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What Next?

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Abstract

This chapter covers what action needs to be carried out to gather together solutions to the issues which were discussed, in order to make progress towards having a European model for the data economy. Follow-up activities are suggested and these would focus around establishing a core group of cities to collectively act as a lighthouse. There will be a focus on how to introduce personal data into the smart city data mix, in order to meet aspirations to become climate-neutral by 2030. Determining the value of data, through developing the "story of data within a smart city", would be one such activity. This, in turn, would help to answer some of the unresolved issues around producing business models for data platforms, whilst having a raft of exemplars and guidance coming from the projects contributing to this book to build upon and to be able to utilise the tools they have developed. The overall goal is to create the critical mass of citizens who would be willing to share their personal data within a smart city, which would give a boost to local data economies and make the likelihood of having a European model dominating. And, of course, the smart cities themselves would benefit with improved services and better informed decision-making and potential revenues for themselves and the local data economy.

17.1 Moving Towards a European Model for the Data Economy

Currently, the dominant non-European data economy model has a commercial focus and is not designed to maximise social and economic impacts for

a city and its citizens. In this model, cities may even have to purchase back their own data, whilst the personal data of its citizens also risk to be exported outside Europe, for corporate gain.

This is clearly recognised in all that is being done by the European Commission to hasten the emergence of a true European data economy model in line with EU values that take account of social and public needs.[1]

"As data becomes the new fuel of the economy and a key asset to address our societal challenges, the EU cannot afford to have the data of its businesses, public sector and citizens stored and exploited largely outside its borders. This is affecting not only our economic performance but also our security, safety and sovereignty. As announced in the EU data strategy, the EU has the means to become the world's most secure and trustful data hub".[2]

17.2 The Focus for Follow-up Activity

If we are aiming to radically change the existing situation, all the available tools must be utilised with regard to making a citizen's personal data more accessible and able to help realise the European vision.

Many of these tools have been described in previous chapters. Many more will be emerging from current and planned projects. Solutions and approaches are being suggested from legal, governance, interoperability, and business model perspectives.

Whilst having no pretensions of offering a joined-up and all-embracing solution to all the necessary requirements, we can suggest a starting point. In the tradition of developing lighthouse projects, a group of cities should gather to compare notes, share experiences, and move forward together as a team, to tackle all the issues focused upon in this book, along with other emerging issues.

- It should fit within and be helped by all the existing supporting activities and networks.
- It should act not simply as a guide to other cities but as a mechanism for them to join and share the value that such a group should be able to create, with the right conditions in place.

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[1] "Communication: A European strategy for data," European Commission, p. 35, Feb. 2020, Accessed: Jul. 25, 2022. [Online]. Available: https://ec.europa.eu/info/sites/default/files/communication-european-strategy-data-19feb2020_en.pdf

[2] "European data strategy - European Commission." https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/european-data-strategy_en (accessed Jul. 25, 2022).

- It should come up with answers as to how revenues may be generated and shared to drive forward the agenda.
- It should determine the most appropriate governance arrangements for such a grouping.
- It should push business models towards achieving the wider goals necessary for achieving climate neutrality.
- And it should strive to utilise the personal data of its citizens, to increase citizens input into the development of their smart and climate-neutral cities.

17.3 The Story of Data

We have covered the local data economy and finance platforms and elaborated on the evolution of business models within a smart cities and a data ecosystem context. But, all is built upon sand without a better understanding of what data, as a non-rival good, is actually worth. Chapter 14 goes into considerable depth regarding the problems faced in attempting to put a value on the use of data, in the midst of a wide range of existing and often contradictory ways of doing this.

As Safe-DEED concluded: "Finally, when reporting the value of data, we recall the observations made of Slotin *et al*. with respect to the efficacy of impact-based approaches to data valuation[3].The success of these approaches consists in the fact that they are able to tell compelling stories based on data and connect them to clear outcomes and contexts. This is also echoed by the Data Narratives approach,[4,5] which acknowledges that "the value of big data is not data, but the narrative that it generates and supports".

