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Use Case Concretisation: Visualisation of Carbon Footprint

50th Anniversary Commemorative Project of ASEAN–Japan Friendship and Cooperation

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This use case concretisation report has been developed through multiple discussions with diverse experts in the Association of Southeast Asian Nations (ASEAN) Member States and Japan to concretise target use cases. The experts include senior executives from industry associations and the private sector. We also conducted in-depth desk research, global best practice benchmarks, and multiple interviews with local and global experts on data sharing platforms. Through these discussions and interviews, we were able to gain a better understanding of local pain points and challenges in data sharing, draw implications for our data sharing initiative, and build consensus on critical components of our use case concretisation. By reflecting on the unique context and situation of the ASEAN and East Asia regions, we agreed with the group of experts on the need to address local pain points and challenges in use case design and implementation.

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Chapter 1
Background and Objective

1. Background of Use Case Concretisation

This report is developed as the next step of 'The Vision for the Digitalisation of Supply Chains in ASEAN and Japan'. In the vision report, we defined four use cases as priorities that need to be concretised to implement the vision. These four priority use cases are (i) visualisation of the supply chain structure, (ii) risk prediction, (iii) visualisation of carbon footprints, and (iv) design and research and development (R&D) data sharing. In response to the discussion group proceedings, we will first focus on one specific use case and concretise it to prepare for implementation.

We selected visualisation of carbon footprints as a starting point, given its importance in global and regional markets, and strong interest from the discussion group. Most Association of Southeast Asian Nations (ASEAN) governments have announced net zero targets with different timelines, but they face challenges due to inaccuracies in carbon emissions data and lack of guidelines for greenhouse gas (GHG) calculations. In addition, this use case could serve as an input for other use cases by identifying multiple stakeholders across the value chain in industry ecosystems and addressing required data sharing standards and structures for data sharing initiatives. Because the scope of this use case is very broad and the supply chain situation varies by industry, we believe that we need to focus on one industry first and expand the scope as progress is made. We selected the automotive industry as the industry to start with. The automotive industry is a representative industry in multiple ASEAN Member States (AMS) such as Indonesia and Thailand, with significant contributions to the countries' economies. In addition, carbon footprints are a very important agenda item for most automotive industry players.

2. Objectives of Carbon Footprint Visualisation Use Case

As described in the vision report, the carbon footprint visualisation use case aims to develop a data sharing initiative where stakeholders can access and share accurate and granular carbon emissions data with defined rules and standards for calculations. Stakeholders can comply with country and industry regulations by using primary emissions data derived from the actual supply chain. By standardising measurement and reporting, they can compare carbon emissions across the supply chain. This use case helps stakeholders to better understand carbon emissions from their own business activities as well as the emissions linked to current or potential suppliers. It can also provide commercial opportunities for suppliers to market their sustainability to buyers and customers who value sustainability and the environment.

3. Focus of the Use Case Concretisation

To realise our use case and to prepare for implementation, we should define guidelines for multiple important aspects of our data sharing initiative by understanding existing carbon footprint visualisation initiatives and implications for our context. In this report, we will make initial suggestions for the following key questions:

- Who are the participants and stakeholders for our data initiative?
- What types of data, in what scope, and at what granularity do we need to aim for in our data initiative?
- What are the standards and processes for data collecting, calculating, and sharing?
- What is the required technical structure to enable our data sharing initiative?
- How do we harmonise with existing carbon footprint initiatives and what should be the relationship with them?
- What are the immediate next steps and future roadmap for implementation?

We will also provide references for our suggestions based on the benchmarks of more advanced carbon footprint visualisation initiatives such as Catena-X in Europe. More importantly, we need to construct our initiative in an Asian way by reflecting the different context and needs of Asia. In this way, it can be differentiated from other initiatives in Europe or the United States (US).

4. Unique Situation and Challenges in ASEAN

An important point that needs to be addressed in this report is defining a way to involve small and medium-sized enterprises (SMEs) in our data sharing initiative. As stated in our vision report, the ASEAN automotive industry is very fragmented. Under this fragmented structure, many Tier 2 and 3 suppliers and SMEs represent most players in the supply chain. So, it is critical that SMEs are involved in the data sharing initiative as users and possibly stakeholders in operations. In addition, multiple SMEs in the value chain need to be involved to cover Scope 3 GHG emissions.

However, SMEs in the ASEAN automotive industry may be reluctant to participate in data sharing initiatives for several reasons. First, they may lack awareness of the need for GHG emissions reduction and may not perceive clear benefits from data sharing, leading to low motivation. Concerns about data sensitivity and the risk of data leakage could further hinder their willingness to provide data. Even if SMEs are motivated to join data sharing activities, challenges persist. Many lack the information technology (IT) infrastructure and sophisticated data management systems needed for a precise data breakdown, such as product-level GHG emissions data or input–output activity allocation. Limited resources for data management in SMEs exacerbate this issue. Moreover, the less advanced data management systems in local SMEs and the limited reliable secondary data sources in ASEAN may present obstacles to providing quality data. The fragmented structure of the ASEAN automotive industry poses difficulties in inviting a meaningful number of SMEs to data sharing initiatives. Collecting Scope 3 data from various stakeholders becomes challenging due to the industry's fragmentation and the limited number of dedicated staff available to provide GHG emissions data. Additionally, SMEs often lack a strong sense of data sovereignty and a clear understanding of data usage and access policies, which may lead to issues surrounding data use and access in the future.

Under these challenges, it is very important to propose clear benefits and incentives for SMEs to participate in our data sharing initiative. Examples of incentives could include supporting SMEs in complying with local carbon footprint requirements, improving operational efficiency and

competitiveness by joining our initiative, and upgrading IT and data management systems by providing a data sharing platform.

In addition to these local pain points and challenges, we also need to address the key issue that data standards and definitions may vary across countries in ASEAN. For example, it might be difficult to define a common standard applicable to all AMS due to different data sovereignty standards and GHG emissions calculations in each country.

All these challenges and implications will be described in more detail in Chapters 2 and 3 of this report.

Chapter 2

Concretisation of Use Case: Visualisation of Carbon Footprint

As stated in the previous section, we will make initial suggestions on four important aspects of data sharing initiatives to provide direction for future use case implementation: (i) key stakeholders, (ii) data coverage and items, (iii) data sharing standards and processes, and (iv) technical architecture.

1. Key Stakeholders

1.1. Our Initial Suggestions

Multiple stakeholders will be involved in the preparation, implementation, actual operations, and utilisation of the data sharing initiative. We can categorise the key stakeholders into five primary roles, based on the roles and responsibilities required under the initiative: (i) stakeholders to establish data standards and technical architecture, (ii) stakeholders to implement the technical architecture, (iii) stakeholders to develop IT applications, (iv) stakeholders for management decisions and daily operations, and (v) end users.

(i) Stakeholders to establish data standards and technical architecture

These stakeholders are responsible for establishing standards, including on data collection, allocation, calculation, and sharing, as well as the technical architecture and requirements of our data sharing initiative. They define the guiding principles for the data standards and technical standards of initiatives. The type of entities that need to be considered in this group are as follows:

- Automotive original equipment manufacturers (OEMs), Tier 1 component and material suppliers, Tier 2 and/or 3 suppliers, and SME suppliers discuss and define processes and standards for data coverage and items. They establish standards and rules for data collection, use, and sharing, by considering the availability and feasibility of data within local industry. All standards must be defined in a manner that promotes the most feasible, accurate, and transparent data sharing within the region.
- IT players with expertise in designing technical architecture and implementing data sharing initiatives include existing data sharing platforms, software development companies, and network providers. They are responsible for designing the technical architecture and requirements that enable data sharing standards and processes defined by the automotive industry players. This group has the final decision-making authority regarding the technical implementation of data sharing initiatives.
- Research and academic partners bring specialised expertise in global carbon footprint visualisation initiatives, as well as established frameworks, guidance, and regulatory knowledge. They can provide their perspective on the latest GHG measurement methodologies and standards. They can also assist the initiative in navigating intricate regulatory environments.

(ii) Stakeholders to develop and implement the technical architecture

These stakeholders are responsible for implementing the technical components of the initiative based on the technical architecture. The type of entities that need to be considered in this group are as follows:

- IT solution providers with expertise in data model implementation.
- IT solution providers with expertise in application programming interface (API), data space connection, etc.
- IT players with expertise in cybersecurity system implementation, including identity management systems, endpoint security management systems, and log tracking systems.
- IT players with expertise in operating system implementation.

(iii) Stakeholders to develop IT applications

These stakeholders are responsible for developing and implementing specific business applications in data sharing initiatives, such as applications related to emission tracking and reporting software and environmental impact assessment tools. Software companies with expertise in application development could be considered as part of this group.

(iv) Stakeholders for management decisions and daily operations

This group oversees the decision-making process related to project management and ensures the daily operations of data sharing initiatives. The stakeholders in this group need to have the capability to work on management agendas such as strategy formulation, investment decisions, implementation progress management, recruiting and onboarding of new members to initiatives, etc. This group can be nominated from the stakeholders responsible for establishing standards.

(v) End users

These stakeholders are the primary participants that actively interact with the initiative to provide data, access information, and utilise its features and services. They include automotive industry insiders such as OEMs, suppliers, and logistics companies.

