Circular economy transition in Denmark

Green and circular economy transition through standardization of product data in digital and automated processes, 8 February 2024

Technical Support Instrument
Supporting reforms in 27 Member States

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1. Purpose of project

Rethinking the way products are made, consumed, and disposed of is an essential element in achieving the goals set out in the EU Green Deal (European Commission, 2019)[1], EU Green Deal Industrial Plan for the Net-Zero Age (European Commission, 2023), and the updated EU Circular Economy Action Plan (CEAP, 2020)[2]. At the heart of the shift towards increased sustainability is the ability to capture, analyse, and compare the climate, environmental, and circularity data for products in a reliable and trustworthy manner. Getting to a point where all European enterprises have this ability is, unfortunately, still a long way off.
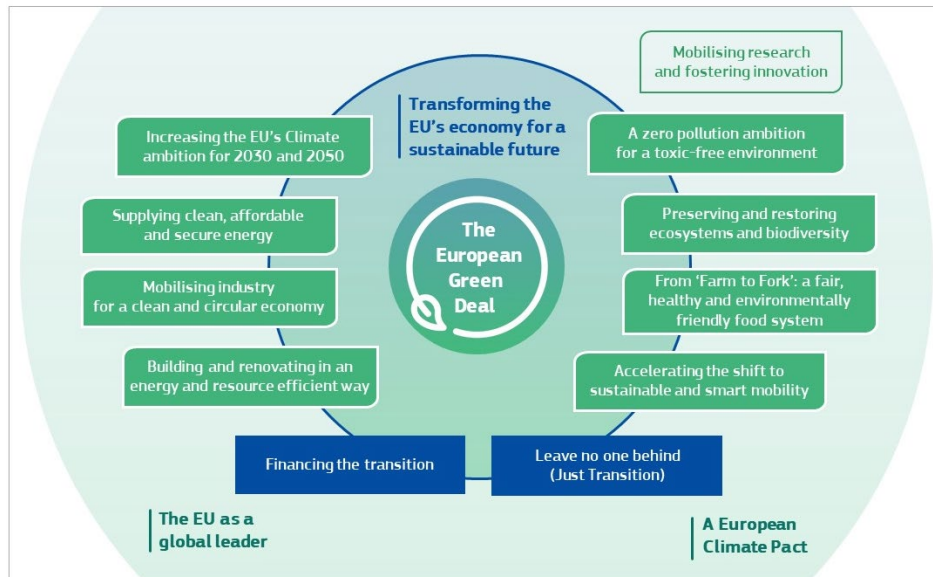
The European Green Deal is the EU's flagship response to Europe's most pressing economic, environmental, and societal challenges. It is an EU-wide sustainable growth strategy that aims to transform Europe into a fair and prosperous society, with zero net GHG emissions by 2050. The European Green Deal is a policy initiative that aims to make Europe climate neutral by 2050 (European Commission, 2019). It's aim is to transform the EU-27 into a modern, resource-efficient, and globally competitive economy, ensuring:

- No net emissions of GHG by 2050
- Economic growth decoupled from resource use, with a major role for circular economy thinking
- Leave no person and no region behind.

In order to achieve these goals, the EU has been updating and creating new regulation (including waste regulation, product related regulation and circular economy related regulation), whilst at the same time channelling financial flows to sustainable companies and public sector organisations.

Closely linked to the EU Green Deal is the EU's 2020 Circular Economy Action Plan (CEAP). This builds upon the EU's existing 2015 Circular Economy Action Plan. One of the main objectives of the CEAP is to make sustainable products and business models the norm in Europe. The plan has led to a particular focus on the updating of EU regulation and policy relating to products with high potential for circularity (e.g. batteries, textiles, construction products, packaging, plastics, etc.). With regard to digitization, the EU is considering the application of a digital product passport for batteries, with a view to stimulating intra-EU circularity in the battery sector. The CEAP also has wide reaching implications

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[1] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX: 52019DC0640

[2] https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en

for the European waste management and resource sector (e.g. ongoing update of packaging waste regulation, new regulation on waste shipments, etc.).