Safe-DEED recognised that this entire narratives approach is very interesting. "Starting from the story (the communication) itself, and define the information needs, which in turn defines the kind of analyses that can be

[3] J. Slotin, "What Do We Know About the Value of Data?" Accessed: Jul. 25, 2022. [Online]. Available: https://www.data4sdgs.org/sites/default/files/services_files/Value%20of%20Data%20Report_Final_compressed_0.pdf

[4] K. J. Hammond, "The Value of Big Data Isn't the Data," Harvard Business Review, 2013, Accessed: Jul. 25, 2022. [Online]. Available: https://hbr.org/2013/05/the-value-of-big-data-isnt-the

[5] M. Bergdahl et al., "Handbook on Data Quality Assessment Methods and Tools," EUROPEAN COMMISSION EUROSTAT, 2007, Accessed: Jul. 25, 2022. [Online]. Available: https://millenniumindicators.un.org/unsd/dnss/docs-nqaf/Eurostat-HANDBOOK%20ON%20DATA%20QUALITY%20ASSESSMENT%20METHODS%20AND%20TOOLS%20%20I.pdf

performed with the facts at hand. Finally, the required facts define how you are going to derive these elements of information from the data you have".[6]

Attention was drawn to the fact that "Data wrapped in stories are 22 times more memorable than bare facts".

Safe-DEED also recommended that we need to focus also on "reporting the results either by well-documented subsequent aggregations, by implementing a labelling/certification system"[6]. A common and joined up way of understanding the value of data within the smart cities environment is well worth pursuing. It was pointed out that research focused specifically on contexts for data value being almost non-existent.

Elaborating this "Story of data", working back from why the data is required, will also have the effect of educating the demand side of the equation. Having a description of the need for data in an understandable way from the point of view of service deliverers particularly can help to add the "Why?" regarding the gathering of data. It would promote "buy-in" at the city level and it would give a process to enable individual cities to make a start and focus on the elements of most interest to them, allowing for bespoke solutions as opposed to one size fitting all.

The situation we would like to get to would be a common cooperative ground with a more focused approach, with a stronger focus on net zero. This would co-exist with the current re-focusing of such initiatives as the Smart Cities Marketplace to adjust to the demands of the 100 cities approach. How can adding personal data into the mix support the planning for carbon-neutrality? A start would be in telling the compelling stories and connecting data to contexts and clear outcomes, highlighting the impact of good or bad data.

We have looked at the teams that would need to be assembled from a wide range of expertise in order to fully utilise personal data in the overall data mix. Mihnea Tufis adds to the list in Chapter 14, teasing out the more precise skills which would be required, whilst pointing out that by cities collaborating, resources need not be duplicated. He further added seven key recommendations for cities to follow, as well as a range of tools to start the process.

17.4 Business Models

Chapter 11 covered the evolution of business models in this area, with other chapters covering the local data economy and financial platforms.

[6] M. Tufiș, "D4.3 Report on context-aware and context-unaware valuation Status Final," 2020, Accessed: Jul. 25, 2022. [Online]. Available: www.safe-deed.eu

If we are to succeed in having a European model, with data and associated revenues and social value remaining in Europe, then there is a need to scale up. A critical mass of citizens will need to agree to share their data, under their own conditions, securely and with reward where that may be expected.

RUGGEDISED[7] made some interesting contributions to this chapter and included elucidating on the role of the network manager for a data platform. A key additional function described was the role of growing the ecosystem. "Ecosystem nurturing capability is the ability of the platform managers to nurture adoption and use of the platform as well as on-going collective innovation and exploration of new business models for the growth of the platform ecosystem".[8]

Further, the suggestion as to how to grow this network was made. "A lesson to be learned when dealing with attracting personal data to a platform is the requirement to reach a critical mass. Final revenues for a platform are equally dependent on a successful recruitment strategy which could entail cross-subsidising, with a pricing structure to support this".[9,10,11]

"It is expected that the establishment of the right pricing structure by the platform manager influences the adoption decisions of platform users and supports network effects within a platform ecosystem".[9,12]

Just the 100 climate-neutral cities represent 75 million people, well over 10% of the EU population.