1.2. Key Takeaways of Catena-X Benchmarking

We believe that the structure and organisation of Catena-X could be a good reference for defining our stakeholders. Catena-X consists of three areas based on roles and responsibilities: (i) association, (ii) development environment, and (iii) operating environment (Figure 2.1). 'Association' is responsible for standardisation, management decisions, and daily operations, while data-sharing standards and technical architecture are designed and implemented in the 'developing environment'. IT players develop applications, and actual users share data in the 'operating environment'. However, Catena-X has its limitations. It is not easy for Catena-X to involve SMEs because SMEs have limited resources to prepare for data sharing, and SMEs may not see clear benefits from participating in data sharing. Additionally, it is challenging for non-core members to influence the direction and strategy of Catena-X due to the heavy concentration of decision power

amongst the 28 core members. Furthermore, the complicated governance structure, with many core members, can impede timely consensus and decision-making.

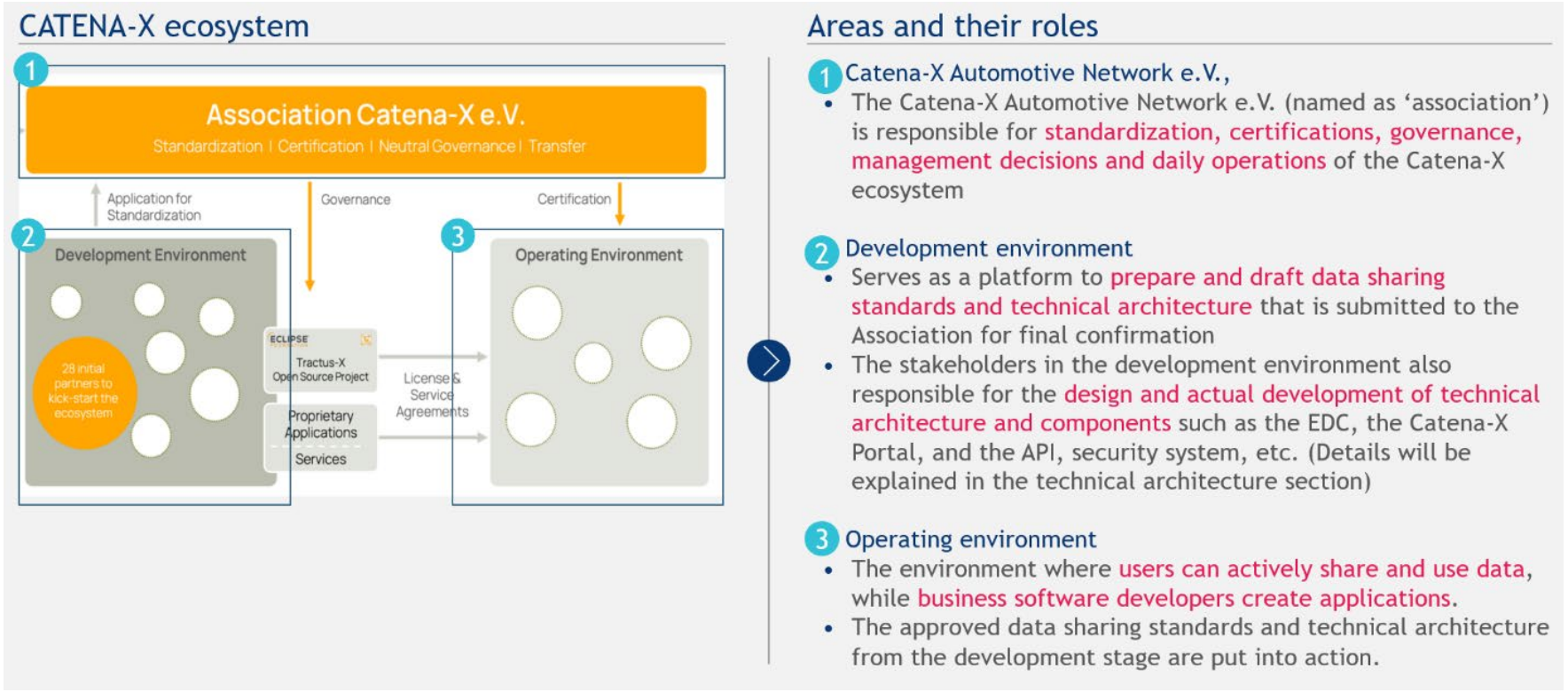
Below are details of key findings from the Catena-X benchmarking for key stakeholders:

(i) Structure of Catena-X ecosystem

As shown in Figure 2.1, the Catena-X ecosystem consists of three major areas: Catena-X automotive network e.V., development environment, and operating environment.

- The Catena-X automotive network e.V., or 'association' area, is responsible for standardisation, certifications, governance, management decisions, and daily operations of the Catena-X ecosystem.
- The development environment serves as a platform to prepare and draft data sharing standards and technical architecture, which are submitted to the 'association' for final confirmation. The stakeholders in the development environment are responsible for the design and development of technical architecture and components such as the Eclipse Dataspace Connector (EDC), which enables data exchange amongst different data spaces, the Catena-X Portal, and API, security systems, etc.
- The operating environment in Catena-X is where users share and use data, while business software developers create applications. Here, the approved data sharing standards and technical architecture from the development stage are put into action.

Figure 2.1. Structure of Catena-X Ecosystem

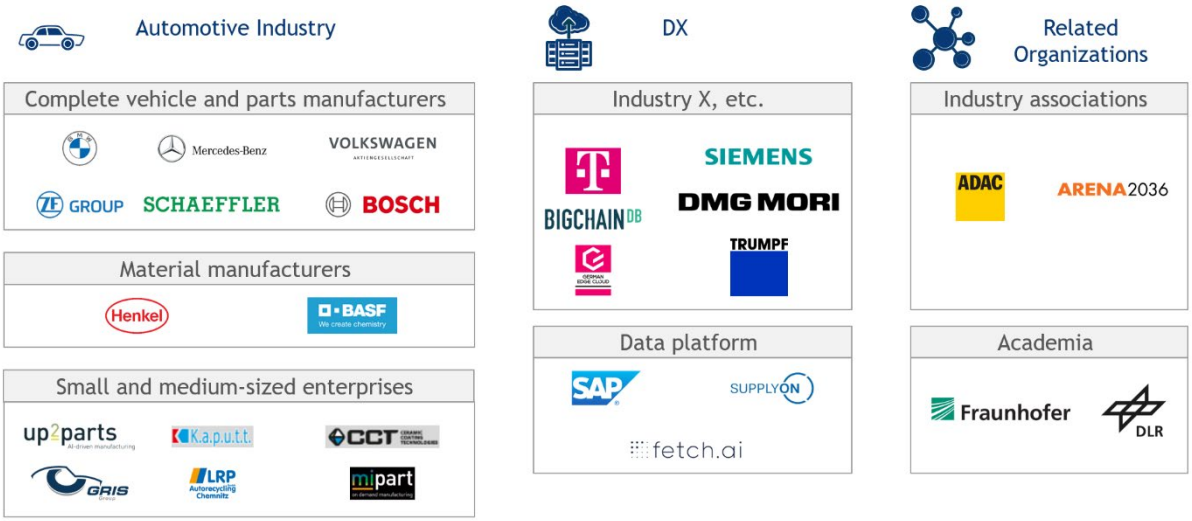


API = application programming interface, EDC = Eclipse Dataspace Connector.
Source: Catena-X (2022a).

(ii) Stakeholders involved in the structure of the Catena-X ecosystem

Catena-X invited multiple participants from the automotive industry, IT industry, academia, and research institutes (Figure 2.2).

Figure 2.2. Examples of Catena-X Ecosystem Stakeholders



Source: Catena-X (n.d.).

- The Catena-X automotive network e.V. includes primary participants such as automotive OEMs and their suppliers (e.g. BMW, Volkswagen, and Bosch); secondary participants such as business application and IT service providers (e.g. SAP and Microsoft); and advisory participants including academia and industry associations (e.g. the German Aerospace Center (DLR), Fraunhofer, and ARENA2036).
- The development environment has 28 initiative members from multiple industries. It includes the global automotive players mentioned above as well as SMEs such as Gris and Mipart. The technology industry also plays a pivotal role, with software and network entities, including software providers serving both OEMs and SMEs, such as SAP, Microsoft, and SupplyOn. Additionally, Catena-X seek benefits from partners in research and academia, including Fraunhofer, which actively supports technological foundations. Members from Gaia-X are also working to align themselves with Gaia-X standards. The federal government of Germany plays a role in supporting core development projects through programme 35c (KoPa 35c) as part of the economic stimulus package.[3]

[3] Programme 35c, also known as the Future Investments in the Vehicle Industry programme, is aimed at supporting the automotive industry in Germany. The programme provides funding for R&D projects that focus on innovative technologies and processes in the automotive industry, with emphasis on digitalisation, automation, and sustainability. The programme is administered by the German Federal Ministry for Economic Affairs and Energy and has a total budget of €2 billion.

- The operating environment involves IT service providers responsible for configuring, customising, and optimising technical services within the Catena-X platform to enhance the user experience. It also includes users from automotive OEMs and their suppliers, which provide and use the data. Catena-X invites IT companies, ranging from major players like SAP and Microsoft to smaller-scale IT firms. This inclusive approach reflects Catena-X's commitment to promoting fair competition, fostering innovation, and creating favourable business conditions for all participants in the data ecosystem.

(iii) Organisation of management decision and daily operations in Catena-X

Catena-X Automotive Network e.V. has a defined organisation to serve a crucial role in managing decisions and daily operations. This organisation consists of several layers:

- Management board: This board is composed of 12 executives who represent diverse perspectives in the automotive value chain. Members includes executives from BMW, Siemens, Volkswagen, and Fraunhofer. The board is responsible for overseeing day-to-day operations, managing ongoing initiatives and workstreams, managing annual budget and finance, and facilitating the onboarding of new members.
- Association office: The 'association' office is responsible for executing day-to-day operations such as enhancing Catena-X's public presence, administering members, providing staff support, and coordinating workflows.
- Advisory council: The advisory council members consist of experts in politics, science, and automotive industry institutions. It supports the management board by connecting with the political, social, and scientific communities; supporting collaborations with external partners; and reviewing new research and technology.
- Working groups and committees: Appointed by the management board, working groups are assigned to the specific issues related to implementation and standardisation in Catena-X. Committees play a role in overseeing specific projects focusing on a narrow scope.