In paving the way for a green and circular transition, it is imperative not only to standardise product data and calculation methods but also to establish a common framework, ensuring a ready availability of valid data, as well as highly automated and shared processes for measuring product impact. The core challenge is not only to build a working framework but also to secure a highly automated and easy-to-access integration with enterprises' (and other users') existing processes and core data processing systems. Building a successfully shared framework with a high adoption rate in the short-term and a high satisfaction and interaction rate in the long-term will require an in-depth understanding of how enterprises are approaching this challenge today and what requirements and barriers must be addressed to deliver value to the relevant enterprises and public authorities, and consequently, to society at large.

The European Commission's DG Reform programme aims to "contribute to institutional, administrative, and growth-sustaining structural reforms in Denmark, in line with Article 3 of the TSI Regulation", specifically by "assisting national authorities in improving their capacity to design, develop, and implement reforms". Through this project, the European Commission (EC) and the Danish Business Authority (DBA) wanted to explore the feasibility of laying the digital foundations to support the green and circular transition by eventually building a collective and trusted framework that could accelerate the standardisation and optimisation of the product (impact) data in Denmark and across the EU.

The project concentrated on five cases to illustrate different angles of the challenges - key representative markets, across sectors, levels of technological development and complexity, and regulatory and policy maturity (within Denmark, but also across EU), outlined on the right.

Extended producer responsibility (EPR) on packaging
EU Directive (EU) 2018/852 on Packaging and Packaging Waste will require businesses to report on packaging data to collective EPR schemes and/or public authorities.

CSRD reporting within the Danish textile sector
The Corporate Sustainability Reporting Directive (CSRD) is new EU legislation that requires all large companies and certain SMEs to publish regular reports on their environmental, social and governance impact (ESG) activities. The companies first covered by the directive need to report on their data in January 2025, which means that they need to start data collection in 2024.

Digital product passport
The EU's planned digital product passport (DPP) represents a clear future policy and regulatory driver for the EU to encourage European businesses to become more transparent and circular in their business model. The technical infrastructure to support a future digital product passport has yet to be decided.

Standardized product codes
By making certain product codes mandatory, Danish public authorities will be able to identify and distinguish between products easier, which will be a first step towards calculating the carbon footprint of these products.

Digitalization of market surveillance
For compliance with CE labelling under the Low Voltage Directive (2014/35/EU), companies will use a set of harmonized standards that are developed for the specific product group. The Ecodesign for sustainable products regulation is also relevant as with this regulation authorities will also have to monitor if products live up to eco-criteria.

Specifically, the project aimed to explore how to

- Minimize the administrative burden coming from legislations on green reporting
- Accelerate the green and circular transition through product data

1.1 Method of approach

Deloitte undertook a significant data gathering exercise with the production of relevant research material. This was guided by Deloitte's Theory of Change (ToC) to clarify, from the start, what would be measured and how (e.g. operationalization, data source and data collection method).

| Inputs | Activities | Outputs | Outcome (short term) | Impact (long term) |
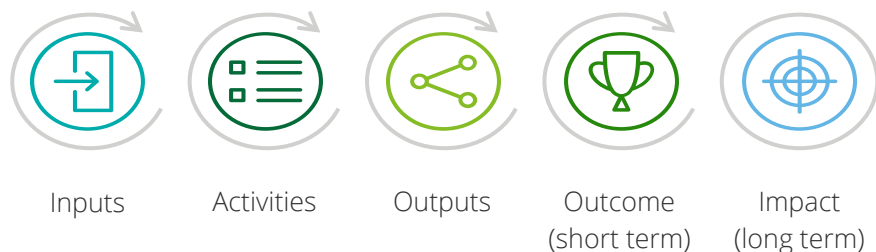
The ToC is a logical model that underpins the costs and benefits identified for each of the cases. It depicts the chain of events that is likely to occur when the EC/DBA/other authority or private vendor roll out requirements for standardized product data via digital and automated processes. Specifically, how the introduction of digital services is expected to impact the selected cases. The ToC was used to frame a joint understanding of the costs and benefits associated with the as-is and the to-be scenario that should be modelled in both quantitative and qualitative terms. Overall, it allowed us to establish, identify, and communicate the causal links between the considered outcomes, activities, inputs, and outputs and was the primary driver for the business case studies. The ToC formed the foundation for the data collection and data analysis by identifying and qualifying relevant indicators for costs and benefits to be assessed in the business case studies.

