SUPPLY CHAIN

Square

GIVING A FUTURE TO TALENT

THE GREEN SUPPLY CHAIN

CAMILLE VILLARD
SOLENN LAPLANCHE
AISSA MAAMER

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Authors: Camille Villard,
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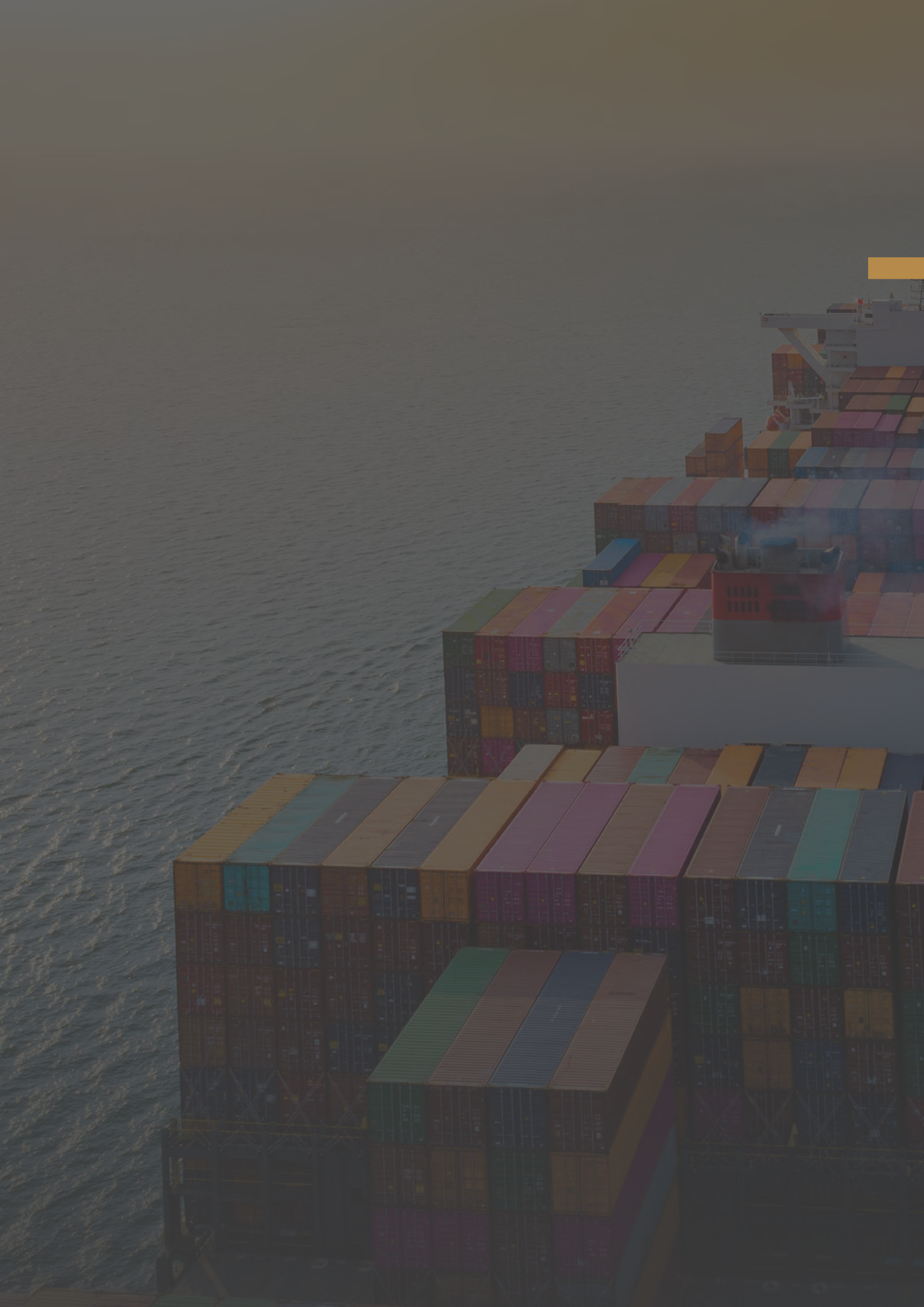

FOREWORD

The climate and environmental urgency cannot be questioned any longer: global warming, proliferation of plastics, shrinking biodiversity, increasing pesticide concentrations, deteriorated water quality, water shortage, soil exhaustion, proliferation of toxic waste, rising natural and industrial risks… The topics of concern are numerous and the urgency to give priority to these subjects has been established by studies and analyses that are winning increasingly unanimous support within the scientific community and public opinions.