Success in moving towards a critical mass will require the kind of governance arrangements discussed in Chapter 14, covering the governance

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[7] "RUGGEDISED - Smart city lighthouse project." https://ruggedised.eu/smart-solutions/smart-solutions-overview/ (accessed Jul. 22, 2022).

[8] M. A. Jeusfeld, C. Quix, and M. Jarke, "Design and analysis of quality information for data warehouses," Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), vol. 1507, pp. 349–362, 1998, doi: 10.1007/978-3-540-49524-6_28/COVER

[9] P. B. Crosby, "Quality Is Free: The Art of Making Quality Certain," 1979.

[10] F. de Amicis, D. Barone, and C. Batini, "An Analytical Framework to Analyze Dependencies Among Data Quality Dimensions.," in Proceedings of the 2006 International Conference on Information Quality, ICIQ 2006, Jul. 2006, pp. 369–383.

[11] T. Gebru et al., "Datasheets for Datasets," Commun ACM, vol. 64, no. 12, pp. 86–92, Mar. 2018, doi: 10.48550/arxiv.1803.09010.

[12] J. P. Carrascal, C. Riederer, V. Erramilli, M. Cherubini, and R. de Oliveira, "Your Browsing Behavior for a Big Mac: Economics of Personal Information Online," in Proceedings of the 22nd International Conference on World Wide Web, 2013, pp. 189–200. doi: 10.1145/2488388.2488406.

of personal data for the public interest being discussed and implemented according to local conditions but also fitting into a wider structure to reap the benefits of scale. In an ideal situation, this would include a discussion on how to utilise any revenues generated in addition to the benefits accruing in fulfilling the requirements established by a city.

With such a growing ecosystem, the local data economy would have a stimulus and the opportunity to flourish. But this would require the technical support for the wide range of tools used in developing such an ecosystem. "From a technical perspective, a platform should also provide business model support tools to enhance the economies of scope by encouraging new communities (e.g., data-driven start-ups, developers, and established firms) to join the platform ecosystem in order to explore new business opportunities, or to enhance their existing business models".[8]

Having the technical support tools such as application programming interfaces and software developer kits allows access and interaction with the platform and mediates between the platform and its users and so helps the local data economy by opening up new business opportunities within the ecosystem. Most of the projects referred to will have their own repositories of manuals and documents to support their software to smooth take-up.

17.5 A "Personal Data-Smart Cities" Group

Such a group would seek to provide a focus for primarily demonstrating all the best practices in utilising personal data in a city, aided by the existing support mechanisms, which would result in a focused joined-up approach by default, given the core focus for the group of cities which would comprise the group, but also providing a mechanism to take the lessons forward, enhanced with the new inputs from the support initiatives. This would have an aligning effect and potentially be self-financing.

The European Commission, in establishing the larger group of "100 Climate-neutral Cities by 2030", aims to exploit the cities' access to capital, know-hows, and economies of scale for the development to pilot and scale up green innovations. Green initiatives can be piloted and these cities will function as an innovation hub and showcase for the rest of Europe to follow and become climate neutral by 2050.

The "Personal Data-Smart Cities Group" would be able to contribute with a "specialist knowledge" to help achieve these aims.

An example of an approach that could be adopted is that of Viable Cities, which is developing new form of initiative to drive systems innovation

for transformation in line with the mission of achieving climate-neutral cities by 2030.[13]

"A system demonstration is a controlled method for testing sustainable systems transition consisting of a combination of innovative solutions in a real-world environment –and with consideration for the context in which it is intended to function. This involves working with multiple levers of change (business models, regulation, forms of governance, behaviour, technology, etc.) based on a specific geographical environment or defined challenge area, in order to learn and build a portfolio of interventions that help to learn and change real-world systems. This is always with the aim of accelerating the climate transition in cities and co-benefits from climate transition such as improved health, more jobs and new business opportunities. It is, not least, a matter of mobilising investment and creating opportunities to scale up and disseminate the measures that prove effective in making the climate transition happen".[13]

For example, an experimentation based around the "story of data" would fit such an approach.

