, guidelines, and performance metrics					
	Align components specifications to the areas and issues they intend to address (e.g. transport, housing, etc.) so that **dedicated directories** would help operators reuse existing component in other parts of Europe.					

	Set up an **EU AI registry based on local AI registries**, adding (when available) information and link to reusable parts like algorithms, models, and datasets.					
3.5	Create a European marketplace for GovTech solutions in support of public sector digital transformation					
	Member States join forces and synchronise actions to support innovative **GovTech companies** that can provide innovative AI applications to the European public sector.					
	Actively reach out to **innovative companies** and identify available AI based solutions they could benefit from					
	Envisage specific procurement frameworks and relevant conditions dedicated to support start-ups development					
4	Apply and monitor sustainability through value-oriented AI impact assessment co-created frameworks					
4.1	Set up an EU observatory on AI, built on a pan-European network of AI national observatories, to gather, share, and collectively manage best practices and experiences learned from different stakeholders in the public sector throughout Europe					
	Establish an AI **EU observatory** as a **one-stop shop/central repository** where public bodies and agencies from all over Europe can benefit from shared knowledge and experiences					
	EU Member States should identify relevant bodies that would act as **AI national observatories** to represent the country and actively participate in the activities of an EU observatory established at the European level and acting as a central hub of expertise on AI dedicated to public administrations.					
	Create a **pan-European network of AI observatories** dedicated to the public sector and promote its use					
	Set up an **European Registry of AI Algorithms** by federating and promoting the creation of **interoperable national registries** to monitor the market around AI, to share relevant information, and help in meeting the relevant criteria set down by EU regulations					
	Coordinate with international organisations already operating in this area (e.g., OECD, UNESCO) on critical topics such as ethics and trustworthiness, and any other cross-cutting issues.					

4.2 Develop and apply umbrella impact assessment frameworks based on key influencing factors to measure the use and impact of AI in the public sector					
Develop **umbrella impact assessment frameworks** that would be adapted and contextualised across different countries and sectors, based on key influencing factors underpinning quantitative as well as qualitative indicators, characterising impact in the specific public sector ecosystem					
Umbrella AI frameworks should link **impact assessment indicators to internationally recognised principles**, especially regarding ethics and a trustworthy use of AI					
4.3 Promote AI in the public sector in support of sustainability while developing sustainable AI, in compliance with environmental principles, and leveraging on civic engagement and participation					
Promote a catalyst role of AI for environmental sustainability to allow examples of beneficial uses of AI in different application areas					
Promote sustainable AI as a mandatory prerequisite in AI strategies of public administrations and governments, both at the international and national levels, including in public procurements frameworks, in compliance with EU values and environmental sustainability principles					
Develop and apply **certification and labelling approaches** based on common sustainability principles aligned to EU environmental policies, like the Green Deal and the United Nations' Sustainable Development Goals					
Promote **active civic engagement**, expressed under different forms of citizens involvement in the management of public good, especially when addressing common challenges and civil fundamental rights					
Develop **impact assessment frameworks in support of sustainable AI**, built on participatory practices and co-creation approaches, drawing from the knowledge and pro-active involvement of citizens and their Communities of Practices operating at the targeted level of intervention					