(iv) Limitations of Catena-X

Involving SMEs in Catena-X presents challenges because SMEs have limited dedicated human resources to prepare data for sharing and do not see clear benefits from participating in Catena-X compared with their effort for data sharing preparation. SMEs are also concerned about data use and protection. Additionally, Catena-X's decision-making is concentrated in 28 core members, consisting of leading OEMs, Tier 1 suppliers, and large IT vendors in the European Union (EU). As a result, non-core members and SMEs find it difficult to express their opinions in Catena-X and have limited influence on decisions. This complicated governance, with many core members, makes it difficult to build timely consensus and decision-making, and actual Catena-X implementation and full operations are currently delayed (Expert interview 2).

1.3. Pain Points and Challenges in the ASEAN Region

ASEAN has a unique automotive industry structure, and the IT industry in some AMS is not fully mature. For these reasons, ASEAN may face challenges in defining and forming the stakeholders required for the implementation and operation of a data sharing initiative.

- The limited number of local OEMs and Tier 1 suppliers could pose a challenge in forming a driving force that could initiate and promote a data sharing initiative. Additionally, the number of advanced IT solution providers with expertise is also limited in the region and it might be difficult to define standards and rules for the technical architecture and implement the platform.
- Since the automotive industry in ASEAN is very fragmented and involves many SMEs, it might be difficult to invite a meaningful number of SMEs to a data sharing initiative.
- SMEs are less likely to be motivated to participate in the initiative since they do not see clear benefits from or the need to join a data sharing initiative. SMEs might be not fully aware of the need for GHG emissions reduction, and it is difficult for Tier 2 and 3 suppliers to invest in GHG visualisation from a solely environmental perspective.

1.4. Implications for Our Initiative

Given the challenges in ASEAN region and the limitations of Catena-X, it is very important to design clear incentives to promote the participation of SMEs. For example, SMEs could be supported in complying with local requirements for GHG emissions guidelines by joining the data sharing initiative. They do not have to create their own data set and constantly update it to meet the standards of GHG emissions guidelines and regulatory requirements. SMEs could also leverage the resources of the IT infrastructure provided by the initiative to collect and share activity data. In addition, since many SMEs might not have the bandwidth for IT support and need to improve IT literacy, training and IT support would make it easy for SMEs to provide data. It would also be effective to define our initiative with broader benefits, not only focusing on carbon footprints, but also improving their operating efficiency and competitiveness. Furthermore, active data sharing would provide SMEs with further commercial opportunities with Tier 1 suppliers or global OEMs that need to comply with various GHG-related regulations.

Another important implication is that unlike in the EU, active engagement of the government sector (e.g. policymakers and regulators) is important to initiate and promote this initiative and to encourage SMEs to join it due to the absence of large local OEMs in the ASEAN region. We may need to consider coordination between large Japanese OEMs in the local market and local SMEs, as well as involve local automotive industry associations in the initiative, given the industry structure in ASEAN.

2. Data Coverage and Items

2.1. Our Initial Suggestions

Scope of data to be shared and specific data items for carbon footprint visualisation

Our data sharing initiative aims to develop a platform where stakeholders can access and share accurate and granular carbon emissions data. To achieve our goal, it is essential to define the coverage of the data and specify the data items. First, the data coverage can be divided into four categories: (i) data source, (ii) data scope, (iii) data granularity, and (iv) data freshness.

(i) Data source refers to the source of data collection. Primary data are a direct, first-hand source collected within an organisation. Secondary data are external reference data such as industry

averages or industry standards data. We need to prioritise the use of primary data to ensure data accuracy. This is in line with existing global standards such as the GHG Protocol Product Standard,[4] which stipulates that primary data should be collected for all processes in the product's life cycle if they are available and of sufficient quality (Greenhouse Gas Protocol, 2013).

However, since primary data are not always available, we should consider using secondary data sourced from proven global or national databases. For example, secondary emission factor databases accepted under the Pathfinder Framework[5] could be considered as accepted global or national databases. Other examples of databases include the following:

- Ecoinvent: A comprehensive and globally recognised Life Cycle Inventory database that facilitates sustainability assessments. It is known for its consistency and transparency and offers over 18,000 reliable data sets across various sectors.
- Product Environmental Footprints: A collection of information and data that measures and quantifies the environmental impact of products throughout their life cycle. It provides detailed information about how a product affects the environment, from the extraction of raw materials to manufacturing, transportation, use, and disposal.
- Official national emission factors databases: For instance, in Japan, the Ministry of the Environment and the National Institute for Environmental Studies release official national emission factors and annual reports on Japan's National Greenhouse Gas Emissions and Removals, offering comprehensive information on GHG emissions and reductions for each fiscal year.

In the worst case, in which no secondary data are available, other sources or proxy data could be used, but the data sources will be documented and made transparent to all stakeholders.

(ii) Data scope refers to the scope of GHG emission activities. The GHG Protocol Corporate Standard classifies a company's GHG emissions into three scopes (Greenhouse Gas Protocol, 2015)

- Scope 1 emissions are direct emissions from owned or controlled sources.
- Scope 2 emissions are indirect emissions from the generation of purchased energy.
- Scope 3 emissions are all indirect emissions, not included in Scope 2, which occur in the value chain of the reporting company, including both upstream and downstream emissions.

[4] The GHG Protocol Product Standard is a framework that enables companies to measure and report the GHG emissions associated with the life cycle of their products, including raw materials, manufacturing, transportation, storage, use, and disposal. It was developed by the Greenhouse Gas Protocol, a collaboration between the World Resources Institute and the World Business Council for Sustainable Development.

[5] The Pathfinder Framework is a framework for the calculation and exchange of product-level carbon emissions data across value chains, developed jointly by 35 stakeholders from industry and the broader decarbonisation ecosystem, harnessing World Business Council for Sustainable Development's role as co-convenor of the Greenhouse Gas Protocol. It is the base framework of Catena-X for developing standards in the accounting and exchanging carbon emissions data across value chains.

The data scope options are to cover own-company emissions data (Scope 1 and 2), direct business partners (Scope 3), or the entire value chain (Scope 3). We need to cover the entire value chain (Scope 3) in the automotive industry, encompassing diverse aspects such as materials, parts and components, car manufacturing, and logistics. Reporting of Scope 1 and 2 emissions is already mandatory for many companies throughout the world. Emissions occurring in the value chain, in contrast, have so far been less in focus. We need to consider Scope 3 emissions given the fact that they constitute most of a company's overall emissions and have the largest potential to reduce emissions.

(iii) Data granularity refers to the unit of data shared and collected. The options are collecting and sharing company-level, production line or plant-level, and product-level data. We need to aim for product-level granularity to provide detailed insights and identify emission areas and reduction opportunities.

- Company-level GHG emissions focus on the overall GHG emissions that result from the aggregation of all a company's activities, including those occurring both upstream and downstream. This approach provides a high-level overview of emissions at the company level, but it also makes it challenging to understand the precise source of emissions and thereby develop effective emission reduction targets and strategies.
- In contrast, product-level means counting GHG emissions from the perspective of individual products or services by tracking emissions throughout a product's life cycle. This approach allows for a more intricate and detailed examination compared with company-level accounting, providing valuable insights that can pinpoint opportunities for reducing emissions.

(iv) Data freshness refers to the frequency of data collection and updates. We can consider multiple options such as annual, monthly, daily, and real-time frequency. We aspire to obtain real-time data for the most up-to-date and accurate data. However, we need to consider the feasibility and reality of users and decide on feasible options in each country.

Secondly, the data items for the data sharing initiative can be divided into three categories: (i) relevant activity data, (ii) relevant emission factors, and (iii) relevant direct emissions data. The total amount of GHG emissions can be calculated by multiplying relevant activity data and relevant emission factors, then adding relevant direct emissions data.

(i) Relevant activity data need to include all activity data related to all relevant processes of product production, such as energy (e.g. joules of energy consumed), mass (e.g. kilograms of a material), volume (e.g. volume of chemicals used), area (e.g. area of the production facility), distance (e.g. kilometres travelled), and time (e.g. hours of operation)

(ii) Relevant emission factors refer to the amount of GHGs emitted, expressed as carbon dioxide equivalent (CO_2e), relative to the unit of activity (e.g. kilogramme of CO_2e per unit). The emission factors need to be decided by the type of activity. For example, emission factors for different types of energy sources (e.g. coal, natural gas, oil, and renewables) provide information on the amount of GHGs produced per unit of energy generated or consumed. Emission factors for various modes of transportation (e.g. cars, airplanes and ships) help calculate emissions based on distance travelled, fuel type, and vehicle efficiency.

(iii) Relevant direct emissions data are the GHG emissions determined through direct monitoring, such as emissions from an incinerator measured through a continuous emissions monitoring system (CEMS).[6]

2.2. Key Takeaways of Catena-X Benchmarking

We have explored the coverage of data and specific data items in Catena-X, as the reference for formulating our plan. Catena-X prioritises the use of primary data and uses secondary data only when primary data are not available, sourcing from verified databases. As for the data scope and granularity, Catena-X covers Scope 3 emissions, since they account for a large share of company GHG emissions, and aims for product-level granularity to ensure an accurate representation of GHG emissions. For data items, Catena-X includes emission-attributable upstream and downstream activities for GHG data sharing but excludes the use of end-of-life management activities due to data feasibility. On the other hands, Catena-X has its limitations. It has limited data visibility rights where users can only exchange data with limited value chain coverage due to compliance issues. It may also be challenging for Catena-X to expand data collection and use, and its expandability to other use cases could be limited. The EU automotive industry tends to restrict data sharing to a minimum due to its competitive nature.