This consensus represents a unique opportunity for transformation (or potentially revolution) because it leads all economic stakeholders to participate actively in this evolution: consumers are embracing more responsible consumption choices, investors are increasingly taking environmental, social, and governance criteria into account for their investments, public authorities are gradually adding regulations at the local, national and international levels, employees and candidates start considering during their job search the "meaning" shown by companies. Eventually, regardless of the origin of the pressure organizations will need to roll out pro-active measures to demonstrate their high level of commitment to this transformation to their customers, shareholders, creditors and employees.

Beyond wishful thinking and stakeholders' pressure, such a shift represents a considerable challenge. It indeed requires to rethink organizations that were built decades ago and revisit the associated mental models.

This document provides a perspective on the environmental transformation challenge of organizations through the "Supply Chain" function.

Supply Chain can be defined as the management of product cycle, from raw material procurement to distribution, whether in retail stores or directly to consumers.

Such a prism may appear paradoxical since the optimizations of Supply Chain implemented in the past decades seem, at first sight, completely opposite to the principles of an economy respectful of the environment: t-shirts manufactured in China are sold at very low prices in France, fish comes from Chili, or Kenya-grown green beans can be found in December on European shelves…

Our conviction is that, quite on the contrary, the Supply Chain will become in the years to come one of the major levers and drivers allowing organizations to dramatically shift their economic model towards a more sustainable one. This conviction builds on our expertise in the Supply Chain business and our experience with clients in the industry, distribution and banking sectors.

This document will highlight three very concrete, Supply Chain-mediated transformation levers:

- Carbon footprint management through the Supply Chain
- Circular Supply Chain
- Eco-responsible deliveries

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1.

ENTERPRISE CARBON FOOTPRINT MANAGEMENT THROUGH THE SUPPLY CHAIN

1. INTRODUCTION: WHAT IS THE CARBON FOOTPRINT?

Designed in 2002 by the ADEME (Agence de l'environnement et de la maîtrise de l'énergie, Environment and Energy Management Agency) in order to respond to the climate challenge urgency, carbon footprint is an approach for quantifying the greenhouse gases (GHG) emissions. This assessment provides an overview, at a given time, of greenhouse gas emissions by a specific activity.

The carbon footprint methodology relies on a set of tools and guidelines allowing to estimate, in practice, the GHG emissions. These tools are based on ISO standards such as 14069, 140064-1 or on the standards defined by the GHG Protocol.

1.1 THREE SCOPES TO CONSIDER FOR CARBON FOOTPRINT

Carbon footprint classifies GHG emissions into three perimeters (called "scopes" in the scientific and regulatory literature):

- Scope 1 represents direct GHG emissions (except energy) coming from company-owned assets (factories, vehicle fleets, buildings, etc.). It is the most limited scope for GHG quantification.
- Scope 2 is more inclusive than scope 1. It includes the "indirect emissions related to energy consumption", i.e. all greenhouse gas emissions from electricity, heat, steam, or cooling.
- Scope 3 has the broadest calculation perimeter. It includes all the indirect GHG emissions that are not accounted for in scopes 1 and 2

and therefore allows to have a broad vision of the greenhouse gas emissions of a company or resulting from the manufacturing of a product. It thus integrates emissions across the entire life cycle: emissions from the organization's suppliers, transportation of employees and customers, procurement, recycling, and end-of-life of products.