Annex 2. Sources in support to Recommendations

Area	#	Recommendation	Policies / regulations	Initiatives	Research literature
1	1.1	Harmonise and complement EU regulations to promote human-centric and trustworthy AI-enabled public services for all citizens	- AI Act - HLEG Ethics Guidelines for Trustworthy AI - UNESCO recommendations on AI ethics - General Data Protection Regulation		- Barocas & Selbst (2016) - Janssen & Kuk (2016) - Janssen et al. (2020)
1	1.2	Promote the adoption of ethical principles, the development of guidelines and the identification of mitigating measures to minimize the risks of deployment of AI by the public sector	- "Regulatory sandboxes and experimentation clauses as tools for better regulation: Council adopts conclusions"		- Harrison & Luna-Reyes (2020)
1	1.3	Develop and promote dedicated AI-enabled solutions based on co-creation approaches to increase relevance of services and citizens' and businesses' trust and confidence in the use of AI by the public sector			- Aoki (2020) - Asatiani et al. (2020) - Linders et al. (2018) - Savaget et al. (2019)
2	2.1	Create an EU-wide network of governance bodies for a streamlined management of AI in the public sector	- Digital Europe Programme: European Digital Innovation Hubs (EDIH)		- Harrison & Luna-Reyes (2020) - Medaglia et al. (2021)
2	2.2	Design national and European capacity-building programmes for public sector innovators aiming to develop and/or adopt AI in support of the digital transformation of public services.	- EU Interoperability Academy	- Master on AI for public services (AI4Gov)	
2	2.3	Build upon and promote the use of regulatory sandboxes for public administrations, allowing experimentation of AI-enabled solutions in controlled environments	- Digital Europe Programme: Testing and Experimentation Facilities (TEFs) - AI Act - ISA2 Programme		

Area	#	Recommendation	Policies / regulations	Initiatives	Research literature
			- ISO (International Organization for Standardization) Guidelines on the testing of AI-based systems		
2	2.4	Optimise funding in support of AI in the public sector to promote the spreading and scaling of reusable solutions	- Digital Europe Programme - Recovery and Resilience Facility (RRF)		
2	2.5	Promote the development of multilingual guidelines, criteria, and tools for public procurement of AI solutions in the public sector throughout Europe		- Tenders Electronic Daily (TED) portal - AI-powered eTranslation portal	- Chowdhury & Sloane (2020) - Moe et al. (2017)
3	3.1	Support multidisciplinary research and knowledge creation amongst European universities and R&D institutions around AI for the public sector		- Master on AI for public services (AI4Gov)	
3	3.2	Build a common European Data Space for public sector bodies and their operators, drawing from the compilation of relevant AI datasets and related Registries throughout Europe	- Coordinated Plan on Artificial Intelligence of 2021 - Public Procurement Directive (2014/24/EU) - European strategy for data (COM(2020) 66 final) - Adopt AI programme - AI White Paper	- DT4REGIONS project - City of Amsterdam Algorithm Register	-van Noordt & Misuraca (2020)
3	3.3	Reinforce and advance existing initiatives on open data and interoperability		- European Data Portal (EDP): high value datasets	-van Noordt & Misuraca (2020)
3	3.4	Share reusable and interoperable AI components at all operational	- Digital Europe Programme:	- AI4Europe	- Campion et al. (2020)

Area	#	Recommendation	Policies / regulations	Initiatives	Research literature
		levels of European public administrations	European Digital Innovation Hubs (EDIH)	- European Connecting Europe Facility	
3	3.5	Create a European marketplace for GovTech solutions in support of public sector digital transformation	- Art. 32 of Directive 2014/24/EU		
4	4.1	Set up an EU observatory on AI, built on a pan-European network of AI national observatories, to gather, share, and collectively manage best practices and experiences learned from different stakeholders in the public sector throughout Europe	- INSPIRE initiative	- Local and Regional Digital Indicator (LORDI) framework - OECD.AI policy observatory	- Annoni et al. (2018)
4	4.2	Develop and apply umbrella impact assessment frameworks based on key influencing factors to measure the use and impact of AI in the public sector	- Assessment List for Trustworthy AI (ALTAI) - HLEG, Ethics guidelines for trustworthy AI - OECD AI Principles - UNESCO Recommendation on the ethics of artificial intelligence - ECP Platform for the Information Society Netherlands, AI Impact Assessment & Code of Conduct		-van Noordt & Misuraca (2020)
4	4.3	Promote AI in the public sector in support to sustainability while developing sustainable AI, in compliance with environmental principles, and leveraging on civic engagement and participation	- OECD, Towards Green ICT Strategies - European Commission, Best Practices in Citizen Science for Environmental Monitoring - European Green Deal - UN SDGs	- JRC Code of Conduct of Data Centres - AI4CITIES	-Dhar (2020) - Lacoste et al. (2019) - Strubell et al. (2020) - Schwartz et al. (2019)