Such an initiative would not seek to replicate or replace anything which currently is serving the purpose of supporting the drive towards making EU cities carbon neutral. But a focal point whereby a small number of cities will specifically look at the issue of how best to utilise a citizens personal data in order to drive forward and enhance urban platforms and digital twins, etc., will generate a specific resource for the supporting networks to draw on.

Net-Zero Cities[14] is a project supporting the European Union's Green Deal[15] and has been designed to help cities overcome the current structural, institutional, and cultural barriers they face in order to achieve climate neutrality by 2030. In this capacity, it is supporting the "100 Climate-neutral Cities".[16]

It will help European cities by providing them with the support and solutions they need to achieve their Net-Zero goal in a socially inclusive way. The "Personal Data-Smart Cities" would be able to complement and contribute and benefit from this work.

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[13] "Viable Cities." https://en.viablecities.se/# (accessed Jul. 25, 2022).

[14] "Net Zero Cities." https://netzerocities.eu/ (accessed Jul. 25, 2022).

[15] "A European Green Deal - European Commission." https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en (accessed Jul. 25, 2022).

[16] European Commission, Directorate-General for Research and Innovation, Gronkiewicz-Waltz, H., Larsson, A., Boni, A., et al., "100 climate-neutral cities by 2030 - by and for the citizens : report of the mission board for climate-neutral and smart cities", Publications Office, 2020, https://data.europa.eu/doi/10.2777/46063

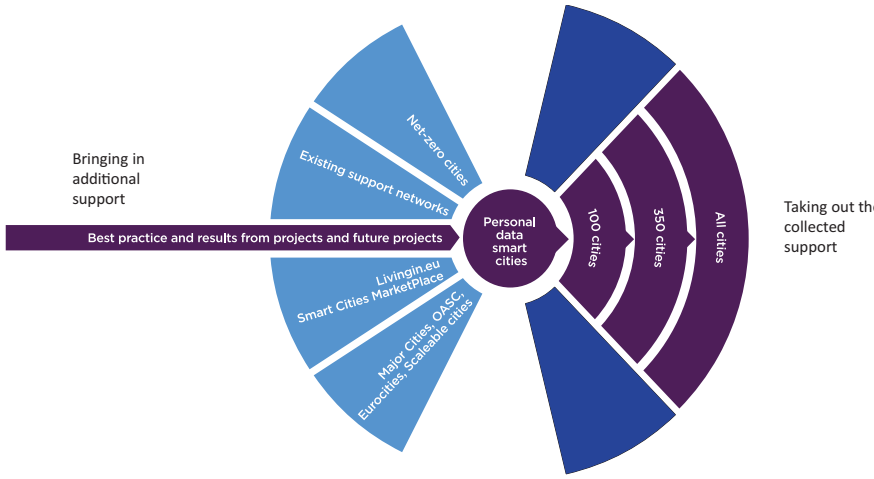

Figure 17.1 Role for a group of personal data-smart cities.

All the various supporting activities would become more valuable if they were to be focused on creating an excellent demonstration platform for the use of personal data and, in turn, would reap the benefits of the outcomes of this activity to use in their work into the future.

17.6 Citizen Engagement

Operational approach: Citizen's engagement should be an objective from the start as citizen use and acceptance supports the overall value creation for urban data platforms. Research in RUGGEDISED has not clearly identified when to include citizens, but it is encouraged to plan that engagement – whenever it may appear – from the beginning. Chapter 16, "Data-driven and Citizens' Inclusive Smart Cities", has focused on the citizen's role, whilst there are examples in Chapter 4 on how current uses of personal data can improve citizen's input into running a city. This is a topic to be further refined and improved in order to make a valuable tool. Simple consultation processes can be enriched by encasing them with additional personal data.