For the data gathering, we used a mixed methods design, in which quantitative and qualitative methods supplement each other. The quantitative data

foundation is three large surveys with 1,178 enterprises in total. This was supplemented by 4 workshops, 235 interviews and a number of observations taken as part of the interviews. We conducted a comprehensive segmentation to ensure that we obtained outcomes from relevant enterprises that currently are, or will be, impacted by the new legislation and suggested changes. This segmentation ensured that our enterprise sample included relevant sectors and a distribution of company sizes that reflected the population expected to be affected by the legislation. When it became clear that both enterprises and public authorities found all the topics complex and were unable to provide as much quantitative data as envisaged, the data gathering was supplemented by expert interviews, interviews with IT vendors and further desktop research. We observed coherence among the data from the surveys, the interview responses, the observed actions, and existing research in the field. By achieving high response rates and conducting a significant number of interviews, our assessment is that the data collection and analysis demonstrate a high level of validity and reliability.

Specifically for the development of the to-be recommendations, two methodology standards, EIRA and TOGAF were applied as the framework to structure the analysis for the solution design. The European Interoperability Reference Architecture (EIRA) is a framework that provides guidance on how to design and implement interoperable digital systems and services within the European Union (EU), while The Open Group Architecture Framework (TOGAF) is a comprehensive approach to enterprise architecture that helps organizations align their business goals with their IT systems and infrastructure.

2. Analysis

Although Denmark is considered a highly digitalized society, when it comes to the digitalization of product data and collecting and sharing ESG (Environmental, Social and Governance) -related data, Denmark is, like other countries, at a low level of maturity. And this is the case for both enterprises and public authorities.

While maturity levels tend to be lower for small organisations, when it comes to product data sharing, the process is generally very manual across all organisations. It is also interesting to note that enterprises are driven by legislative requirements and, for some, the potential of common standards across the EU and from public buyers in Denmark is seen as positive.

Maturity of enterprises

No standard data formats or classification standards

Lack of standardised formats lead to additional manual work

The ability to track and trace is limited, e.g. due to low data quality

As expected, large enterprises tend to have a more digitally mature setup than SMEs, in addition to more financial and resource capacity and capability. They will, therefore, also be able to adapt to and adopt more easily to any new requirements for digitalisation of product data as well as be more willing to and see less of an issue in investing in additional IT systems.

However, there are varying levels of maturity when we dig deeper into, for example, data collection, sharing, and management, which, generally, are very manual processes.

We also found no standard data formats or classification standards for sharing and this lack of standardised data formats also lead to additional manual work for enterprises when handling the data.

Our analysis finds that sharing product data is largely a manual process. Although enterprises might have data collection and storing systems in place, they are not used for this purpose. The tendency is to collect and share by the exchange of emails. In general, enterprises receive data in the supplier's chosen data standard and manually convert the data to fit their preferred system or software.

For public procurement processes, invoices can be and are sent using a digital platform; for some, they are entered automatically, and for others, the process is more manual.

The general picture is that data handling is rather immature and more manual than automatic. The enterprises that structure the data will manually handle and enter the data into their preferred system or software. And even though they might be able to register the data in their ERP system, many enterprises choose not to. Generally, we find that they tend not to use certain functionalities or register data unless there is a specific requirement for them to do so. Enterprises collect the data they find relevant, either for their own purpose or because it is a specific requirement, e.g., fiscal, legislative or customer requirements. It also means that some sectors collect more data than others, depending on whether they are covered by specific legislation or are subject to inspections.

The ability to track and trace product data is also fairly limited across enterprises. It is, for example, difficult to trace the origin of waste and actual recycling rates due to low data quality or even lack of data. Although there are increasing requirements to track ESG product data on, for example, textiles, the

process is very manual, and enterprises spend a lot of time manually collecting the data from their suppliers.