Annex 3. Summary table of AI National Strategies

COUNTRY	STRATEGY STATUS	PUBLICATION DATE	REVISED DOCUMENT – LINK
AUSTRIA	**Yes**, Austria has released its AI strategy	September 2021	link
BELGIUM	The Belgian federal strategy is still under draft[98]	N/A	N/A
BULGARIA	**Yes,** Bulgaria has released its AI strategy	December 2020	link
CROATIA	Croatia has no AI Strategy yet	N/A	N/A
CYPRUS	**Yes**, Cyprus has released its AI strategy. The document is in Greek.	January 2020	link
CZECH REPUBLIC	**Yes**, the Czech Republic has released its AI strategy	May 2019	link
DENMARK	**Yes**, Denmark has released its AI strategy	March 2019	link
ESTONIA	**Yes**, Estonia has released its AI strategy	July 2019	link
FINLAND	**Yes**, Finland has released its AI strategy	October 2017	link
FRANCE	**Yes**, France has released its AI strategy	March 2018	link
GERMANY	**Yes**, Germany has released its AI strategy[99]	November 2018	link
GREECE	Greece has not published an AI strategy yet[100]	N/A	N/A
HUNGARY	**Yes**, Hungary has released its AI strategy	May 2020	link
IRELAND	**Yes**, Ireland has released its AI strategy	July 2021	link
ITALY	**Yes**, Italy has released its AI strategy	November 2021	link
LATVIA	**Yes**, Latvia has released its national AI strategy	February 2020	link
LITHUANIA	**Yes**, Lithuania has released its AI strategy	April 2019	link
LUXEMBOURG	**Yes**, Luxembourg has released its AI strategy	May 2019	link
MALTA	**Yes**, Malta has released its AI strategy	October 2019	link
NETHERLANDS	**Yes,** the Dutch government released its strategic action for AI	October 2019	link
NORWAY	**Yes,** Norway has released its AI strategy	January 2020	link
POLAND	**Yes,** Poland has released its AI strategy	Dec 2020	link
PORTUGAL	**Yes**, Portugal has released its AI strategy	June 2019	link
ROMANIA	Romania has not published an AI strategy yet	N/A	N/A
SLOVAKIA	**Yes**, Slovakia has included its AI strategy as part of its Digital Transformation Strategy	October 2019	link
SLOVENIA	**Yes**, Slovenia has released its AI strategy	June 2021	link
SPAIN	**Yes**, Spain has released its AI strategy. The document is in Spanish.	December 2020	link
SWEDEN	**Yes**, Sweden has released its AI strategy	May 2018	link
SWITZERLAND	Switzerland has not released its AI strategy yet	N/A	N/A
UNITED KINGDOM	**Yes,** the United Kingdom has released its AI strategy[101]	April 2018	link

Note. Last update November 2021

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[98] Belgium has released the AI 4 Belgium document which is the latest preparatory document acting as input for the Belgium Federal AI Strategy.
[99] Germany has also published an updated AI Strategy in December 2020.
[100] Greece has published a document on the "Digital Transformation Bible 2020-2025", which includes policy proposals on the digital transformation of public administrations.
[101] The UK released an updated strategy in September 2021 (link)

Annex 4. Extract of findings from the survey on "Use and impact of AI in the public sector"

The data reported below has been extracted from the responses to a survey titled "Use and impact of AI in the public sector". The survey was carried out between March and July 2021.

The survey targeted Member States' practitioners of public administrations at all levels for both internal use and for outreaching to businesses and citizens, with the objective of collecting data from ongoing AI projects in the public sector in support of the recommendations included in this handbook. The survey included questions on the purpose of the AI-based solutions known by the respondents, the policy areas for which the solution has been developed, its degree of automation, the perceived factors influencing adoption, and the perceived actual or expected impacts, risks, and likelihood of permanent implementation.