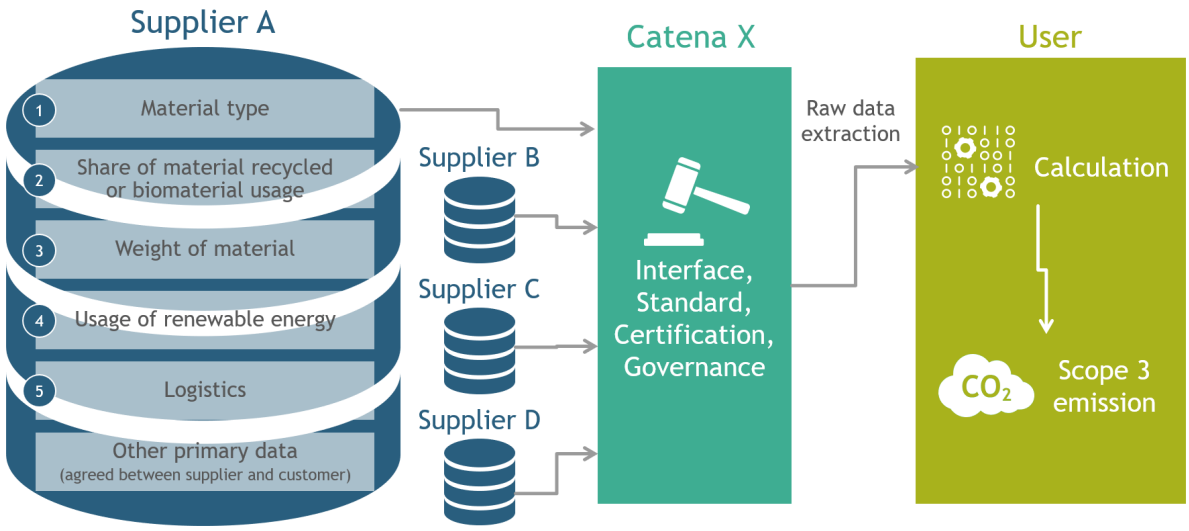
Below are details of the key findings from the Catena-X benchmarking for data coverage and items:

(i) Data coverage: Catena-X prioritises the use of primary data, aligning with established standards like the GHG Protocol Product Standard. It advocates collecting primary data for all stages of a product's life cycle to cover Scope 3 emissions when such data are available and of sufficient quality (Catena-X, 2022b).

- Primary data, particularly company-specific activity data used for calculating product-level GHG emissions, are prioritised. They aim to directly measure GHG emissions or calculate them using a combination of primary activity data and emission factors, referred to as the best case.
- Figure 2.3 illustrates the primary data categories required by Catena-X for Scope 3 calculations at the product level. These categories primarily consist of material type, the proportion of recycled or biomaterial usage, material weight, renewable energy usage, and logistics. Users can calculate Scope 3 emissions with such data.
- While primary data are the preferred choice, there are situations where they may not be available, such as for purchased energy flows like electricity or heating. In such cases, secondary data from verified global or national emission factor databases can be used, termed the base case.

[6] A CEMS is a tool to monitor the gas streams resulting from combustion in industrial processes. A CEMS can measure gas concentrations for oxygen, carbon monoxide, carbon dioxide, and other pollutants to provide information for combustion control and compliance with emission standards.

Figure 2.3. Primary Data Categories and Data Flow



CO_2 = carbon dioxide.
Source: Catena-X (n.d.)

(ii) Data items: Catena-X defines the scope of relevant activity data based on the life cycle of products. It adopts the Life Cycle Assessment (LCA) approach, aiming at product-level granularity.

- LCA is a widely used method to evaluate the environmental impact of a product throughout its life cycle, from raw material extraction to disposal (Greenhouse Gas Protocol, 2013).
- Catena-X includes emissions attributable to upstream activities and direct emissions from relevant activity data, such as material acquisition and pre-processing, production, distribution, and storage. However, it excludes the use and end-of-life management stage[7] due to data feasibility challenges.

(iii) Limitations of Catena-X

Catena-X has data visibility authorisation where users can only exchange data with limited value chain coverage due to compliance issues. Users can only exchange data with stakeholders one tier up and one tier down in the supply chain. This means users can exchange data with their direct suppliers and direct customers but cannot access data for Tier 2 and 3 suppliers. The data sharing atmosphere in the EU automotive industry is constrained by the competitive nature of the industry, leading to a reluctance to share more than the minimum required information. Therefore, it might be challenging for Catena-X to expand data collection and use, and its expandability to other use cases can be limited (Expert interview 1).

[7] The end-of-life stage begins when the consumer disposes of the product and ends when the product either returns to the environment or contributes to the life cycle of a separate product. For example, when a product is reused or recycled, it is then considered part of a new life cycle.

2.3. Pain Points and Challenges in the ASEAN Region

ASEAN has multiple challenges regarding data coverage and items, and these challenges need to be addressed when we implement the data sharing initiative.

- There are challenges in providing quality primary and secondary data due to the less advanced data management systems of local SMEs, lack of dedicated staff to provide emission data, and limited reliable sources for secondary data when primary data are not available.
- It might be challenging to collect Scope 3 data from various stakeholders due to the fragmented industry structure.
- It might be difficult to collect all the necessary data to calculate product-level GHG emissions data or allocate input data to output activities due to the less sophisticated data management systems of SMEs.
- Due to the limited use of sensors for GHG emissions, there might be a lack of direct emissions data.

2.4. Implications for Our Initiative

Considering the Catena-X benchmark and local pain points, the implications for data coverage and items in our initiative are as follows:

- Our data sharing initiative needs to provide IT infrastructure and systems to enable SMEs to provide quality data.
- The rules and procedures need to be clearly defined to ensure a high level of data accuracy.
- The authenticity and verification of data will be very important because data will come from many different sources.
- We may consider starting with production line granularity and expanding it to product level granularity given data feasibility in ASEAN.

3. Data Sharing Processes and Rules

3.1. Our Initial Suggestions

Our aspiration is to achieve product-level data granularity and to cover GHG emissions associated with the life cycle of a product. The life cycle of a product consists of the phase of material acquisition and preprocessing, production, distribution and storage, product use, and end-of-life. We aspire to cover all these phases, but need to consider local data availability and the feasibility of data collection. However, we also need to cover upstream data for materials acquisition and processing, company production, and distribution and storage at least to calculate Scope 3 emissions. GHG emissions data on product use and end-of-life could also be included based on their availability and utility. The basic procedure, methodologies, and standards of data calculation and usage can be referenced from existing globally recognised protocols and standards for the product life cycle approach. These protocols and standards include the ISO LCA standards[8] and GHG

[8] ISO 14040:2006 on Life Cycle Assessment: Principles and Framework; and ISO 14044:2006 on Life Cycle Assessment: Requirements and Guidelines.

Protocol Product Standard. These established protocols and standards delineate comprehensive phases and procedures for GHG emissions accounting. We could consider continuing alignment with these global standards when developing our standards at the time of implementation.

Data sharing processes include (i) data collection, (ii) data assessment, (iii) data calculation, (iv) data allocation, (v) data verification, and (vi) data usage. Furthermore, it is important to define data governance throughout the data sharing process, specifying the requirements and responsibilities for all participants.

(i) Data collection: the standards and processes need to be clearly defined to capture all the defined data items, including activity data, emission factors, and direct emissions data.

- The first step is to identify all the activities in product production that contribute to GHG emissions and to capture all the required data for GHG emissions calculation.
- The data source needs to be defined as primary and/or secondary, following the initial suggestion made in 2-2.
- These activities can be divided into a company's own activities, upstream activities (e.g. material or energy supply), and downstream activities (e.g. transportation) to understand the data source and define potential target areas to reduce GHG emissions.
- Emission factors need to be collected from primary or proven secondary data, following the initial suggestion made in 2-2.
- Direct emissions data need to be collected from direct monitoring of the company.

(ii) Data assessment: data quality is assessed to assure data quality and improve data credibility and trust. To assess how well each datum represents the actual process, specific assessment criteria need to be defined. The criteria below could be considered to assess data quality:

- Completeness: the degree to which the data are statistically representative of the process.
- Technological representativeness: the degree to which the data reflect the technologies used in the process (e.g. implementation of energy-efficient machinery).
- Geographical representativeness: the degree to which the data reflect the geographic location of the processes (e.g. country or site).
- Temporal representativeness: the degree to which the data reflect the time or age of the process (e.g. 2023).
- Reliability: the degree to which the sources, data collection methods, and verification procedures used to obtain the data are accurate (e.g. the basis for calculation is measured inputs or assumptions).

(iii) Data calculation: the total GHG emissions of a product are calculated. The calculation follows a formula that GHG emissions arising from a process can be determined by multiplying the relevant activity data with an emission factor of CO_2e per unit of activity. The resulting activity emissions will then be added to direct emissions.

(iv) Data allocation: emissions may need to be allocated since one common process could have multiple products as outputs, so it may not be possible to collect data at the individual product level. For example, the oil refining process can be divided into several manufacturing processes, such as petrol manufacturing and fuel oil manufacturing. Petrol and fuel oil are produced simultaneously during oil refining. When determining the emissions of the process at each branch, the total emissions from oil refining should be allocated proportionally between the petrol and fuel oil.

Globally accepted standards can be referenced, such as the GHG Protocol Product Standard (Greenhouse Gas Protocol, 2013), to guide allocation decisions.

