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# Circular economy — Review of existing value networks

*Économie circulaire — Examen des réseaux de valeur existants*

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# Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 323, *Circular economy*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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# Introduction

**0.1** The global economy can be characterized as "linear" as it is mainly based on extraction, production, use and disposal. This linear economy leads to resource depletion, biodiversity losses, waste and pollution causing serious damage to the capacity of the planet to continue to provide for the needs of future generations. Moreover, several planetary boundaries have already been reached or exceeded.

To meet current and future human needs (welfare, housing, nutrition, healthcare, mobility, etc.), there is an increased understanding that a transition towards an economy that is more circular, based on a circular flow of resources, can create and share more value with society and stakeholders, while natural resources are managed and regenerated in a sustainable way, securing the quality and resilience of ecosystems.

Organizations recognize many potential reasons to engage in a circular economy (e.g. delivering more competitive and sustainable solutions; improved relationships with stakeholders; more effective and efficient ways to fulfil voluntary commitments or legal requirements; engaging in climate change mitigation or adaptation; managing resource scarcity risks; increasing resilience in environmental, social and economic systems) while contributing to satisfying human needs.

The ISO 59000 family of standards (see Figure 1) is designed to harmonize the understanding of the circular economy and to support its implementation and measurement.

These standards also support organizations, such as government, industry and non-profit, in contributing to the achievement of the United Nations (UN) Agenda 2030 for Sustainable Development.

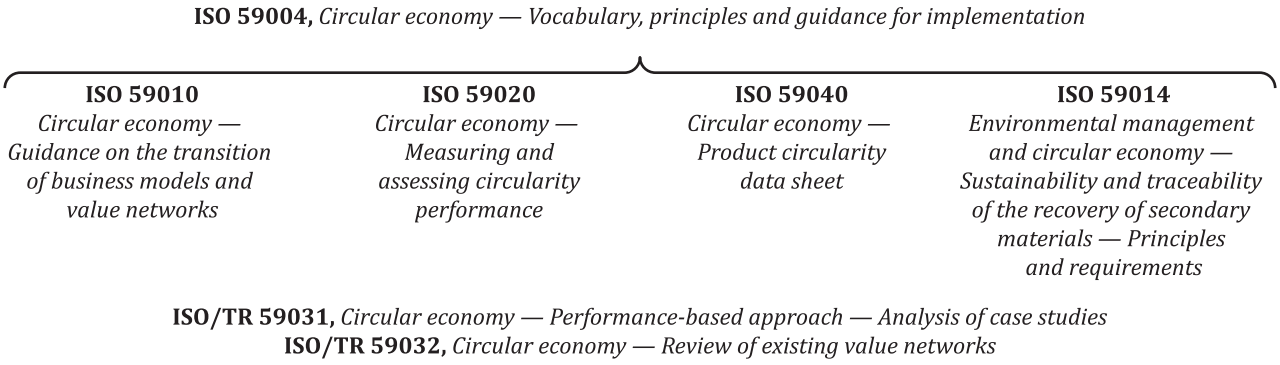


**Figure 1 — ISO 59000 family of standards**

**0.2** ISO 59004, ISO 59010 and ISO 59020 are interconnected, as shown in Figure 2, and support organizations in implementing a transition towards a circular economy.