The survey had 58 respondents.

Area 1. Promote an EU value-oriented, inclusive and human-centric AI in the public sector

The responses from three of the dimensions investigated by the survey provided direct support to some of the recommendations in the Area of Intervention 1 (Promote an EU value-oriented, inclusive and human-centric AI in the public sector). Survey data from these items indicate that only a small portion of AI-enabled solutions addressed accessibility of information by the general public. This is an additional element that substantiates recommendation 1.1 ("Harmonise and complement EU regulations to promote fair, non-discriminatory and transparent AI-enabled public services for all citizens").

Can the following parts of the AI-enabled solution be **accessible by the public**?
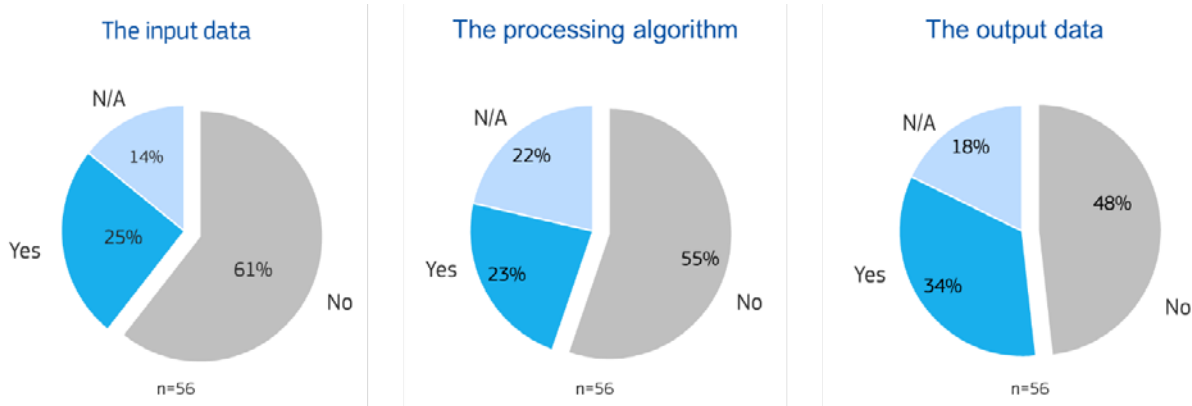
Moreover, the survey findings show that citizens were only rarely involved in the planning (19% of the respondents) and piloting (26%) of AI-enabled solutions, and that most public administrations do not expect AI-enabled solutions to enhance citizens' influence on government actions and policies (73%). The lack of citizen involvement and, conversely, the need for co-creation, is the rationale for formulating recommendation 1.3 ("Develop and promote dedicated AI-enabled solutions based on co-creation approaches to increase citizens' and businesses' relevance and confidence in the use of AI by the public sector").