- When a clear physical relationship exists, we can allocate based on the physical relationship (e.g. the volume or amount of energy).
- When defining a physical relationship is challenging, the allocation can be based on economic value or another method, reflecting relationships between the product under study and its by-products.

(v) Data verification: third-party auditors are requested to ensure compliance with defined standards. This is usually an optional process in similar initiatives, as it is a further step to ensure data credibility and quality. On the other hand, it entails additional time and costs in the data sharing process and may raise potential concerns for data security.

(vi) Data usage: the GHG emissions result is generated and reported to relevant stakeholders such as initiative users, investors, and end customers. In addition, measures could be developed to reduce GHG emissions as an outcome. GHG emission results needs to include attributional information, preconditions of the calculation, and the calculation result.

- General information and scope: company name and contact information, product name, product code (for tracking and identification), and product description
- Scope of activities: GHG emissions attributable to processes and activities
- Data source: primary and secondary data sources, data collection period, and data collection methods
- Allocation rules: description of how emissions data are allocated
- Calculation results: description of GHG emissions volume calculated
- GHG emissions reduction measures: detailed measures to reduce emissions based on the calculation result and overview of any reductions achieved

The guidelines for access to and usage of data need to be defined to ensure data sovereignty and data security in the data sharing process.

(i) Access control decides who can access the data amongst all stakeholders. Access rights could be defined based on data users' profile attributions including their roles, qualifications, and geographical location.

(ii) Usage control defines how the data can be used, including limits on duration, roles, and purpose. Duration specifies the length of time the data can be used, roles limit modification rights to specific people or positions, and purpose restricts the boundaries of data use.

It is important to define data governance throughout the data sharing process, specifying the requirements and responsibilities for all participants. Data governance is a set of practices and policies aimed at establishing clear and unified legal obligations and responsibilities for participants. The primary objective of data governance is to mitigate the risk of losing control over data, ensure secure access to information, and maintain data quality. Based on the Catena-X benchmark, data governance needs to encompass four key areas: data management processes, data governance policies, IT governance policies, and the digitisation strategy. (Catena-X, 2023a, 2023b)

- Data management processes: defining the roles and responsibilities of handling data
- Data governance policies: encompassing a range of guidelines, including data usage and access policies; automated data usage agreement negotiations; technical standards for data sharing amongst organisations; and the roles, rights, and obligations of both data providers and users
- IT governance policies: simplifying the management of digital documents and ensuring security
- Digitisation strategy: embracing transformation through the adoption and leveraging of digital technologies

3.2. Key Takeaways of Catena-X Benchmarking

There are key findings from the Catena-X benchmarks related to data sharing standards and processes. Catena-X focuses on collecting primary data and defines attributable activities for GHG emissions. To ensure data quality, Catena-X quantifies data based on criteria such as technological accuracy, geographic location, timeliness, completeness, and reliability. Additionally, to ensure data sovereignty, participants can decide on access and usage policies to limit access to and use of data. Access policies determine who can view and access data based on the data consumer's role or the company's location, etc., while the usage policy limits data duration, user roles, and usage purposes.

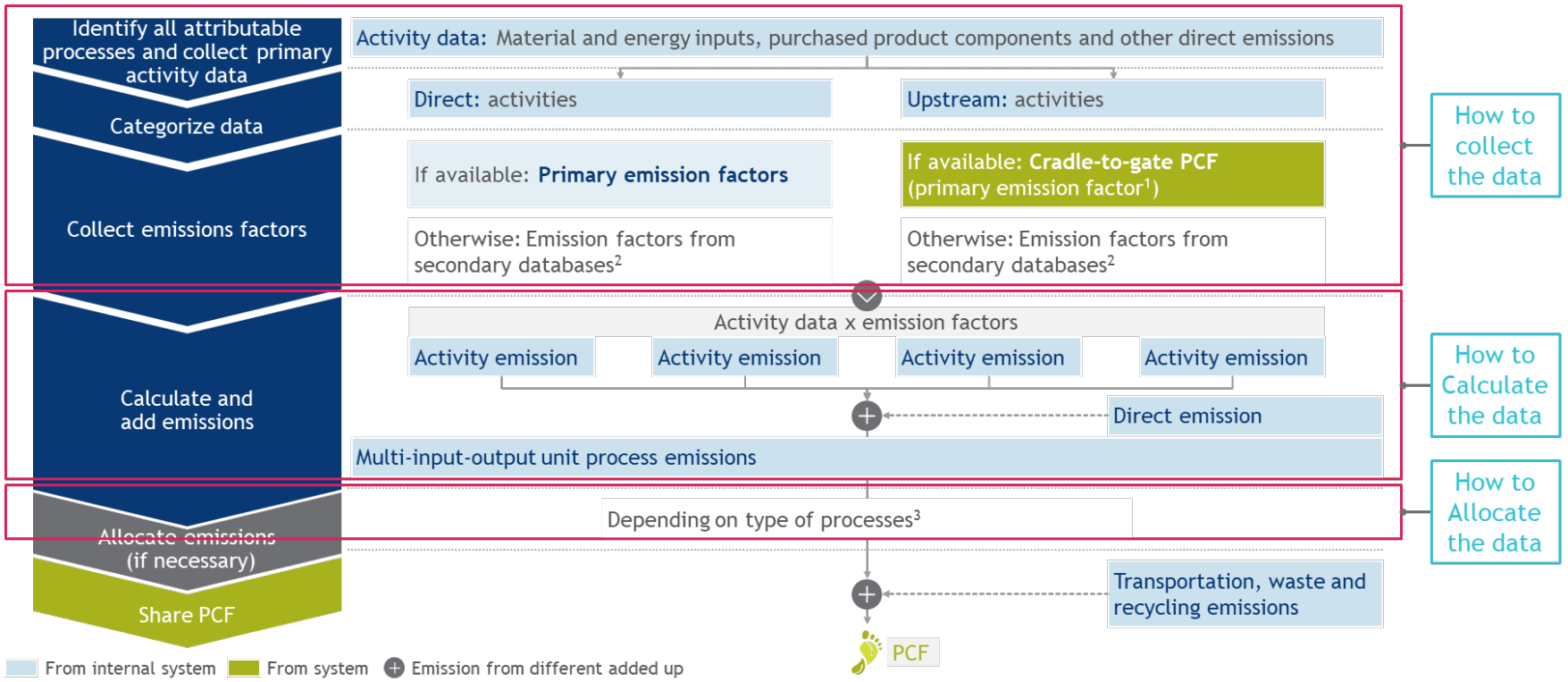
As Catena-X pursues decentralised company-to-company data sharing, it does not own or store the data on the platform. This approach limits the ease of adding new services and functions that use the data. Additionally, Catena-X provides a rulebook for GHG emissions calculation but does not offer an actual GHG calculation function. As a result, the outcome of GHG emissions calculations in individual companies can differ, even with the same input data, depending on the databases and guidelines used by each company.

Below are details of the key findings from the Catena-X benchmarking for data coverage and items:

(i) Data sharing processes

As shown in Figure 2.4, Catena-X defines the process for carbon footprint calculation by adopting the globally adopted framework. It defines the major steps for product carbon footprint calculation from data collection to data sharing.

Figure 2.4. Carbon Footprint Data Sharing Process in Catena-X



PCF = product carbon footprint.
Note: Multi-input-output unit process refers to an operation or process with multiple inputs (e.g. materials and energy) and multiple outputs (e.g. co-products and waste).
Source: WBCSD (2021: 22).

Step 1) How to collect data: This refers to the sub-processes of identifying all attributable processes and collecting primary activity data (1a), categorising data into director upstream emissions (1b), and collecting emissions factors either from primary or secondary databases (1c). Catena-X prioritises the use of primary data.

Step 2) How to calculate data: Catena-X does not provide a calculation function, and calculation is left to the individual company. It only provides calculation guidelines. The process is to multiply activity data and emission factors and add up direct emissions to calculate product-level emissions.

Step 3) How to assess data: Catena-X defines criteria for data assessment and a scoring standard to quantify the assessment results (Figure 2.5). Catena-X assesses data using specified criteria to ensure data quality. It quantifies data quality based on the degree to which the data reflect the actual technology, geographic location, time, completeness, and reliability.

Step 4) How to allocate data: Catena-X tries to avoid allocation whenever possible. When allocations are needed, sector-specific guidance, if any, should be followed. If not, allocation should be carried out in line with the physical relationship, economic value, etc.

Figure 2.5. Data Assessment Standards of Catena-X

Quantification	Criteria for data assessment and scoring standard				
			1-Good	2-Fair	3-poor
• Data quality will be assessed using five specified criteria as listed on the right, and the quantification will be determined by averaging the scores of each criteria	Technological representativeness (TeR)	the degree to which the data reflect the actual technologies used in the process	Same or similar technology	Different technology	Unknown technology
	Geographical representativeness (GeR)	the degree to which the data reflects actual geographic location of the processes within the inventory boundary (e.g., country or site)	Same region or country	Same continent	Global or unknown
	Temporal representativeness (TiR)	the degree to which the data reflect the actual time (e.g., year) or age of the process	Data less than 3 years old	Data less than 6 years old	Data more than 6 years old
	Completeness (C)	the degree to which the data are statistically representative of the process sites	All processes run by the company within reporting period	50% processes run by the company for shorter period	<50% processes run by the company for shorter period or unknown
	Reliability (R)	the degree to which the sources, data collection methods, and verification procedures used to obtain the data are dependable	Measured data	Data partly based on assumptions	Non-qualified estimate

Source: Catena-X (2022b.30-32.), PCF Rulebook Use Case Sustainability Version 1.0.0.