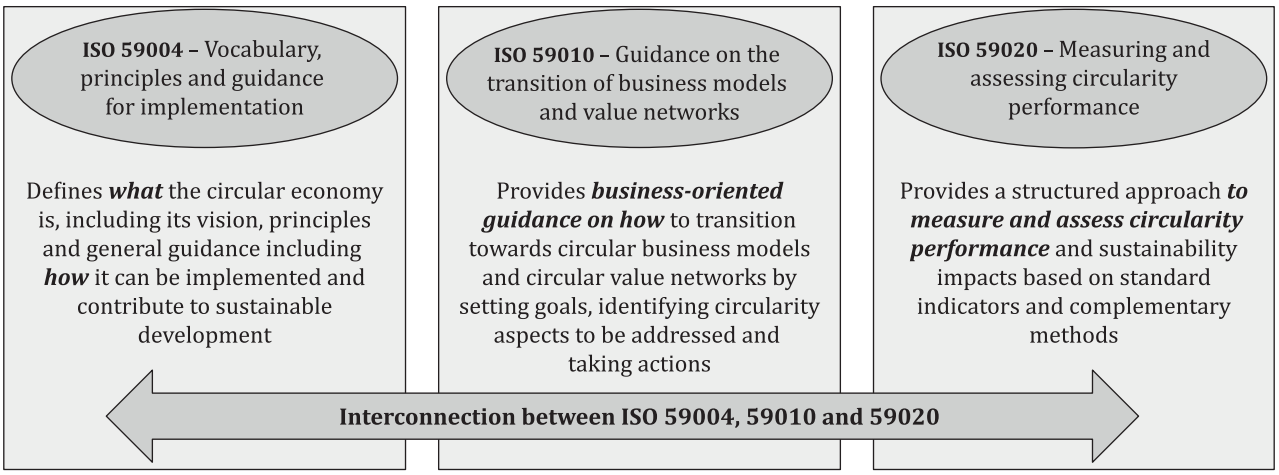


**Figure 2 — Relationship between ISO 59004, ISO 59010 and ISO 59020**

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**0.3** ISO 59010 provides guidance on supporting an organization's business model and processes from linear to circular by transforming an organization's business ecosystem into a value network. The contents of this document support the users of ISO 59010 in providing further detail on the development of value networks in a circular economy. In the development of ISO 59010, a survey was conducted to review and analyse the examples of globally existing value networks. This document provides an analysis of the survey results. It reviews examples of value networks to illustrate their characteristics and structures and how they can accelerate a circular economy transition process, and therefore supports ISO 59010.

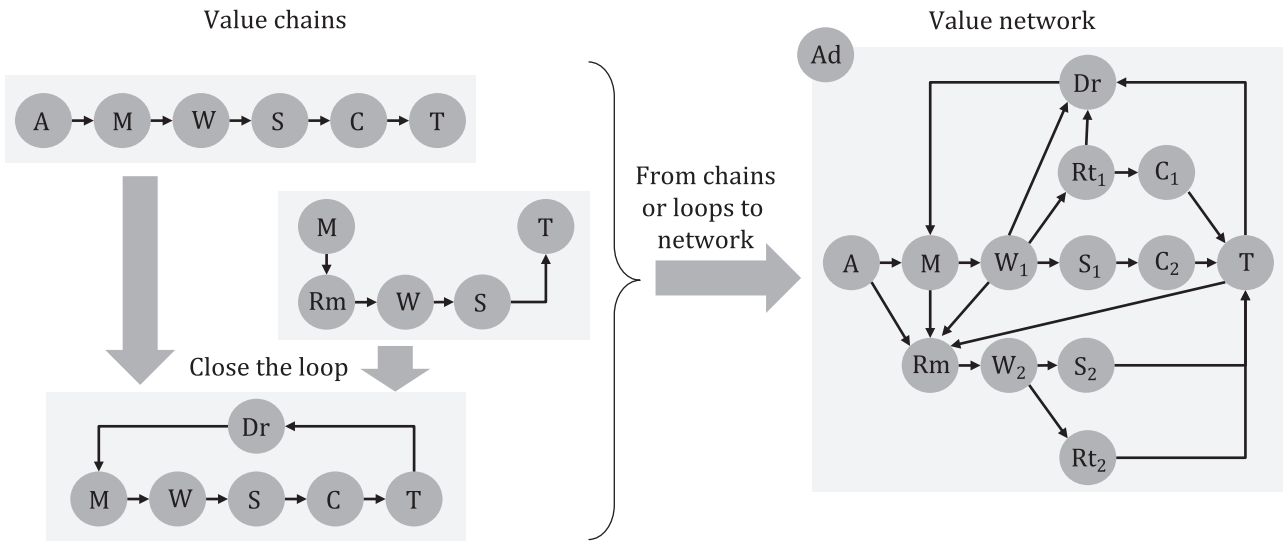
This document investigates suitable examples of value networks to promote circular economy transition. The characteristics and structure of the value networks reflect multiple organization cooperation. The multiple organizations work together to advance their businesses and accelerate their circular economy transition process. A specific organization does not necessarily control the others. This document addresses the methods used to establish and organize a value network to meet the desired requirements.