The first two scopes are generally relatively simple to quantify for organizations because all the data originate from the company itself and are therefore accessible, provided the necessary efforts and resources are involved. However, scope 3 is much more complex to quantify since it involves internal as well as external players, upstream and downstream of the production line.

Upstream activities

1. Purchased goods and services: extraction, production of goods or services acquired/purchased by the company, including emissions relative to the life cycle of a good before it is delivered to the company (raw material extraction, agricultural activity, etc.)
2. Capital goods: purchase of equipments, vehicles, facilities
3. Fuel and energy not included in scopes 1 and 2
4. Upstream transportation and distribution of products by tier 1 suppliers
5. Upstream waste management by companies other than those considered in the footprint assessment
6. Business travels, except for the company's employees
7. Employee commuting
8. Upstream leased assets

Downstream activities

9. Downstream transportation and distribution of products sold by the company
10. Use of intermediate products by a third-party
11. Use of sold products. This represents the scopes 1 and 2 of end users
12. End-of-life treatment of sold products
13. Downstream leased assets – the company owns goods and leases them
14. Franchises
15. Investments (not included in scopes 1 and 2)

To better understand the principle of carbon footprint and the complexity of scope 3, let us consider a fictitious case, the ABCD company, which produces a unique product in its factory ABCD, which is then sold through its store ABCD. The company owns a truck that delivers products to its store. To manufacture its product, the factory ABCD has two suppliers:

- Supplier A, which brings into play supplier C for raw materials. Supplier A owns a truck to get its supplies from C. A has a salesperson who flies to negotiate with factory ABCD.
- Supplier B, which sells an intermediate product and calls upon another company for waste management.

Carbon emissions resulting from activities upstream of the reporting factory are accounted for in scope 3, with a significant majority of emissions reported under "purchasing of goods from supplier X" (see Figure 1).

Currently, carbon footprint reporting in France is dictated by a precise regulatory framework: one regulation comes from the French Environment Code, while the second stems from the French Commercial Code.

Figure 1. Carbon footprint for a fictitious company ABCD (and its suppliers)

Carbon Footprint Supplier C

Scope 1: direct emissions from raw material extraction

Scope 2: indirect emissions (electricity generation)

Scope 3: downstream transportation and distribution (C > A)

Carbon footprint Supplier A

Scope 1: direct emissions from intermediate product manufacturing and its transportation fleet to supply raw materials

Scope 2: indirect emissions (electricity generation)

Scope 3: 1. purchase of raw materials from C (includes the equivalent of Supplier C's emissions proportionally to its contribution to purchased raw materials)
9. downstream transportation and distribution (A>ABCD)
10. use of intermediate products by a third party (manufactured by ABCD)

Carbon footprint Supplier B

Scope 1: indirect emissions (electricity generation)

Scope 2: indirect emissions (electricity generation)

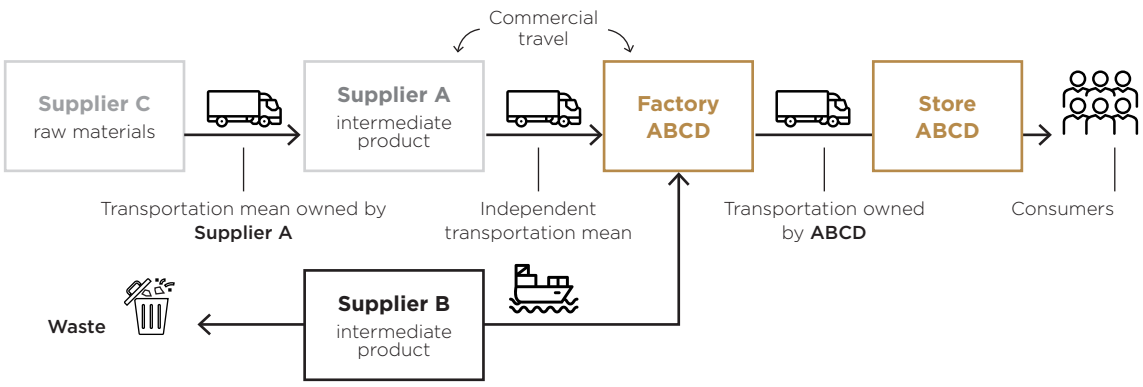
Scope 3: 5. Upstream waste management by third-party companies
9. downstream transportation and distribution (N>ABCD)
10. use of intermediate products by a third party (manufactured by ABCD)