(ii) Access and usage policies

- Access policy: The data provider can establish standardised access policies during the creation of a data offer. These policies will restrict visibility and access to the data offers, defining limitations based on factors such as the role of the data consumer or the location of the company. For instance, a policy could restrict access to the data offer to a specific recycler located in Germany, using the location attribute as a criterion.
- Usage policy: The data provider can establish standardised usage policies during the creation of a data offer. They have the flexibility to choose pre-defined usage policies and customise their attributes. These may include duration restrictions, limiting the data asset's use to a specific timeframe; role restrictions, allowing usage only by designated individuals or roles; and purpose restrictions, specifying that the data asset can only be used for a particular purpose. If the pre-defined policies are insufficient, Catena-X will implement a free-form policy, enabling data providers to add any number of text policies to the data offer.

(iii) Limitations of Catena-X

Catena-X may face challenges when it wants to add new services and functions due to its policy of data sovereignty. As Catena-X aims for decentralised data sharing, it does not own or store the data on the platform. For this reason, it is not easy to add new services and functions to use existing data. If new services and functions need to be added to use the data, a separate entity must be set up to meet data sovereignty requirements. In addition, there are no functions to calculate GHG emissions, analyse industry trends or implications, or identify potential GHG reduction opportunities. As such, calculation is left to the individual companies and GHG emission calculation results can differ even with the same input data depending on the databases and guidelines each company uses (Expert interview 2).

3.3. Pain Points and Challenges in the ASEAN Region

There might be challenges in ASEAN in collecting data from many stakeholders, especially from local SMEs due to the fragmented industry structure and lack of dedicated staff at SMEs to provide GHG emissions data (Section 2.3). In addition, local SMEs might be reluctant to provide data due to concerns about data sensitivity and the risk of data leaks. Another challenge in ASEAN is that data sovereignty and data calculation standards differ amongst countries. Therefore, it will be not easy to define a common standard applicable to all AMS. Lastly, ensuring data authenticity could be challenging, especially when the supply chain involves cross-border transactions amongst countries with different standards and regulations.

3.4. Implications for Our Initiative

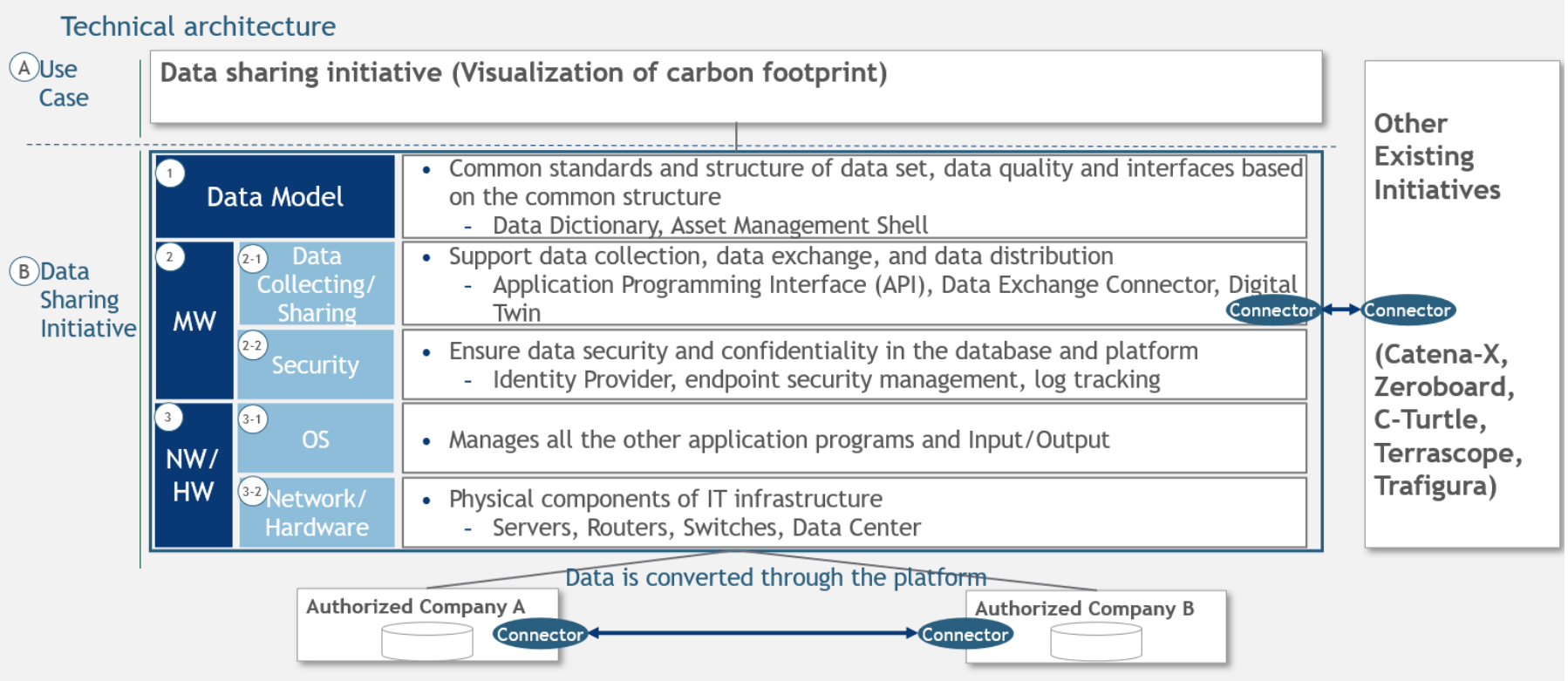
We may consider providing GHG calculation functions to support potential users and motivate participation in our initiative. This function will help SMEs calculate GHG emissions in a more standardised way so that they do not need to invest in their own systems or dedicated staff to calculate GHG emissions to meet local regulations. In addition, we need to establish clear guidelines for data sovereignty and data governance and collaborate with the government sector to align with local sovereignty guidelines and regulations, and the rules and procedures need to be clearly

defined to ensure the authenticity and verification of data. Lastly, we need to develop an implementation plan by reflecting the different progress and potential adoption of data sharing in multiple AMS. We may need to consider starting with one target country and expanding to other countries for quicker and more effective implementation of the data sharing initiative. We may also need to consider starting with a smaller group of companies and gradually expanding to a large group of data sharing participants.

4. Technical Architecture

The technical architecture serves to enable the data sharing objective of transparent data sharing, interoperability, and data security. As shown in Figure 2.6, the technical architecture can be defined as (i) a data management model, (ii) middleware, and (iii) network and hardware.

Figure 2.6. Technical Architecture



HW = hardware, IT = information technology, MW = middleware. NW = network. OS = operating system.
Source: Catena-X (2022).

(i) The data management model is the common standards and structure of the data set, data quality, and interfaces based on the common structure, which enables the exchange of data amongst different industries or use cases. It comprises two components: the data dictionary and the asset management shell.

- The Data Dictionary is a database that describes the types, names, meanings, and locations of data to maintain consistency and integrity.
- The Asset Management Shell is a repository for disclosing and sharing management information on assets such as equipment, machinery, production plans, human resources, etc. over a network, so that GHG emissions calculations are more realistic and reliable based on information with the actual CO_2 emissions numbers and emission factors of an asset.

(ii) Middleware is software and systems that provide functionalities to support data collection and sharing, and it supports functions to ensure data security and confidentiality in the database and platform.

Software to support data collection and sharing includes an API and data exchange connector.

- An API is an interface that enables a programme to be connected from other programmes.
- A data exchange connector is software to exchange data between participants within the secured and trusted connection. It plays a critical role in interoperability by supporting connections with different data spaces in other data sharing initiatives.

Systems to ensure data security include an identity provider, endpoint security management, and log tracking.

- An identity provider is a system that assigns IDs to users and verifies the IDs of users accessing the system.
- Endpoint security management is a system to manage endpoint security on devices such as mobile or computing devices.
- Log tracking is a system used to maintain a system log to detect security risks and issue alerts.

(iii) Network and hardware consist of an operating system, network, and hardware. The operating system acts as an intermediary between the hardware and software. It supports the execution of all the application programmes, manages input and output, and allocates required resources such as CPUs and memory. The network and hardware are physical components of IT infrastructure including servers, routers, switches, and a data centre.

Chapter 3

Future Roadmap

In this section, we introduce two pivotal components of our future roadmap: (i) alignment and collaboration with other initiatives, and (ii) an action plan.

1. Alignment and Collaboration with Other Initiatives

1.1. Existing GHG Data Sharing Initiatives in ASEAN and Japan

Multiple carbon footprint visualisation initiatives already exist in the region (Figure 3.1), and it is essential to determine how we can align and collaborate with them effectively. Collaboration with other initiatives will enable us to expand our data scope, invite more stakeholders in ASEAN, amplify our impact, and drive meaningful change on a larger scale. In addition, we can consider the selected initiatives as references to improve our initiative and accelerate implementation.