Were **citizens** involved during the **different phases** of the AI-based solution?
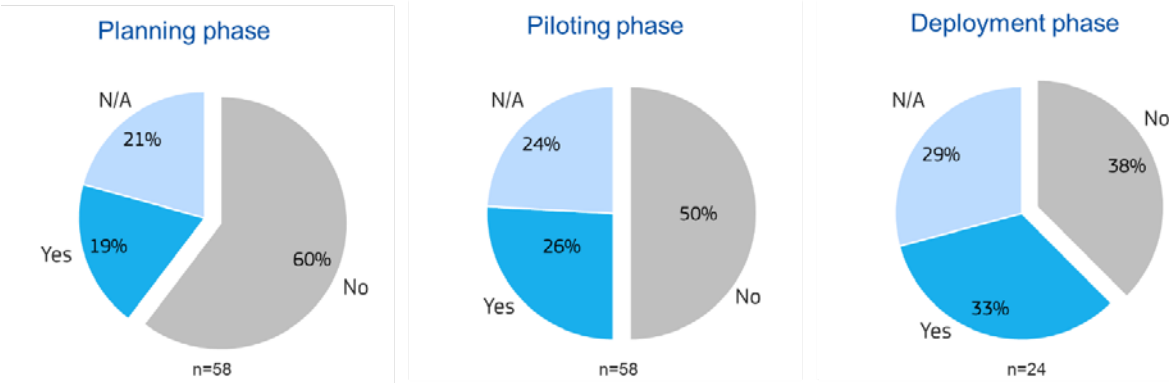
In your opinion, what is the **expected effect** of the AI-enabled solution on citizens' **influence** on government actions and policies?
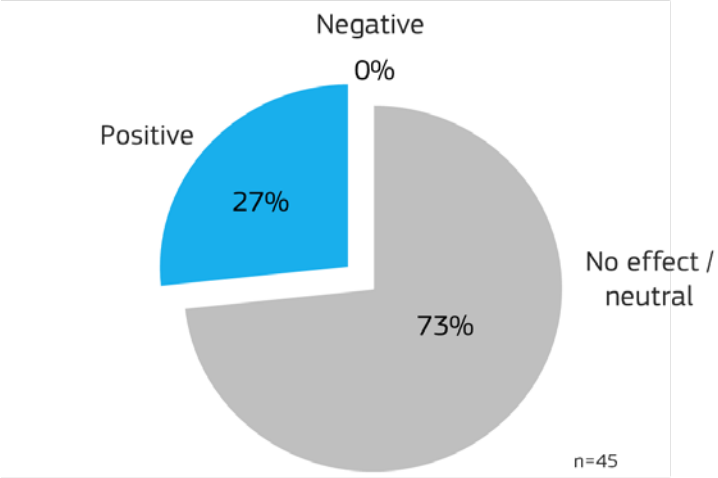
Area 2. Enhance coordinated governance, convergence of regulations and capacity building

Findings from two dimensions covered by the survey support recommendations in Area 2 (Enhance coordinated governance, convergence of regulations and capacity building). A survey question on the operational level of government in which AI-enabled solutions are adopted shows that the vast majority of initiatives take place at the national level (47 out of 58 responses), and much fewer at the municipal, regional and supranational levels. This unbalanced awareness of initiatives across levels of government calls for an increased effort to improve information exchange and coordination within and amongst Member States, while disseminating good practices of AI throughout the EU: this is the rationale of recommendation 2.1 ("Create an EU-wide network of governance bodies for AI in the public sector").

In which **level of government** does the AI-enabled solution take place?
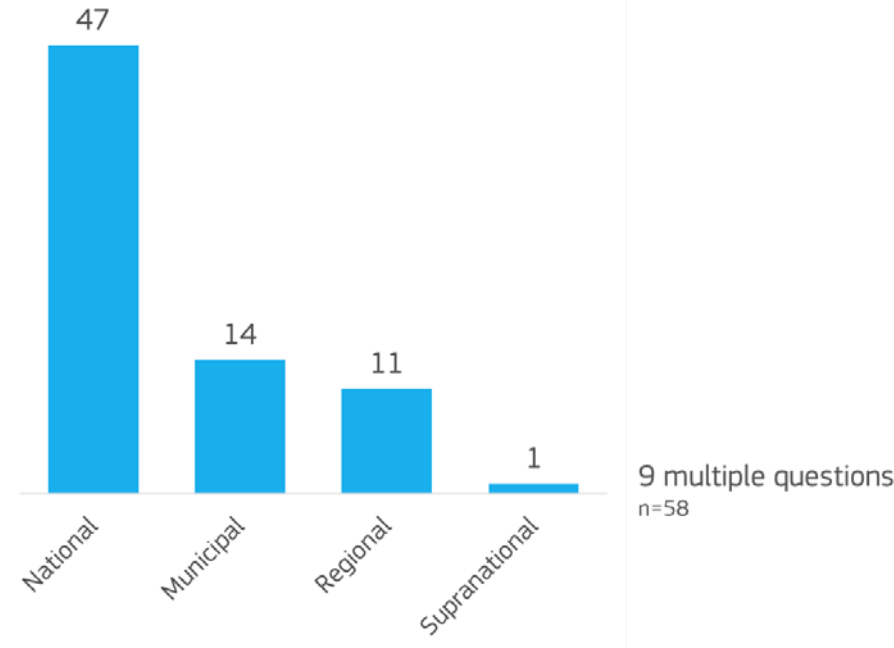
Findings from another item in the survey showed that the digital literacy of employees using AI systems and the presence of in-house expert AI knowledge is rather low on average (respectively 2.9/5 and 3.1/5).