This document collects and analyses existing relevant cases, examples of the creation of value networks, to demonstrate what is a value network in the context of the circular economy. A general image of the value network discussed in this document is shown in Figure 3.

The objectives of this document are:

— to provide useful information by analysing existing value networks;

— to enhance understanding of the success factors and enablers for creating value networks derived from examples.




**Key**

| | |
|---|---|
| A | raw materials acquisition |
| M | manufacturing |
| $W_1$,$W_2$ | wholesaling |
| $S_1$,$S_2$ | service |
| $C_1$,$C_2$ | consumer |
| T | collection and take-back |
| Rm | remanufacturing and reusing |
| $Rt_1$, $Rt_2$ | retailing |
| Dr | disassembling and recycling |
| Ad | research, association and administration |

**Figure 3 — General process from value chains to a value network**

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# Circular economy — Review of existing value networks

## 1 Scope

This document reviews the characteristics and structures of some existing value networks as examples in accelerating a circular economy transition process.

ISO 59010 gives guidance on a critical aspect in transitioning an organization's business model and processes from linear to circular and transforming an organization's business ecosystem into a value network. This document complements ISO 59010 by providing further information on value networks.

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

**3.1**
**circular economy**
economic system that uses a systemic approach to maintain a circular flow of resources, by recovering, retaining or adding to their value, while contributing to sustainable development

Note 1 to entry: Resources can be considered concerning both stocks and flows.

Note 2 to entry: The inflow of virgin resources is kept as low as possible, and the circular flow of resources is kept as closed as possible to minimize waste, losses and releases from the economic system.

[SOURCE: ISO 59004:2024, 3.1.1]

**3.2**
**common infrastructure**
systems shared among participants in a *value network* (3.6) for mutual benefit

Note 1 to entry: The system indicates an optimization system, traceability system, information exchange system, branding, equal relationship and internal standardization as a certification system.

**3.3**
**governance**
principles, policies and framework by which an *organization* (3.4) is directed and controlled

[SOURCE: ISO 21505:2017, 3.1]

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**3.4**
**organization**
person or group of people that has its own functions with responsibilities, authorities, and relationships to achieve its objectives

Note 1 to entry: The concept of organization includes, but is not limited to sole-trader, company, corporation, firm, enterprise, authority, partnership, charity or institution, or part or combination thereof, whether incorporated or not, public or private (e.g. foundation, union, association, agency, municipality, region, country, intergovernmental agencies).

Note 2 to entry: A group of organizations can also be considered as an organization that has, alone or collectively, their own objectives.

[SOURCE: ISO 59004:2024, 3.4.1]

**3.5**
**value chain**
set of *organizations* (3.4) that provide a solution that results in value for them

[SOURCE: ISO 59004:2024, 3.5.2]

**3.6**
**value network**
network of interlinked *value chains* (3.5) and interested parties

[SOURCE: ISO 59004:2024, 3.5.3]

# 4 Review of existing value networks

## 4.1 Method

### 4.1.1 Survey process

The survey was conducted in accordance with the steps shown in Figure 4. The process of collecting the cases was based on different experts voluntarily accepting an invitation to submit examples. The examples were selected based on the criteria shown in Figure 4.