Regarding greater citizen participation, the previous chapter drew attention to the Net-Zero platform being a digital platform to monitor in the coming years to help meet the challenge of having a more focused approach towards citizen engagement within climate neutrality policies in urban contexts. And, further, several new projects will be announced to tackle issues arising from the development of new technologies, challenging individual values including privacy and accountability, equality and fairness, whilst looking

at how to harness the technologies for inclusive and fair civic engagement and democratic participation, with the demonstration activities worthwhile following.

Chapter 10 looked at what is in the pipeline and what should be in the pipeline regarding the standards that need to be in place for citizens to have a consistent experience and not to be side-lined. A view on further needed actions was provided to enhance citizen services, including the data aspects, citizen-oriented management of local authorities, and citizens' security.

17.7 Governance

The first chapter in this volume sets out methods to steer future technical developments in the direction of Utopia and away from Dystopia. The first of four conditions identified is in the process of being met and of having the right privacy-enhancing technology that respects human rights and ensures responsibility. A steer had been given in Chapter 13 to the governance models suited for taking the direction towards "Utopia" in having "The right governance to implement the strategies that mitigate the 'regression to dystopia'" along with a set of recommendations towards having the right leadership, ethics and values from citizens and institutions to obliterate the digital divide and safeguard human rights. Having the right research to fully understand digitalisation and the behavioural, economic and political dynamics of our augmented humanity is needed whilst having a group of cities willing to be at the forefront of showcasing the outputs of this research can provide a focal point.

In Chapter 13, Marina Micheli indicated the models for governing the data ecosystems emerging, with one of them suggesting that local public administrations could play a key role in addressing power unbalances of the current data landscape acting as trusted data intermediaries and enabling the use of citizens' personal data for the public interest. She pointed out that such a model was still at a prototype stage, but the potential for utilising it is there, acting as a source for inspiration on how best to progress in the public interest. A recommendation was to "form or join alliances between cities which would enhance their opportunities to access, use and better govern (personal) data for the public interest".

Attention was paid to outlining the new skills and roles which would be required to overcome current barriers to progress, one of which is the emergence of "data stewards" in cities. This was initially a recommendation from the high-level expert group on B2G data sharing and described "individuals or teams that are empowered to proactively initiate, facilitate and coordinate"

data sharing.[17] Their role would be to systematise data partnerships and scale efforts; hence, they will have the expertise for promoting data access, sharing, and management.

This would be consolidated by incorporating the job-description of such a facilitator as set out in Chapter 11, in which the need for managers to also look at growing an ecosystem and realising the potential of reaching a critical mass of cities collaborating and subsequently producing revenues to escalate the process.

With regard to the suggested group of cities, ideally, a team would consist of these managers as well as representatives of those working within a public administration and assisting the leadership in the disciplines which this book has attempted to make a start in covering. They would be lawyers, economists, service providers, strategists, technicians, and, of course, those in control of the emerging data ecosystems.

Peer-to-peer relations of officers at a similar level have been shown to be productive. Teams from a variety of disciplines, collectively addressing the issues, may help remove obstacles before they present themselves. But these teams would also benefit with academic participation to capture the lessons to be learned and subsequently to be shared by participating in the process as it evolves as active members, and subsequently contribute to research. The intention would not to be having a "possessor" of a good practice passing it down to others but for all to move forward collectively.

17.8 Interoperability

Interoperability is crucial if an ecosystem is to flourish and a critical mass of cities and citizens are to be involved. Whilst Chapter 7 covered the MIMS approach, Chapter 8 looked at interoperability within the health sector in a city, and Chapter 9 described a case study for demonstrating the MIM4 approach to interoperability between several existing projects and initiatives, including DataVaults, KRAKEN, and MyData. The context is set for local data sharing ecosystems, where data from many different agencies can be brought together to enable the city to be managed in a more holistic way. It points out that this requires technical, information, and organisational interoperability and provides a list of some of the specific areas where interoperability is needed in such an ecosystem. It then places this

[17] European Commission, 2020. Towards a European strategy on business-to-government data sharing for the public interest. Final report prepared by the High-Level Expert Group on Business-to-Government Data Sharing, at https://op.europa.eu/en/publication-detail/-/publication/d96edc29-70fd-11eb-9ac9-01aa75ed71a1

within the European Policy Context. The concept of minimal interoperability is then dealt with as a way of enabling small- and medium-sized cities and communities to put in place "good enough" interoperability mechanisms to enable effective data sharing without requiring excessive time or resources to implement. The chapter closes by reviewing the minimal interoperability mechanisms being developed by Open and Agile Smart Cities that are incorporated within the Living-in.EU initiative, thus helping to bring consistency into the marketplace.