⬛ Maturity of public authorities

> Use of product data varies greatly
>
> Low data quality, e.g. on invoices, necessitates additional work to alter product classifications

The use of product data varies between public buyers, with some local authorities, regions, and procurement organisations being digitally mature and able to use product data actively, whereas others are less mature.

The more digitally mature authorities demand more from their suppliers, e.g inclusion of product codes in tender materials or invoices. Product data is then also used by those same authorities to improve and deliver on a greener procurement strategy, calculating and reducing their CO_2 emissions.

In general, though, municipalities and regions in Denmark are just maturing when it comes to ESG. Some of them produce carbon accounts based on their invoice data, using proprietary solutions procured for that reason only. However, they still need to spend time on screening and altering the classification made by the IT vendors. This suggests that these solutions still have some way to go to optimise their classification methods and that they are unable to classify a significant share of invoices correctly. This is also related to the quality of the data, e.g. the data on the invoice is not specific enough.

⬛ Drivers and barriers

> Barriers include low data quality, fragmented IT systems and different classification standards – and for SME also costs and effort required.

In general, there are bigger barriers for SMEs than for larger enterprises to digitalise product data. The expected cost and efforts required for the implementation is seen as a big barrier to SMEs. They believe they will have to change how they work with their

suppliers, systems, and internal processes to collect and share data but also that the current data is of limited quality. For large and international enterprises, low data quality across supply chains, fragmented IT systems across supply chains, and different classification standards and definitions of data are all significant barriers.

Some enterprises experience low data quality by suppliers not sharing product data due to, for example, them not having the data or being unwilling to share it due to concerns regarding competitive advantage.

In addition, the complexity of obtaining the data increases with each additional link in the supply chain. It is particularly relevant when suppliers are outside of the EU and, therefore, not subject to the same legislation as the enterprises. Those suppliers lack the legal incentive to register and share data with their customers, leaving enterprises unable to obtain such data.

Public authorities experience similar barriers as private enterprises, such as the quality of data, current operational processes, making a digitalised and automated process difficult to implement and benefit from.

> Public authorities want better data in order to make more informed decisions – also to help them with the green transition.
>
> Enterprises want to comply with legislation and meet demands of customers and therefore see a value in standardisation and digitalisation.

We found that the data collection from enterprises is primarily driven by external factors; the need to comply with specific legislative requirements, the expectations or demands from customers (private and public), and a perceived competitive advantage (in Denmark and also importantly in international markets). These factors lead to enterprises collecting and sharing or reporting specific data or data in specific formats.

Public authorities, on the other hand, are motivated to collect data from enterprises to make more informed policies and strategic decisions. Using data and information as a foundation to make decisions allows for more accurate and targeted policies that, for example, can boost the green transition.

Large enterprises, in particular, see the value of standardisation, as they are already subject to different requirements from different actors, public and private and also customers. Enterprises operating in international markets are required to comply with international standards, including upcoming requirements of sustainability. Using standardised product data would make it easier to track and trace a product through its life cycle, and the private sector also recognises that standardisation of product data and better data quality is needed.

2.1 Business case for digitalization

Standardisation and disclosure of product data is associated with a large potential in the green transformation of society, as it will incentivise a sustainable behaviour across the value chain. Based on an assessment of the five individual case studies, the benefits for businesses, however, are modest. For businesses to harvest the fruit of the interventions, standardisation must be harmonised across use areas and geographies in a shared public infrastructure.

All five business case assessments are indicative assessments meaning that the expected costs and benefits primarily are based on qualitative methods and existing theoretical and empirical evidence, rather than measurements. This is since the alternative scenario in the five case studies are defined in overall terms leaving room for a high degree of flexibility in the implementation, while at the same time the baseline scenario represents a diverse business landscape with a varying degree of data maturity and hence point of departure in a standardisation process.