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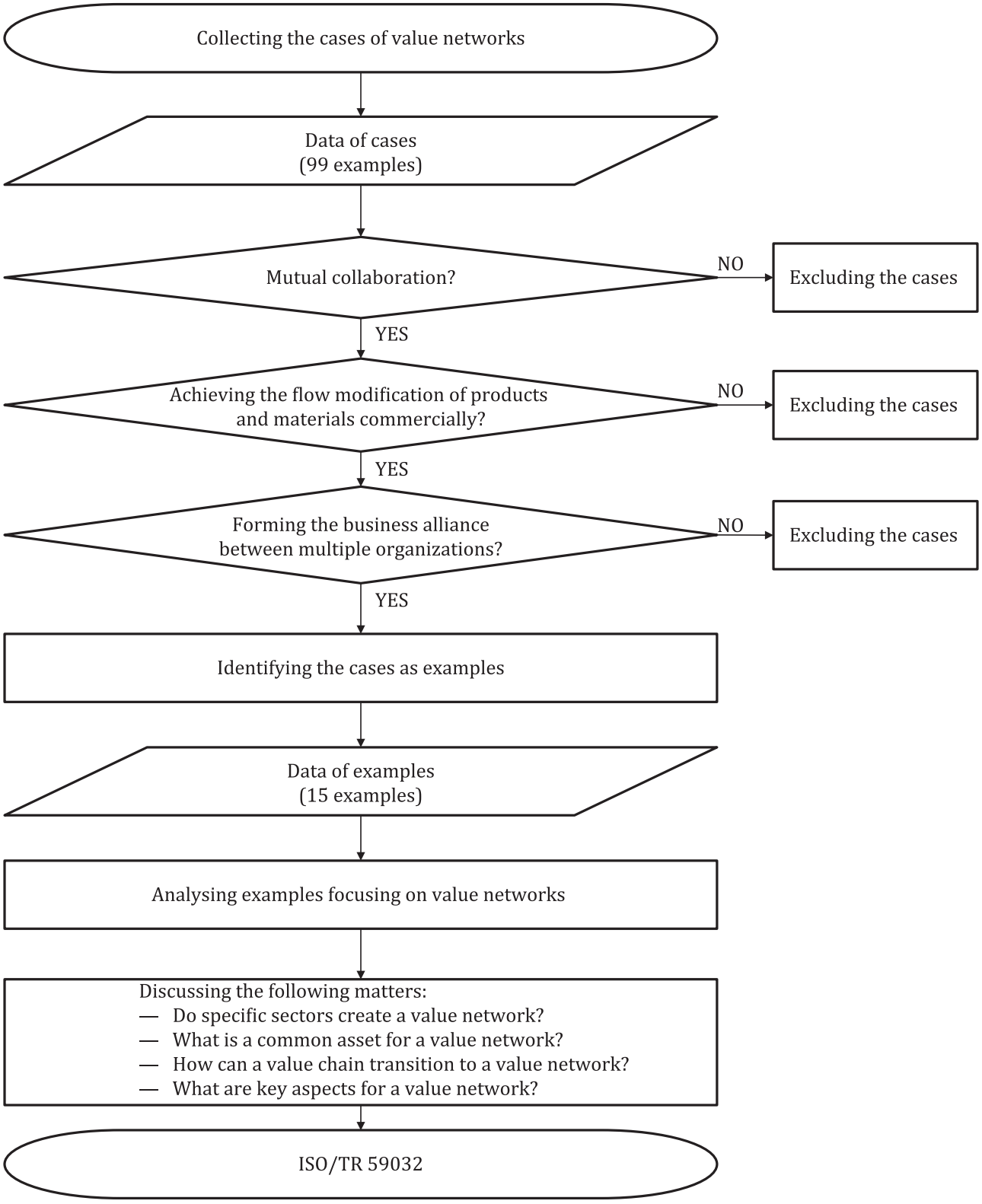


**Figure 4 — Survey process**

### 4.1.2 Preparing questionnaires

The survey was conducted by experts on existing value networks in each region, country or organization to collect the following information:

a) type of case;

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b) title and basic information;

c) overview of the implementation model;

d) beneficial or detrimental impacts (listing and highlighting critical aspects);

e) relevance to the Sustainable Development Goals (SDGs), including detrimental impacts;

f) key aspects relevant to the circular economy ;

g) implementation methodology;

h) enablers, barriers and concerns;

i) relevant information specific to businesses or individual projects.