Survey data indicate that there is a fragmented situation, with AI projects divided almost equally between organisations with digital literacy and in-house knowledge and cases where there is a lack of these elements.

This calls for a systemic approach envisioned in recommendation 2.2. ("Design national and European capacity-building programmes for public sector innovators aiming to adopt AI in support of the digital transformation of public services").

How would you assess the availability of the following **resources** in the organisation?

Digital literacy of employees using AI systems

Average: 2.9

n=51

In-house expert AI knowledge

Average: 3.1
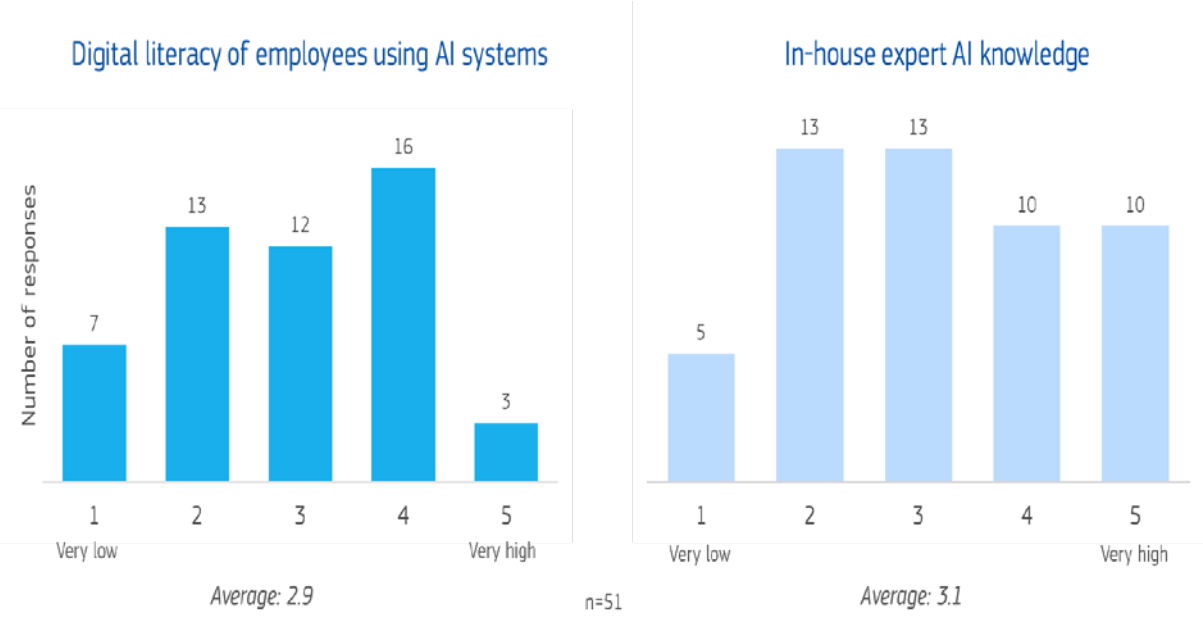
Area 3. Build a shared and interactive AI digital ecosystem

Survey data on the advancement status of AI projects show that a large portion (41%) of the respondents indicate that they are involved in projects that have moved beyond the planning and piloting phases, and are already deployed.

The increasing availability of deployed solutions is the necessary condition for establishing the sharing of reusable and interoperable AI components (recommendation 3.4 – Share reusable and interoperable AI components at all operational levels of European public administrations), and for building a common European Data Space (recommendation 3.2 – Build a common European Data Space for public sector bodies and their operators, drawing from the compilation of relevant AI datasets throughout Europe).