Figure 3.1. Existing GHG Initiatives in the Region

Country	Title	Initiative's leader	Contents
Japan	Ouranos Ecosystem	METI, DADC(IPA), NEDO	• Started "Ouranos Ecosystem" to build a supply chain data sharing platform where diverse data, including CFP information, is shared amongst different companies & industries
Indonesia	Sign Smart	Ministry of Environment and Forestry	• Developed GHG emissions calculation support system/application for the private sector, providing information on how to calculate Scope 1 GHG emissions • New application is under development to calculate Scope 1-3 emissions
Indonesia	KADIN	KADIN	• As part of the Net Zero Hub program, KADIN organizes a program to support companies in calculating and managing of Scope 1-3 GHG emissions
Singapore	Agora	Trafigura/Plantir Technology	• Developed a platform to calculate and manage GHG emissions, including Scope 1-3, in the supply chain of the energy sector with Plantir Technology (US) • The main target is large companies in the oil and metals industry
Singapore	Terrascope	Terrascope	• Developed platform to visualise, calculate, and manage GHG emissions, including Scope 1-3 • The main target is large companies, especially agricultural industry.
Viet Nam	Zeroboard (Japan)	Zeroboard/Nagasa	• Will introduce a platform to calculate and visualise Scope 1-3 GHG emissions for local companies in Viet Nam with the support of Nagase (Japan) • "Zeroboard" is already used by more than 2,200 Japanese companies
Viet Nam	SPI-NDC	JICA/MONRE	• Based on the existing system (DataEnergry.VN), Technology Solutions Joint Stock Company established the Scope 1 GHG emissions reporting system, supported by JICA
Thailand	LT-LEDS	Greenhouse Gas Management Authority of Thailand	• Developed guidelines in accordance with ISO 14064-1 for Thai companies that intend to quantify and certify their GHGs

CFP = carbon foot print; DADC = Digital Architecture Design Center; GHG = greenhouse gas; IPA = Information-Technology Promotion Agency, Japan; JICA = Japan International Cooperation Agency; KADIN = Indonesian Chamber of Commerce and Industry; LT-LEDS = long-term low-emission development pathways; METI = Ministry of Economy, Trade and Industry; MONRE = Ministry of Natural Resources and Environment; NEDO = New Energy and Industrial Technology Development Organization; SPI-NDC = Support for Planning and Implementation of the Nationally Determined Contributions in Vietnam, US = United States.

Sources: METI (2023); UNFCCC (2021a; 2021b; 2022); Kadin (n.d.); Terrascope (n.d.); Trafigura (2022); Nagase (2022); and JICA (n.d.).

Here are some examples of data sharing initiatives in each country:

(i) Japan: Ouranos Ecosystem initiative – jointly launched by the Ministry of Economy, Trade and Industry (METI); the Digital Architecture Digital Center (DADC) of the Information-Technology Promotion Agency, Japan (IPA); and the New Energy and Industrial Technology Development Organization (NEDO) – to build a supply chain data sharing platform where diverse data, including carbon footprint information, are shared amongst different companies and industries.

(ii) Indonesia: GHG Emissions Calculation Support System/Application – developed by Indonesia's Ministry of Environment and Forestry – tailored to offer guidance to the private sector on calculating Scope 1 GHG emissions, focusing on emissions generated directly by company activities.

(iii) Singapore: Terrascope initiative – launched by Terrascope – dedicated to creating a platform that visualises, calculates, and manages GHG emissions. It covers Scope 1, 2, and 3 emissions, including both direct and indirect emissions, and primarily targets large companies.

(iv) Viet Nam: Zeroboard initiative – originally developed in Japan in collaboration with LOGIVAN Vietnam Technology Company, Ltd., a start-up that operates a logistics platform in Viet Nam – aims to digitise logistics data and achieve cost reduction and GHG emissions reduction through the optimisation of delivery routes and loading volumes.

(v) Thailand: Thailand Greenhouse Gas Management Organization has taken steps to support Thai companies in quantifying and certifying their GHG emissions. It has developed guidelines, in line with ISO 14064-1 standards, which provide a structured framework for GHG accounting and reporting. These guidelines aid Thai businesses in accurately measuring their carbon emissions and contribute to the country's efforts in GHG management and mitigation.

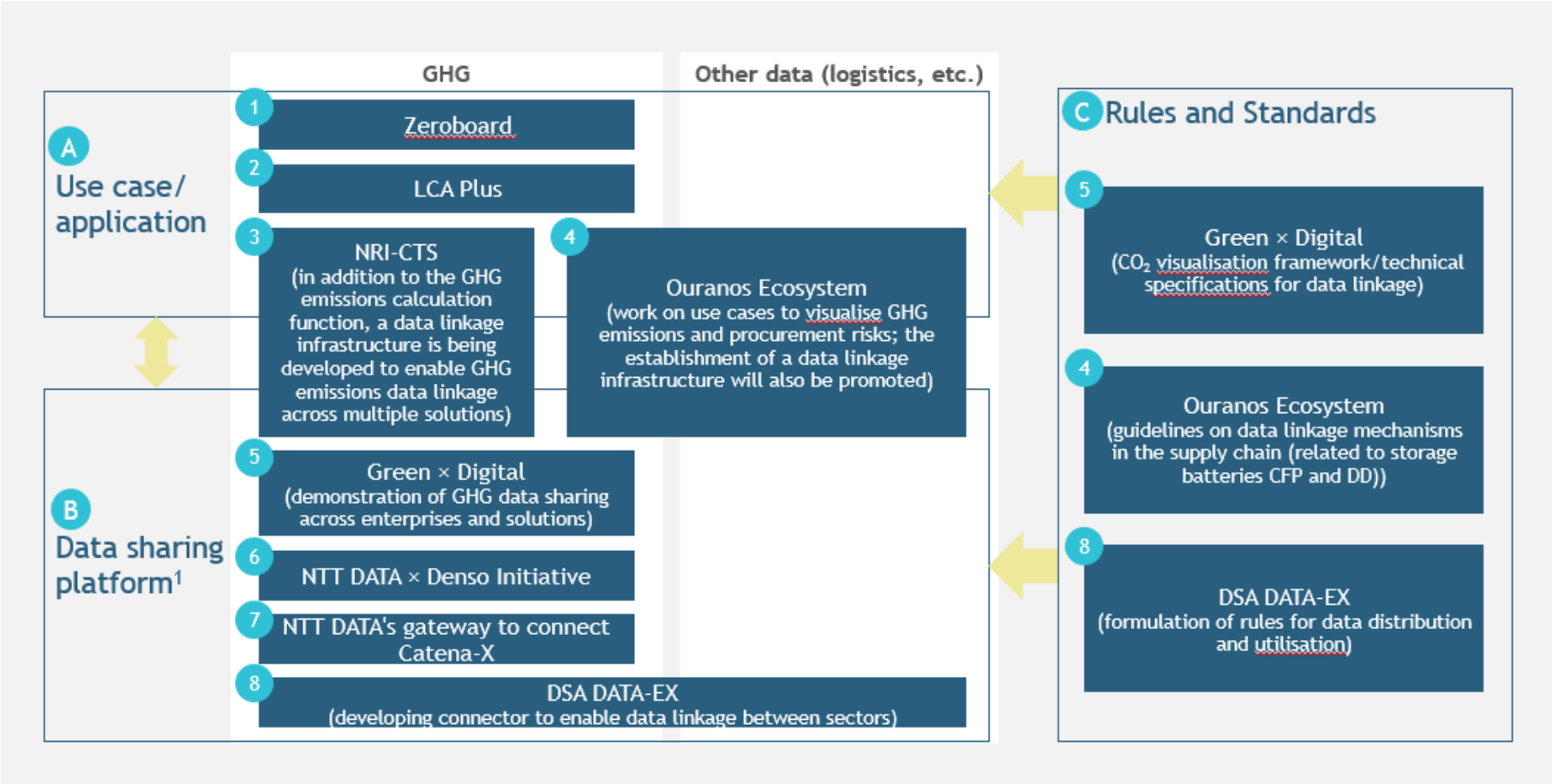
Japan already has several initiatives to share GHG emissions data, led by both the public and private sectors (Figure 3.2). These initiatives can be categorised into three layers:

A) Use case/application: actual data exchange and use amongst stakeholders

B) Data sharing platform: development of infrastructure to achieve use case objectives

C) Rules and standards: establishment of rules and standards for use cases and data sharing platforms

Figure 3.2. Existing GHG Data Sharing Initiatives in Japan



CO_2 = carbon dioxide, CFP = carbon footprint, CTS = Carbon Tracing System, DD = human right due diligence, DSA = Data Society Alliance, GHG = greenhouse gas, LCA = life cycle assessment, NRI = Nomura Research Institute.
Sources: Zeroboard (n.d.); LCA Plus (n.d.); NRI-CTS (n.d.; 2023); METI (n.d.-b); JEITA (n.d.); NTT DATA (2022; 2023); and DATA-EX (n.d.).

A detailed explanation of each initiative, based on publicly available information, follows.

(i) Zeroboard

- Zeroboard is an application designed to calculate supply chain GHG emissions by company, site, and product, including Scope 3, developed by Zeroboard.
- The application is in the sales phase, and the automotive industry may be included. Zeroboard has entered a partnership with Toyota Tsusho to provide services to its clients.

(ii) LCA Plus

- LCA Plus is an application designed to calculate the GHG emissions of products based on LCA, led by Mitsui & Co.
- The application is in the demonstration phase, and several companies in the automotive industry have participated in the demonstrations.

(iii) NRI-CTS

- The Nomura Research Institute Carbon Tracing System (NRI-CTS) is an application designed to calculate GHG emissions by company, site, and product, including Scope 3, in line with the Pathfinder Network.
- NRI also provides a prototype of a data sharing platform as an extension of the access control and traceability functions of the NRI-CTS.
- The application is in the demonstration phase, with the automotive industry identified as the target. It aims to support automotive and battery manufacturers in complying with battery regulations.
- Data shared on the platform primarily consist of GHG emissions data, but information related to human rights and environmental due diligence will also be shared.

(iv) Ouranos Ecosystem

- The Ouranos Ecosystem is an initiative aimed at achieving data sharing and utilisation across companies, industries, and national borders through collaboration amongst industry, academia, and government, led by METI.
- A supply chain data sharing platform is under construction as part of the initiative. Batteries have been selected as the first use case, and guidelines have been issued.
- In the future, the scope of the data will be expanded to include other vehicle components and the vehicle itself. Ultimately, the goal is to link data from various industries.