### 4.1.3 Collecting the cases of value networks

The aim was to cover a wide scope of various types of existing value networks. Geographical and sectoral balance was considered when collecting the existing cases of value networks. There were 99 cases collected that fulfilled the questionnaire requirements for further analysis.

The collected cases are geographically diverse across countries or regions (Japan, Europe, the United States, Brazil, China, India, Canada, Mauritius and Singapore). The collected cases cover various sectors, including machinery and equipment, forest and bio-based industries, waste management, textiles, chemicals, food, drink, mining, metals, minerals, cement, construction, transport, furniture, glass and steel.

### 4.1.4 Selecting the examples

Fifteen examples were selected from the collected value network cases using the following criteria:

a) Does the case have a mutually beneficial collaboration?

b) Does the case achieve the flow modification of products and materials commercially?

c) Does the case form a business alliance between multiple organizations?

The selected examples achieve a scale flow modification of products and materials commercially, and form a business alliance between multiple organizations. The status of the examples covers not only the aspects of the value network but also circular economy implementation and use case (see Figure 5).

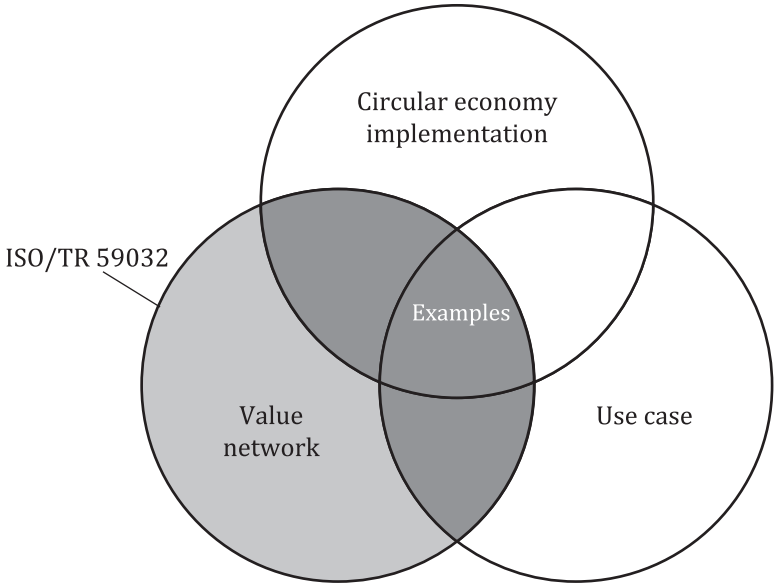


**Figure 5 — Status of the examples**

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### 4.1.5 Selected examples

The examples shown in Figure 6 and listed in Table 1 were selected as examples of value networks from the 99 worldwide examples collected.

**Figure 6 — Geographical distribution of collected and selected examples**

**Table 1 — Geographical location of collected and selected examples**

| No. | Title | Geographical location |
|---|---|---|
| 1 | Horizontal closed loop aluminium recycling system of Shinkansen | Japan |
| 2 | Improving the income levels of Indian farmers through better access to information | India |
| 3 | Case in the USA | USA |
| 4 | Effective industrial symbiosis | Denmark |
| 5 | CIRCULÉIRE – The National Platform for Circular Manufacturing | Ireland |
| 6 | Omnicane's "zero waste" industrial ecosystem | Mauritius |
| 7 | Eco-town business | Japan |
| 8 | Resources complex consortium | Japan |
| 9 | Case in Spain | Spain |
| 10 | Global case | Global |
| 11 | Aluminium recycling in the window and curtain walling industry | Germany |
| 12 | Close the Glass Loop – The European Union (EU) ambition to collect increased amounts of glass more effectively | EU |