What is the current **status** of the AI-enabled solution?

n=58

67
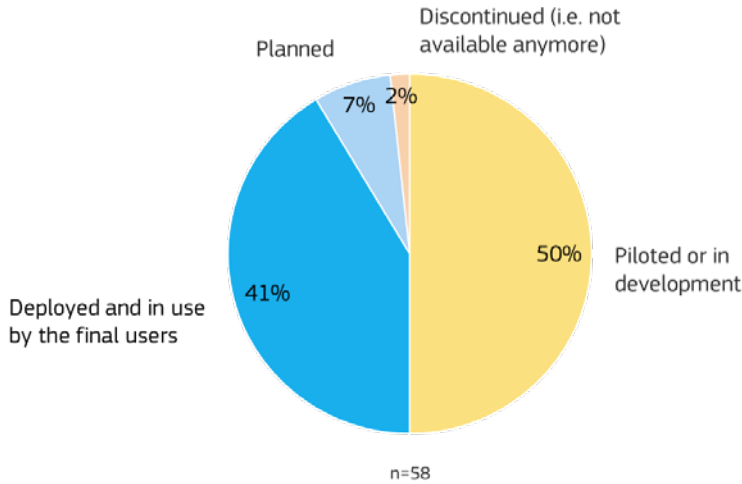
Area 4. Apply value-oriented AI impact assessment frameworks

For this area, survey data point to the need for recommendation 4.3 ("Support Green AI in the public sector in compliance with environmental sustainability principles, and promote civic engagement to that end"). In fact, the majority of survey respondents indicate that they do not expect any effect from the AI-enabled solution on the natural environment – for instance on levels of energy consumption – (63%) showing a lack of awareness of the relations between AI and environmental sustainability.

In your opinion, what is the **expected overall effect** of the AI-enabled solution on the natural environment (e.g., energy consumption)?
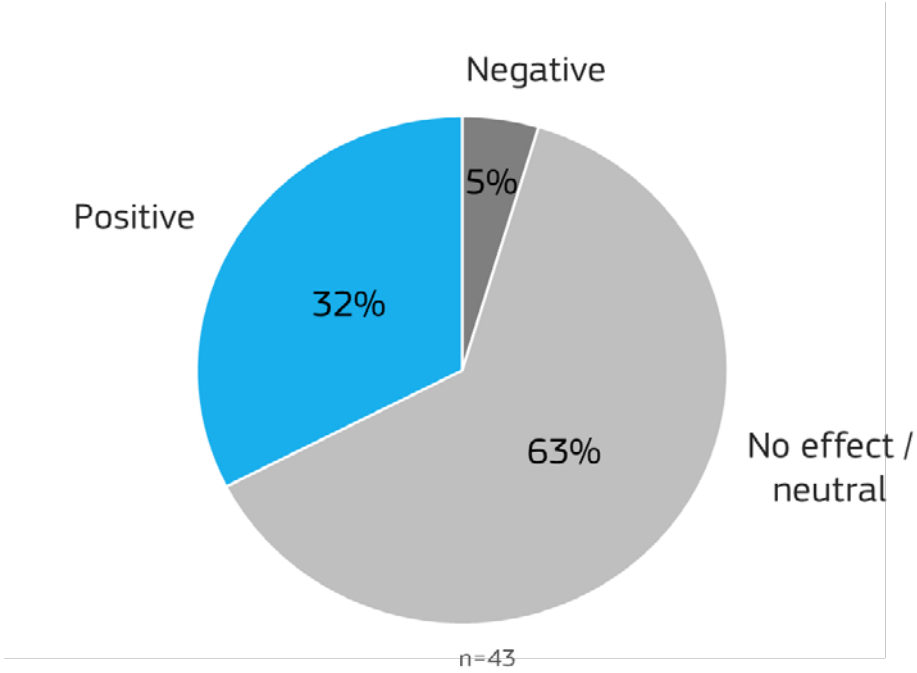
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