An overall conclusion across business cases is that to reach the full potential of standardisation and disclosure of data in a shared, public infrastructure, harmonisation across use areas and geographies must be implemented. The large potential springs from synergy effects that will occur when all business in all countries in all parts of the value chain are using the same standards and infrastructure for ESG data.

Many businesses are already facing a requirement to report the same data for the same regulatory purposes across states in the EU and internationally. Hence, when the businesses state that they can better harvest these fruits, if

standardisation is committed to in a wider perspective, across use areas and public infrastructures, then this is what they will soon be impacted by. Thus, a main recommendation in the to-be report is a shared, overall ESG data distribution architecture to support this.

Expected benefits

- Reduced administrative burden
- Synergies with other ESG reporting requirements and reporting in other countries
- More reliable and transparent data
- Reduction in human errors
- Improved transparency, standardisation, supplier evaluation, regulatory compliance

Potential costs

- Relatively high switching costs, particularly with complying with complex legislation
- Economic consequences vary significantly across segments
- Net results vary across SMEs and large enterprises. Especially, large enterprises will experience relatively large costs that are, however, exceeded by even larger benefits

3. Recommendations

It has been Deloitte's objective to assess whether existing digital building blocks and standards in the European Union could support the five case studies for ESG-related data reporting and data distribution. One such building block is CEF eDelivery[3] which provides a widely distributed open network enabling different stakeholders to exchange data and documents regardless of their IT-system providers. In Denmark, this infrastructure is implemented in NemHandel and currently used for the exchange of electronic documents like e-invoices. We researched possible solution design scenarios to support future ESG data distribution, aligned with the European Commission guidelines and framework, and for the case of Denmark, the framework for Shared Public Digital Architecture (Fællesoffentlig Digital Arkitektur).

Our recommendation of the digital building blocks that would be able to support an overall ESG data distribution is shown below. This architecture can support ESG data distribution across the supply chain, from data creation to reporting and data exchange.

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[3] https://ec.europa.eu/digital-building-blocks/sites/display/DIGITAL/eDelivery
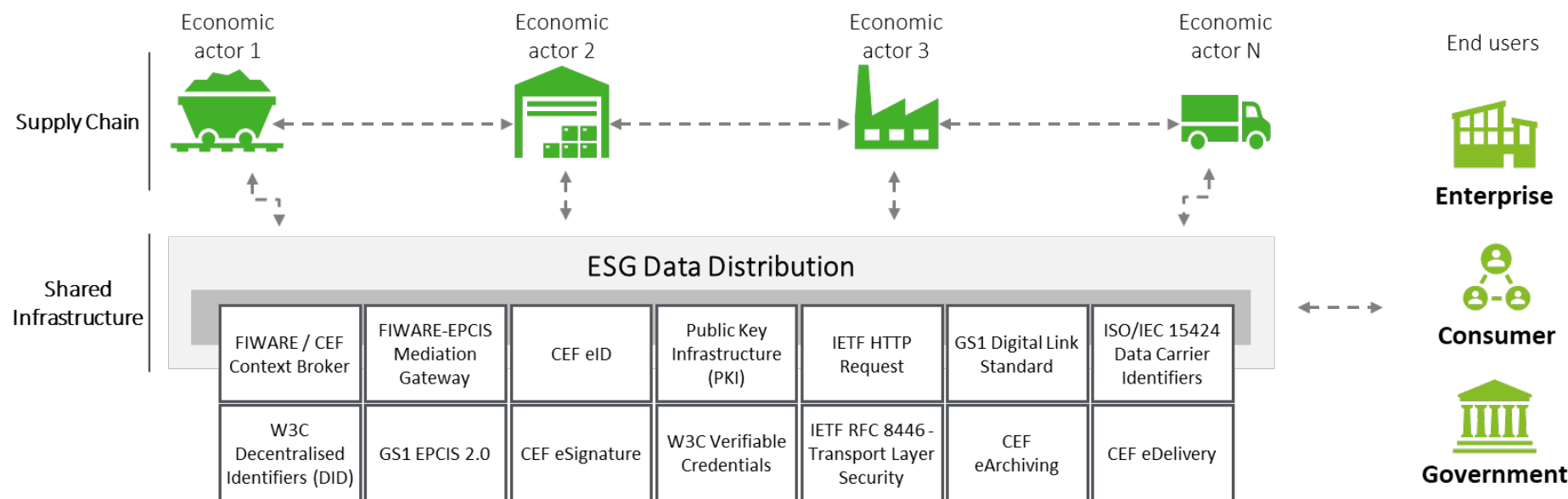
In our evaluation of the different scenarios, we applied six criteria, see below.