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**Table 1** *(continued)*

| No. | Title | Geographical location |
|---|---|---|
| 13 | Lopyanko – AGRY_GAYA'18 Project for sustainable organic silk | Bulgaria |
| 14 | An open-access circular supply chain for fashion | UK |
| 15 | Cargo Carousel System | Canada |

## 4.2 Examples

### 4.2.1 Example 1: Horizontal closed loop aluminium recycling system of Shinkansen (Japan)

This example includes facilitators and participants from various sectors, including information and communication technology (ICT), transport, construction, machinery and equipment, mining, metals and minerals, power and utilities. The construction of a value network is expected to promote the construction of an advanced recycling system consisting of different industries. Key methodologies, including recycling process certification, recycled resources standards and sharing information, can help to create and maintain the value network. Some aspects, including reducing costs and improving the value of resources and resource efficiency, seem to be the key motivations for participation in this value network (see Table 2).

**Table 2 — Horizontal closed loop aluminium recycling system of Shinkansen (Japan)**

| Parameter | Description |
|---|---|
| Facilitators (designers) | Sectors:<br>— Transportation<br>— Waste management<br>Organizations:<br>— Central Japan Railway Company<br>— Harita Metal Co., Ltd. |
| Year of implementation | 2020 |
| Participating companies | Sectors:<br>— Metal manufacturing<br>— Other transport manufacturing<br>— Machinery<br>— Other (mining, power and utilities)<br>Organizations:<br>— Sankyo Tateyama, Inc.<br>— Nippon Sharyo, Ltd.<br>— Hitachi<br>— Japan Aluminium Association |
| Geographic location | Asia (Japan) |
| Relevant matters | Machinery, metals, waste management (recycling), railway |
| Relevant products/services | Recycled products (aluminium, etc.) |
| Key aspects (activities) | — Manufacturing Shinkansen materials and parts<br>— Recycling aluminium scrap<br>— Manufacturing and sale of recycled resources<br>— Construction business of recycling systems |

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**Table 2** *(continued)*

| Parameter | | Description |
|---|---|---|
| Impacts | Added/created value aspects | The collaboration has resulted in the construction of an advanced system that reuses the discarded aluminium from the Shinkansen for the Shinkansen (not a cascade recycling but horizontal recycling). |
| | Social aspects | — Promoting resource recycling<br>— Reducing waste<br>— Reducing environmental impact<br>— Promoting employment<br>— Forming new markets |
| | Environmental aspects | — Improving resource efficiency<br>— Reducing $CO_2$ emissions<br>— Reducing environmental impacts |
| | Economic aspects | — Reducing waste disposal costs<br>— Stable supply of recycled resources<br>— Sustainable recycling |
| Motivation of participants in the value network | | — Cost reduction (collection, waste, recycling cost)<br>— Improving the value of resources<br>— Improving resource efficiency<br>— Development of a circular economy<br>— Improving the recycling technology<br>— Securing secondary resources |
| Methodology for creating and maintaining the value network | | — Recycled resources standard<br>— Recycling process certification<br>— Shinkansen disposal and manufacturing plan<br>— Sharing material information<br>— Certification, standard and traceability system<br>— Japan Aluminium Association as a neutral organization |
| Common infrastructures | | Certification, standard, information |
| Enablers and barriers | | Enablers:<br>— Resource efficiency, traceability and proper disposal of dischargers<br>— A horizontal recycling committee for aluminium vehicles, in which many companies participate in the Japan Aluminium Association<br>— Recycling process certification standard and secondary resource standards for the committee |
| Source | | Based on the Harita Metal website (https://www.harita.co.jp/eng/index.html) |

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### 4.2.2 Example 2: Improving the income levels of Indian farmers through better access to information (India)

This example includes facilitators and participants from various sectors, including agriculture, food and drink, ICT and packaging. The construction of a value network is expected to promote reducing the mismatch between supply and demand in a wide range of markets. Key methodologies, including online platforms, win-win structures and fair transactions, can help to create and maintain the value network. Some aspects, including improving income levels and lower procurement costs, seem to be the key motivations for participation in this value network (see Table 3).