Carbon footprint Supplier ABCD

Scope 1: direct emissions
- from manufacturing in factory ABCD
- from its transportation fleet to deliver goods from factory ABCD to store ABCD
- from its store

Scope 2: indirect emissions (electricity generation to manufacture the end product)

Scope 3:
1. purchase of intermediate products from A (includes the equivalent of Supplier A's emissions proportionally to its contribution to purchased products)
   > includes all emissions proportionally to their contribution to the intermediate product coming from upstream manufacturing (Suppliers A and C) and to the transportation between C and A
6. business travel, except for employees of the company, to negotiate with A
4. upstream transportation and distribution of products from Supplier A
4. upstream transportation and distribution of products from Supplier B
11. use of sold products (based on product design specifications and assumptions about product use). It represents the Scopes 1 and 2 of final users.



1.2 REGULATORY FRAMEWORK FOR CARBON FOOTPRINT IN FRANCE

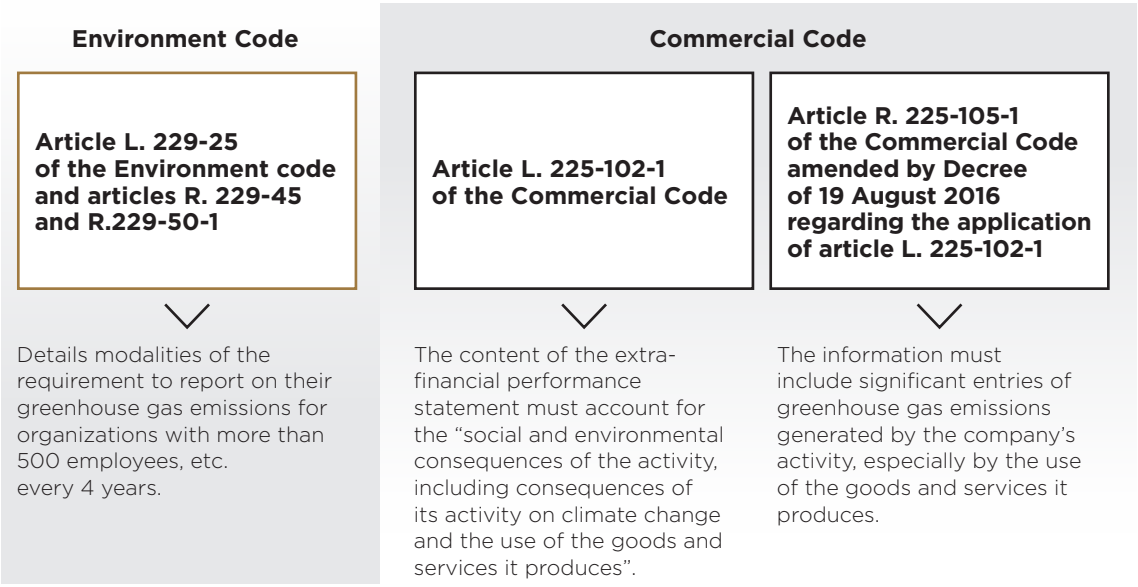
Since the Grenelle II law of July 2010 the quantification of the GHG emissions generated by an activity has become mandatory for a number of public and private actors: for private companies with more than 500 employees, public bodies with more than 250 agents, local and regional authorities with more than 50,000 inhabitants and the State. This is named mandatory "Bilan GES" (GHG footprint reporting).