(v) Green × Digital Consortium

- The Green × Digital Consortium is an initiative aimed at achieving carbon neutrality through digitalisation, including the establishment of a platform to visualise GHG emissions across the supply chain. It is led by the Japan Electronics and Information Technology Industries Association (JEITA), which collaborates with several companies, including Zeroboard and NRI-CTS, to demonstrate data collaboration across companies and solutions.

- The consortium has developed a CO_2 visualisation framework, which includes methodologies for data calculation and sharing. Additionally, technical specifications for data linkage, such as common data formats and APIs, have been established.
- Automotive companies such as Honda, DENSO, and AISIN are members of the consortium.

(vi) NTT DATA × DENSO Platform

- NTT DATA × DENSO Platform is designed for secure data sharing with various trading partners in the value chain to comply with European battery regulations. It is led by NTT DATA and DENSO.
- The platform is under construction, with the automotive and manufacturing industries identified as the target sectors.
- Data shared on the platform are mainly GHG emissions data, but human rights and environmental due diligence information will also be shared.

(vii) NTT's Gateway

- NTT's Gateway is connected to Catena-X, providing Eclipse Dataspace Connector (EDCs) to each user, led by NTT DATA.
- The gateway is in the demonstration phase, and data exchanged on Catena-X, including GHGs will be shared.

(viii) DSA DATA-EX

- DSA DATA-EX is an initiative aimed at realising cross-industry data collaboration platforms such as GAIA-X. It is led by the Data Society Alliance (DSA). In DATA-EX, connectors for data linkage are developed, and rules for data distribution and utilisation are established.
- For DSA DATA-EX, GHG data sharing may be one of the objectives, but the initiative aims to exchange a wide range of data across industries, including energy, infrastructure, agriculture, etc.

We need to consider how to collaborate and determine which initiatives to collaborate with in the later phases.

1.2. Potential Options for Collaborating with Other Initiatives

There are multiple ways to collaborate with existing initiatives, and we could consider the following options based on the degree of collaboration:

Option 1) Share lessons learned: share best practices and risks associated with rules and standards development, implementation, and operation of data sharing platforms with other initiatives and reflect these learnings in our data sharing initiative.

Option 2) Share data sharing standards and rules: use common standards and rules with existing initiatives and co-develop data sharing reference models for interoperability.

Option 3) Develop common IT interfaces: develop an interoperable interface with existing initiatives and define common standards and rules for IT architecture.

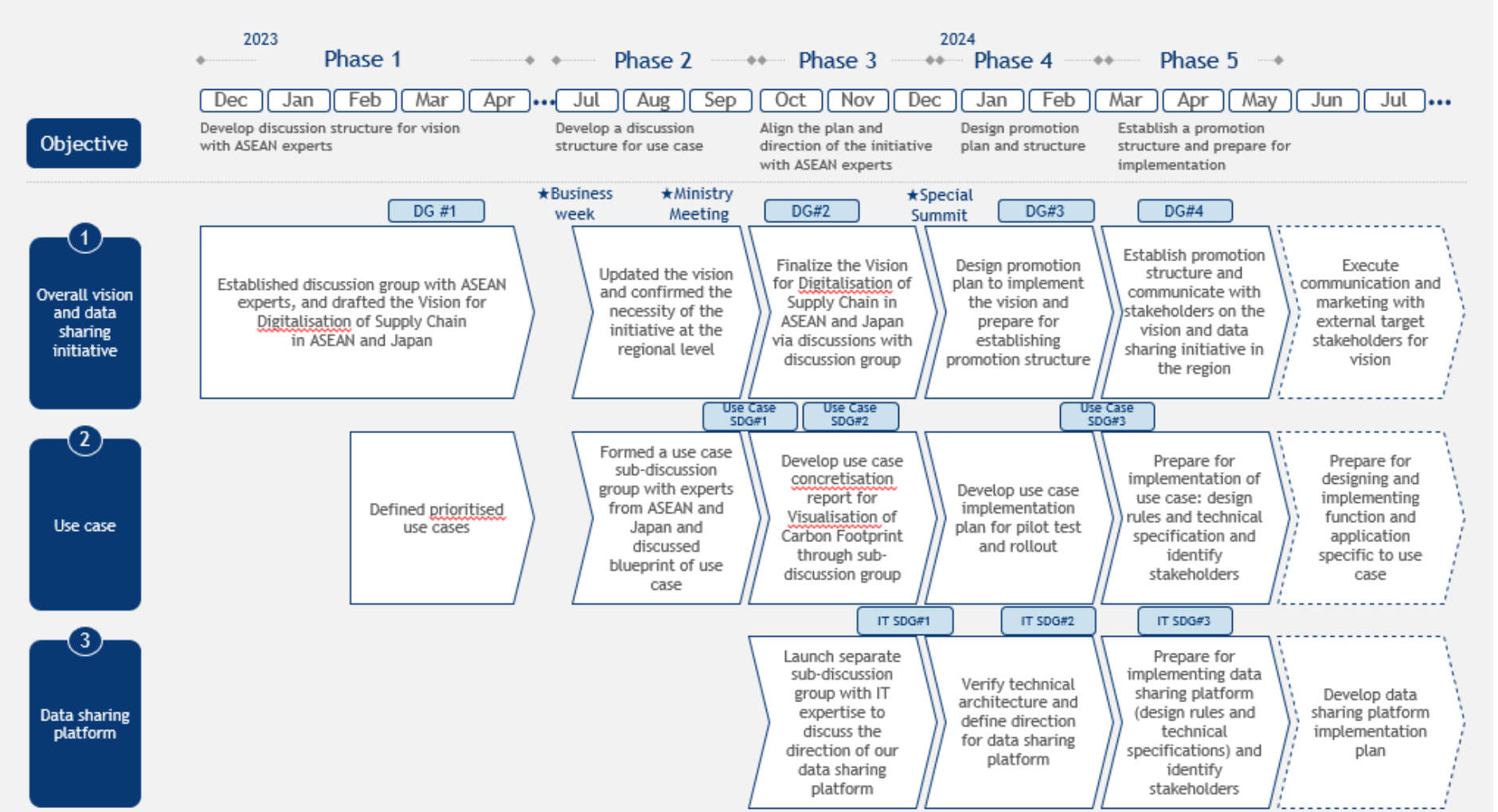
Option 4) Integrate with other initiatives: merge/integrate with existing initiatives or co-develop initiatives together with other data sharing initiatives.

We plan to decide how to collaborate and determine which initiatives to collaborate with when we develop the implementation plan in the future.

2. Action Plan

We understand that it is important to accelerate the onboarding of stakeholders in the region and gain momentum before the other initiatives become *de facto* beyond Asian control. For this acceleration, it is necessary to create use cases that Asian companies can benefit from, and to move forward to establish a digital ecosystem while expanding the number of users. With this understanding, we will continue to concretise our use case and to prepare implementation by discussing it with local experts in Asia. As shown in Figure 3.3, multiple tasks are planned to be completed by 2024. As an immediate milestone, we will share our progress and plan at the ASEAN–Japan Commemorative Summit to be held in December 2023.

Figure 3.3. Milestones and Goals of Our Initiative



ASEAN = Association of Southeast Asian Nations, IT = information technology.
Source: Authors.

(i) Progress made as of December 2023 (Phase 1~3): developed a discussion structure with ASEAN experts and achieved alignment on the vision and use case of the initiative.

- Finalised the Vision for Digitalisation of Supply Chain in ASEAN and Japan after incorporating the views of the discussion group.
- Formed a use case sub-discussion group with experts from ASEAN and Japan, and conducted multiple discussions to define the use case blueprint.
- Developed use case concretisation report for Visualisation of Carbon Footprint through multiple discussions with use case sub-discussion group.
- Launched separate sub-discussion group with IT expertise to discuss the direction of our data sharing platform, and discussion is being planned.

(ii) By early March 2024 (Phase 4): develop a grand design for promotion plan and structure.

- Design promotion plan to implement the vision and prepare for promotion structure establishment.
- Develop use case implementation plan for pilot test and rollout.
- Verify technical architecture and IT requirements for data sharing platform with IT sub-discussion group, and define direction for data sharing platform implementation.

(iii) By end of May 2024 (Phase 5): establish a promotion structure by involving relevant stakeholders and prepare for implementation.

- Establish promotion structure and communicate with stakeholders on the vision and data sharing initiative in the region.
- Prepare for implementation of the use case by designing rules and technical specification for the use case and identifying potential stakeholders to implement the use case.
- Prepare for designing and implementing function and application specific to the use case.
- Prepare for implementation of data sharing platform by designing rules and technical specifications for the data sharing platform and identifying potential stakeholders to implement data sharing platform.
- Use case pilot implementation through collaboration with IT solution vendor will be in the second half of 2024.
- Actual design and implementation of data sharing platform will be prepared in the first half of 2025.

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Expert interview 1

Date: 2 October 2023

Interviewee: Anonymous

Expert's job position

Current Product Owner | Senior Consultant

Questions

What are the limitations of Catena-X?

What are the potential challenges in data sharing implementation and what could be the difference between Europe and ASEAN?

What should be incentives for SMEs to participate in data sharing initiatives?

What could be the types of options for collaborating with the other initiatives?

Expert interview 2

Date: 3 October 2023

Interviewee: Anonymous

Expert's job position

Current Project Manager

Questions

What are the limitations of Catena-X?

What are the potential challenges in data sharing implementation and what could be the difference between Europe and ASEAN?

What should be incentives for SMEs to participate in data sharing initiatives?

What could be the types of options for collaborating with the other initiatives?