Administrative efficiency
Evaluates the efficiency of administrative processes in data management activities, including data transfer, storage, and semantics.

Degree of interoperability
Evaluates the ability of the solution to work with other systems or components without special effort. It refers to how easily data can be exchanged, understood, and used among different systems and organisations.

Adherence with regulatory requirements
Assesses the extent to which the scenario complies with particular legal mandates.

Ease of implementation
Evaluates how seamlessly the new solution can be integrated with existing systems, compatibility of data formats, the ease of data transfer and adaptability.

Alignment with design criteria
Determines how well each scenario aligns with the principles laid out by the relevant frameworks.

Flexible infrastructure with some mandatory data standardization
Key capabilities should be in place either across supply chain actors or as a shared infrastructure.

Based on our evaluation, it is our conclusion that very similar capabilities across the five case studies are required to be in place to support ESG data collection and reporting. It is therefore Deloitte's recommendation that the European Commission and the member states align on a target state architecture to support the exchange of ESG-related data, future regulatory purposes for circular transition and the business ambitions for providing better ESG data and "green product data" transparency for actors and products in the market.

This would provide the clarity for which reference architecture to design against when needing to exchange ESG-related data and minimize the number of independent initiatives setting their own data definitions and proprietary standards – ultimately reducing the resources, efforts, and complexity that the stakeholders need to work against. If there is no target state architecture nor standards in place, initiatives or companies would instead be left to handle their solutions individually. This would mean data shared point-to-point in one-off integrations and that the data to be provided would need to be agreed and determined in new agreements on an ad hoc and case to case basis.

The target state architecture for ESG Data Distribution will support the economic actors with a shared, digital infrastructure to fulfil the total number of ESG-data related requirements and create overall capabilities for the economic actors to exchange ESG-related data. This should work in an open-standard, network-based setup – and will make society avoid redundant, point-to-point and resource-consuming it-solutions in the longer run. The alternative, a multitude of technical solutions and many versions of data definitions and standards would inevitably impose a higher burden on the economic actors – for them to share data and report to authorities – and ultimately create a higher carbon footprint from the number of solutions that would end up running to support ESG data exchange and the information required to make circular economy transition successful. The large potential associated with the target state architecture springs from synergy effects that will occur when all business in all countries in all parts of the value chain are using the same standards and infrastructure for ESG data.

4. Conclusions

At the offset, this project aimed to explore how to minimize the administrative burden coming from legislations on green reporting while also accelerating the green and circular transition through product data.

Undertaking the project and particularly speaking to key stakeholders across the five cases, we learned a few lessons that are relevant for Denmark and the EU but also other member states

- We initially expected enterprises and public authorities to have a better understanding of upcoming legislation and changes.
- We expected large enterprises to be more mature in their handling and sharing of product data
- The extent of poor data quality, particularly also the difficulty in tracing data, e.g. when waste leaves the country
- Many enterprises expressly stated that they would welcome more standardization and regulation – particularly across the EU
- Interest organisations and business associations are heavily engaged, influence the market and some are already developing processes and infrastructure to address upcoming legislation. Keeping them involved will reduce duplication of effort.

Through our analysis over the last 17 months, we have found that although Denmark is a highly digitalized society, when it comes to handling and sharing product data, this is still a very manual process for enterprises and public authorities. This also means that the key barriers towards digitalization are primarily low data quality and a fragmented systems landscape.

However, we also conclude that a shared public infrastructure and standards can, in time, reduce the administrative burdens, provide greater transparency across the value chain and then ultimately strengthen the conditions for a circular economy.