**Table 3 — Improving income levels of Indian farmers through better access to information (India)**

| Parameter | | Description |
|---|---|---|
| Facilitators (designers) | | Sectors:<br>— Agriculture (tobacco)<br>— Paper manufacturing<br>— Food manufacturing<br>Organizations:<br>— Private company |
| Year of implementation | | 2000 |
| Participating companies | | Sectors:<br>— Agriculture<br>— Food manufacturing<br>— Others (ICT and packaging)<br>Organizations:<br>— Private company<br>— Farmer |
| Geographic location | | Asia (West Bengal, India) |
| Relevant matters | | Farmers, online platform, poverty |
| Relevant products/services | | Agricultural products, food |
| Key aspects (activities) | | — Higher profits<br>— Optimizing the use and distribution of time and resources<br>— Securing a long-term food supply |
| Impacts | Added/created value aspects | Mismatch of supply and demand is reduced in a wide range of markets, which improves the sales for the stakeholders. |
| | Social aspects | — Ensuring higher profits for farmers<br>— Securing a long-term food supply |
| | Environmental aspects | — Reducing emissions, water usage and environmental degradation<br>— Optimizing the use and distribution of time and resources |
| | Economic aspects | — Ensuring higher profits for farmers<br>— Lower procurement (costs) and targeted sales<br>— Optimizing the use and distribution of time and resources |

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**Table 3** *(continued)*

| Parameter | Description |
|---|---|
| Motivation of participants in the value network | — Improving income levels (higher profit)<br>— Lower costs of procurement<br>— Lower targeted sales<br>— Sharing information/knowledge<br>— Securing a long-term food supply |
| Methodology for creating and maintaining the value network | — Online platform for improving sales/reducing costs (pricing, weather forecasting, knowledge)<br>— Win-win structure (higher profits for farmers, lower procurement and targeted sales)<br>— Four million farmers use the service<br>— Farmers can make decisions on their own<br>— Farmers respect manufacturers that offer fair prices |
| Common infrastructures | Online platform (information, knowledge) |
| Enablers and barriers | Enablers:<br>— Lower procurement, optimizing the use and distribution of time and resources through information<br>— Improving income levels, lower costs of procurement, lower targeted sales<br>— Win-win structure (higher profits for farmers, lower procurement and targeted sales)<br>— Developing IT infrastructure |
| Source | Based on the ITC website (https://www.itcportal.com/businesses/agri-business/e-choupal.aspx), Ellen MacArthur Foundation website(https://www.ellenmacarthurfoundation.org/case-studies/improving-income-levels-of-indian-farmers-through-better-access-to-information) |

### 4.2.3 Example 3: Case in the USA

This example includes facilitators and participants from various sectors, including waste management, food and drink, ITC and packaging. The construction of a value network is expected to promote the use of by-products. Key methodologies, including finding synergies, matching demand and supply, and accessibility for small businesses, can help to create and maintain the value network. Some aspects, including cost reduction, increasing the bottom line and cultivating local circular economies, seem to be the key motivations for participation in this value network (see Table 4).

**Table 4 — Case in the USA**

| Parameter | Description |
|---|---|
| Facilitators (designers) | Sectors:<br>— Construction<br>— Waste management<br>Organizations:<br>— Non-profit organization<br>— Private company |
| Year of implementation | 2011 |

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