The scope covered by this GHG footprint reporting does not make it mandatory to calculate and measure emissions across the entire three scopes, but only for scopes 1 and 2 without taking into account the indirect emissions generated by operations across the entire product or service value chain (scope 3). Measuring scope 3 emissions is recommended but not mandatory. The law requires to carry out this mandatory GHG footprint reporting every 4 years for companies and every 3 years for public institutions, local authorities and State's services included in the application scope.

Two articles of the French Commercial Code complement the requirements of the Grenelle II law. These two articles specify that listed companies and French companies or subsidiaries of companies operating abroad with more than 500 employees and a revenue greater than 100M Euros must each year disclose a reporting on significant items of direct and indirect GHG emissions as part of their extra-financial performance statement.

In addition to respecting a regulatory constraint, performing a carbon footprint reporting on its activities presents several advantages for organizations: it allows to anticipate upcoming regulatory constraints (at the local, national or international levels), and to align their actions with the global trend aiming to reach publicly claimed ambitions on GHG emission reduction,

Figure 2. French regulatory framework for carbon footprint reporting



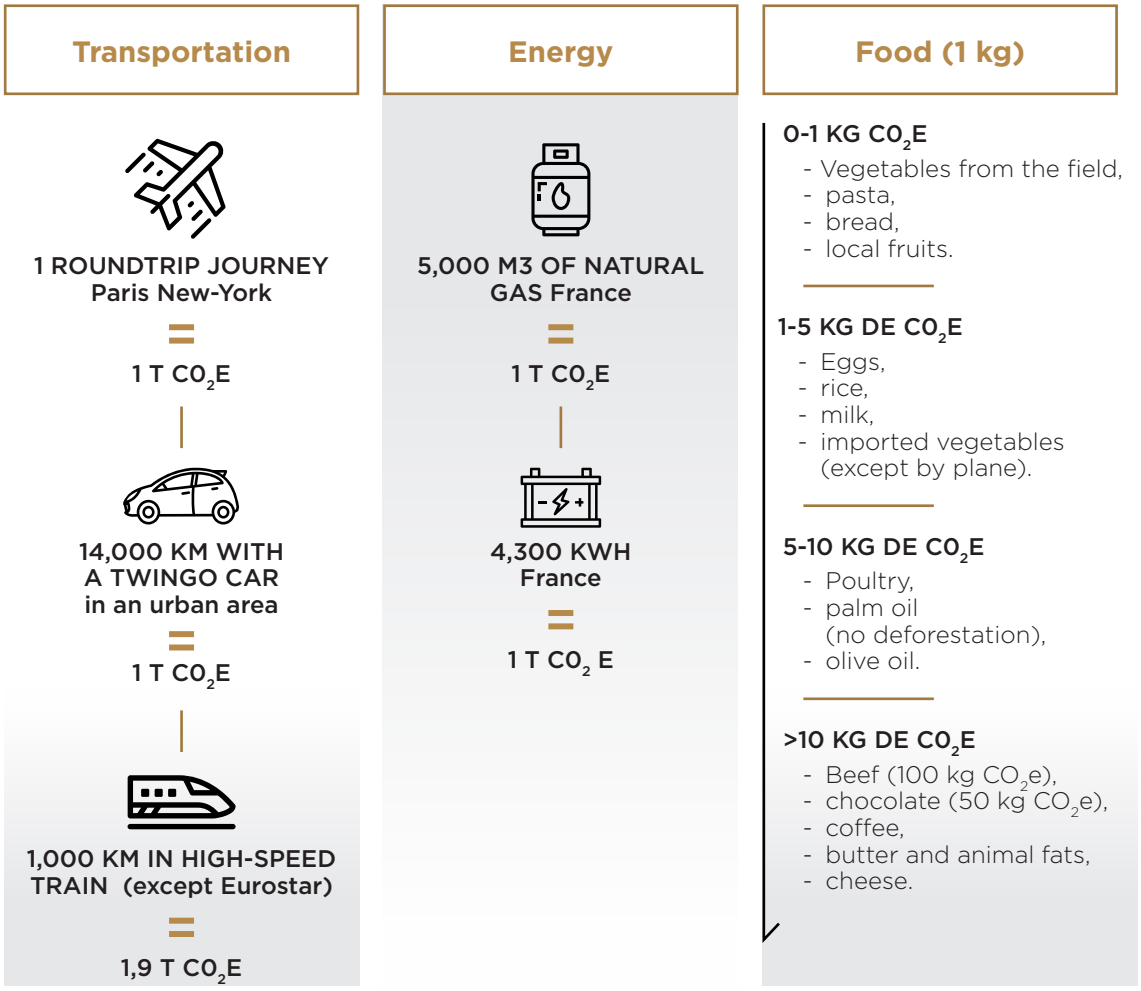
such as those defined at the COP21 Paris agreement of 2015.