Developing and enforcing data sharing and privacy standards can be complex, particularly in industries with multiple stakeholders and integrating new data-sharing systems with existing legacy systems can be difficult and time-consuming. A shared infrastructure should be built on existing building blocks, reuse what EU and other key organisations are already using and be implemented across all member states. Standardisation across EU across regulatory frameworks and industries is key to a successful transition, minimising the impact and disruption on all actors.

The European Commission has just released an SME relief package[4], recognising the comparatively large impact legislative changes will have on smaller enterprises. We believe this is a key development and will help to ensure small enterprises are still able to compete in the European market.

Although we have provided recommendations around a shared public infrastructure and its potential benefits and costs, this project is really only the first step in the process towards accelerating the green transition. The results of the project can hopefully provide input to further development and roll-out of Danish and EU legislation and frameworks as well as any solutions (infrastructure and standards) to support this. The analysis contained in this report will also provide the European Commission and the Danish Business Authority with a better understanding of the environment enterprises and public authorities find themselves in, the complexities and quite often also the lack of knowledge of upcoming changes and their impact.

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[4] https://cor.europa.eu/da/news/Pages/HL60---ECON-meeting-6-December.aspx
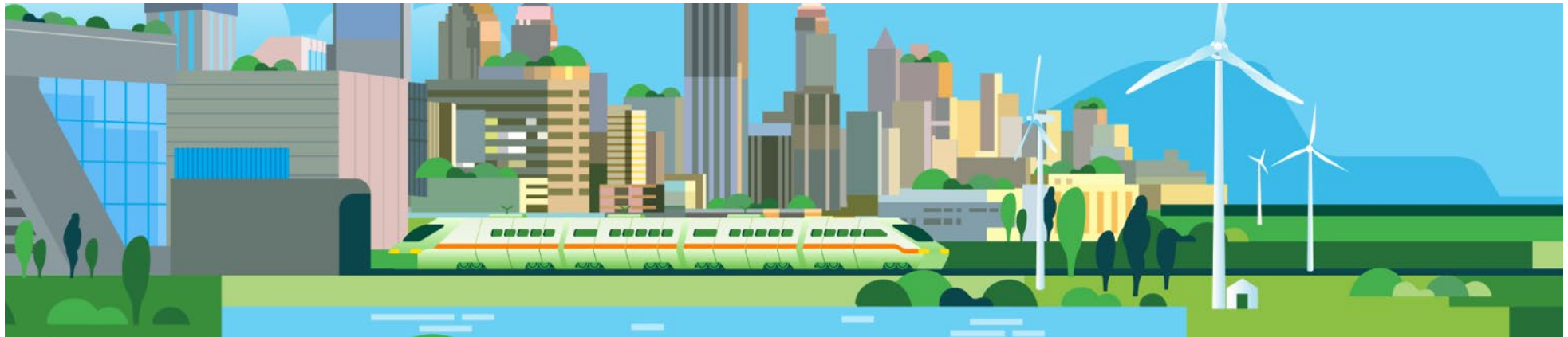
Conclusions

- Handling and sharing product data and ESG reporting are very manual processes
- Low data quality and a fragmented systems landscape are key barriers
- Expected burdens will be comparatively higher for smaller enterprises and authorities
- Many enterprises and public authorities have already implemented local solutions or workarounds to help with their ESG reporting
- Large companies and companies operating internationally are asking for standardization
- Standardization across EU can lead to synergies and strengthen the conditions for a circular economy
- Shared public infrastructure and standards can, in time, reduce the administrative burden and provide greater transparency

Recommendations

- Standardisation across EU across regulatory frameworks and industries
- Balance trade-offs like efficiency, ease of implementation, degree of interoperability and adherence with regulatory requirements.
- Align and reuse what EU and other key organizations are already using
- Close collaboration with interest groups/key stakeholders who will be able to facilitate dialogue and reduce duplication of effort
- Consider phased implementation to reduce impact on smaller parties (or initiatives such as SME relief package)
- Roll-out support and solutions to assist with take-up and reduce the burden of compliance
- Consider planning for the long term/future proof the solution