However, there should be no limit as to how many other projects and initiatives could join in such experimentation, supporting the development of a critical mass of users, with its benefits to any business case.

When considering why you would want to have a project covering the use of the personal data from a football club's supporters to be compatible with a project dealing with the logistics within a port, there may not be an obvious answer. But if you add into the equation, tackling the problems of traffic in a city, then having the experiences from the travellers going to a match, alongside all the data about lorry movement, etc., then a local traffic strategy could benefit. But, looking at it from a perspective of a growing ecosystem, most cities on the list of 100 carbon-neutral cities will have a football team and many of them are ports. Consolidating the use-cases will make all more attractive and increase the likelihood of gaining a critical mass of users. A talented designer would have work to do in illustrating such a snowball effect!

17.9 Legality

It is also clear that the potential legal obstacles are being tackled. As Chapter 15, covering the legal and ethical aspects, pointed out, vast reforms are underway and an update of the European regulatory landscape was announced in terms of the Commission's Mission Statement for 2019–2025. Especially, some of them are expected to be significant for the deployment and use of personal data platform. The EC aims at renewing its overarching framework to achieve the proper balance between the wide availability and use of data with the high preservation of privacy, security, safety, and ethical standards. Aspects related to data ownership and data governance are going to be addressed and/or reframed. The strategy is motivated by the need to put people first in developing technology and to defend and promote European values and rights in how the technology is designed and deployed in the real economy and it sets out a programme of policy reforms, already started with the Data Governance Act, the Digital Services Act, the Digital Markets Act, and the Cybersecurity Strategy.

17.10 On the Horizon

2030 is no time away for the 100 cities to become carbon-neutral. Meeting this ambitious target will also mean the adoption of the emerging technologies, be they related to energy, mobility or in our case optimising the usage of data of all kinds, augmented by personal data, will also mean a requirement to rapidly introduce these technologies, immediately they are functional. Any delays which have often occurred in the past between the development of technology within a project and its eventual deployment need to be reduced in the current circumstances.

Whilst this work has concentrated on bringing the results from a wide range of projects having just finished or are due to finish or having results available to share, we must take cognisance of what is on the Horizon. Given the urgency of requiring drastic action quickly in order to achieve net-zero, we cannot afford to build into the time schedule any delay between a project delivering their findings and then these results taking a further period of time before they are deployed.

For example, it is necessary to monitor and engage with the projects announced as a result of the call for projects under the Horizon Programme Call "World Leading Data and Computing Technologies 2022 (Horizon-CL4-2022-Data-01)".[18]

The emphasis is on the development and demonstration of practical and mature end-to-end systems, building on the results of work on data platforms (topic H2020-ICT-13-2018-2019), privacy-preserving technologies, and computing technologies under Horizon 2020 and this programme. Much of this work on data platforms was carried out by projects referred to in this work.

The new projects about to start late in 2022/early 2023 are expected to contribute to the following expected outcomes:

> "improve the digital technologies, solutions and interoperable frameworks for data markets and data economy (e.g. industrial, administrative and societal/cultural data platforms/data spaces), allowing for data assets to be discoverable, efficiently and fairly priced and shared/traded in a secured, user-friendly, compliant and energy-efficient

[18] "Funding & tenders. Technologies and solutions for data trading, monetizing, exchange and interoperability (AI, Data and Robotics Partnership) (IA) - TOPIC ID: HORIZON-CL4-2022-DATA-01-04."https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/horizon-cl4-2022-data-01-04 (accessed Jul. 25, 2022).