1.3 AVERAGE INDIVIDUAL EMISSIONS SHOULD BE CUT BY FOUR IN FRANCE

On average, a French person generated in 2019 the equivalent of about 12 Tons of CO_2 per year. To comply with the commitments made by France at the Paris agreements and keep global warming below 2°C, or even 1.5°C, this individual average must be cut by a factor of four at least. A French individual should generate 2T of CO_2e, on average and per year, for its professional and personal activities.

The concrete examples detailed below allow to better grasp the carbon footprint of our daily activities or purchases:

Figure 3. Example of carbon footprint for daily activities



It should be noted that carbon footprint varies greatly depending on the country. For example, 4,300 kWh of electricity represent 4 times as much CO_2 equivalent in India (polluting energy generated from coal).

The average distribution of these yearly 12T CO_2e is as follows in France in 2019:

- Car – 2 T CO_2e, per capita
- Residential energy – 1.7 T CO_2e (electricity, heating, etc.)
- Public services and health services – 1.5 T CO_2e
- Purchase and use of new technologies – 1.2 T CO_2e
- Food (mainly meat and fish) – 1.5 T CO_2e

The category "purchase and use of new technologies", which represents an average of 1.2 T CO_2e per French person in 2019, starts being of concern because of its exponential growth: an ever-greater desire to consume, manufactured products with a high carbon footprint, and the uncontrolled development of clouds all contribute to the growth of this category.

Cutting emissions by 4 constitutes a major challenge for economic players. Our conviction is that the pressure put on organizations to make them participate in a strong and fast reduction of GHG emissions will rise significantly in the coming years. This pressure could be of a regulatory nature, with additional requirements or come from the organization's stakeholders (associations, consumers, shareholders, …). Regardless of the origin of such pressure, companies should get prepared to strongly increase their contribution to the reduction of emissions and demonstrate that they are strongly mobilized for this cause. This contribution can be achieved through the capacity to quantify and manage the organization's GHG emissions and we consider that the Supply Chain function probably constitutes the best way to lead these projects of carbon footprint quantification and management. Indeed, in many organizations and mainly those belonging to the manufacturing or distribution sectors, **the Supply Chain is cross-functional, spanning the entire value chain and represents the most competent function for quantifying and managing the carbon footprint evolutions,** especially if one considers that the quantification and management challenge does not apply to direct emissions only but to the entire set of direct AND indirect emissions.

2. THE SUPPLY CHAIN, AT THE HEART OF CARBON FOOTPRINT QUANTIFICATIONS AND MANAGEMENT

The Supply Chain, through its very design, allows to grasp the emissions in their most significant spectrum (scope 3). It also allows to isolate the major emission sources of the value chain and therefore compare different economic sectors or different players of a same sector. It provides work avenues to reduce these emissions.