> way; promote the development of a European industrial ecosystem of the data economy capable of ensuring digital autonomy; develop training material to endow workers in this occupational group with the right skillset in order to deploy the new technologies".[17]

The focus of these new projects is on technologies, solutions, and frameworks that facilitate the collection, sharing, storing, processing, trading, and re-using of data in compliance with the legal framework and satisfying the needs, expectations, and rights of the data providers, brokers, users, and data subjects.

They have to create practical and scalable solutions for handling large amounts of transactions while minimising energy consumption is necessary (e.g., smart and automated contracting, data rights management, and tracking of subsequent data use). They will be paying special attention to fostering approaches that ensure data and metadata interoperability, including the application of appropriate standards, reference architectures, common ontologies, vocabularies, and data models allowing smooth data sharing and this also across sectors.

These projects will also be expected to develop and support data spaces of realistic scope and size, deployable in real-world applications in various application areas. In particular, the actions are expected to support the deployment of the Common European Data Spaces, covered in "section 2.2 Data for EU" under the Digital Europe Programme for 2021–2022.[19]

A mechanism will be the Data Spaces Support Centre, which is to be set up under the Digital Europe Programme. All the projects will have an obligation to engage with a wide range of European data sharing schemes.

All this activity is expected to lead to the EU having world leading data and computing technologies. And closely linked to the goal of 100 carbon-free cities is the ambition to make Europe the first digitally led circular, climate-neutral and sustainable economy through the transformation of its mobility, energy, construction, and production systems, which will also depend heavily on having a globally attractive, secure, and dynamic data-agile economy. There is an argument for following the progress of this ongoing work, rather than to wait for it to be completed.

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[19] European Commission, "ANNEX to the Commission Implementing Decision on the financing of the Digital Europe Programme and the adoption of the multiannual work programme for 2021 - 2022," 2021, Accessed: Jul. 25, 2022. [Online]. Available: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=consil%3APE_13_2021_INIT

17.11 Contracts to Have Data Plan

With the mission "100 Climate-neutral Cities by 2030", the European Commission aims to exploit the cities' access to capital, know-hows, and economies of scale for the development to pilot and scale up green innovations. 100 European cities have been selected and supported in their transformation towards complete climate neutrality by 2030. Here, green initiatives can be piloted and these cities will function as an innovation hub and showcase for the rest of Europe to follow and become climate-neutral by 2050.

These 100 climate-neutral cities will be developing contracts, based on guidance from the Commission. Swedish cities have had experience of this process, with Gothenburg,[20] as part of the Viable Cities movement, having produced an example of a "Climate City Contract". (Similar work has been ongoing in other countries such as Italy and Spain.) The initial overall strategic discussions underpinning the Swedish process were followed by a number of ambitious strategic initiatives, or system demonstrators, which give concrete form to the city's overall strategy of transition and create the conditions for success. These included progressing the work towards practically useful management and control tools for climate transition.

Their digital twins and a digitalised planning process are at the heart of this and a deep knowledge of management and governance challenges linked to climate transition has grown. But again, underpinning all this is the use of data, and particularly when considering issues of citizens participating in the process, consideration should be given in this contractual process as to how best to utilise a citizen's personal data. As Chapter 14 drew attention to, "For those cities that are still at the beginning of their digital transformation journey, this may be a good opportunity to do things right from the onset, by creating the data collection and management infrastructure, processing pipelines and metadata in a coherent way".

17.12 Concluding Remark

The foreword to this book expressed "The hope is that it will inspire smart cities to engage more actively in using relevant data, and in particular citizens' personal data, to support important local policy objectives, notably to become climate neutral as quickly as possible". And it is fitting to end with this.

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[20] Viable Cities, "Climate City Contract 2030," 2021. Accessed: Jul. 25, 2022. [Online]. Available: https://static1.squarespace.com/static/5dd54ca29c9179411df12b85/t/61bcccdf-336b2422ef7f0a98/1639763168501/Climate_City_Contract_2030_ENG_Goteborg.pdf