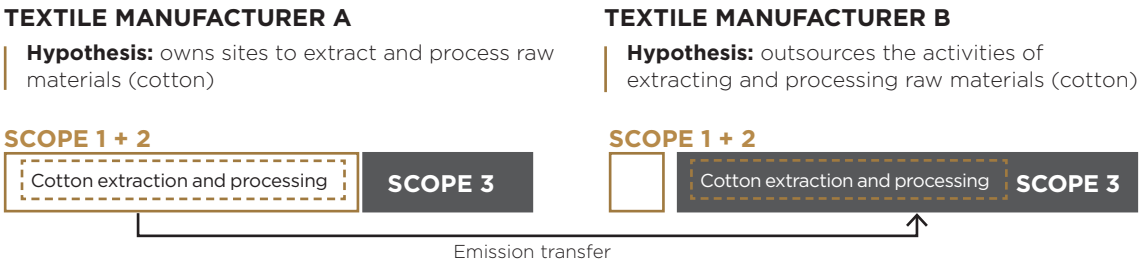
2.1 THE SUPPLY CHAIN, TO GO BEYOND DEBATES ON SCOPES 1, 2, AND 3

The debate on the relevance of scopes 1, 2, and 3 of GHG emissions is substantial. This debate results from the combination of two factors. The first one is that most organizations merely disclose their scopes 1 and 2 reporting. In such framework, comparing the emissions generated by organizations is highly limited as illustrated in the example below.

Let us consider two similar textile manufacturers, for which a major part of emissions is coming from raw materials (production and processing of cotton). Let us assume that manufacturer A owns raw material processing factories in China. The emissions linked to its factories can thus be directly allocated to its emissions on behalf of

scopes 1 and 2. On the opposite, manufacturer B decided to outsource its raw material processing factories: its scopes 1 and 2 emissions will be lower than those of manufacturer A, although their real impact (i.e. accounting for indirect emissions) is the same.

Figure 4. Example of "carbon accounting" depending on scopes



Only an approach accounting for scope 3 emissions can provide a "fair" view of the emissions of both manufacturers. **The Supply Chain function becomes extremely valuable in this context since it goes beyond the notion of scope while providing a comprehensive view of the value chain consistent through design with the scope 3 approach.**

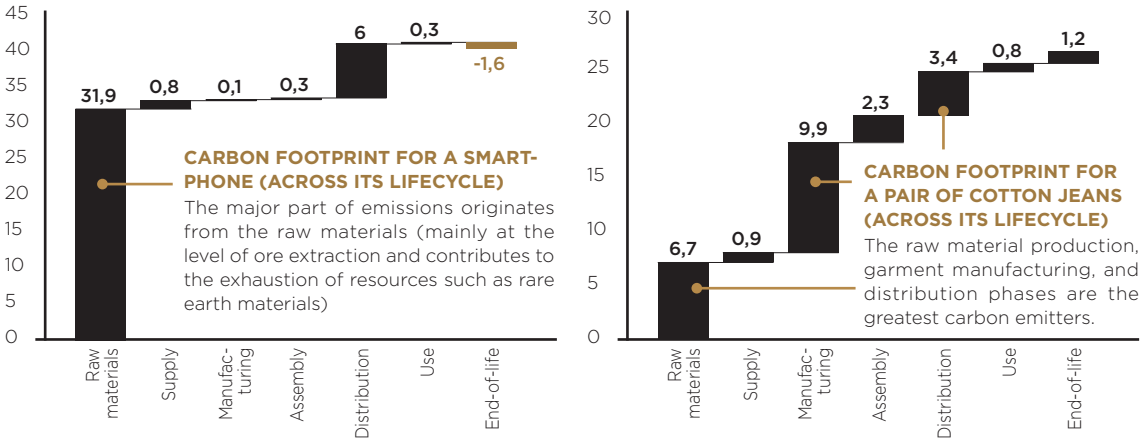
2.2 STRUCTURE OF THE SUPPLY CHAIN AND ITS COMPONENTS TO BE INTEGRATED IN THE CARBON FOOTPRINT SCOPE

The Supply Chain brings into play many players, activities and operations belonging to a single organization. Through its cross-functionality across the value chain, it allows to have a global view of the emissions of each player and therefore makes it possible to compare in a fair manner the emissions generated by several chains. The Supply Chain can be structured as follows:

- UPSTREAM: Raw Materials – raw materials production/extraction
- UPSTREAM: Procurement – raw materials and packaging procurement
- MIDSTREAM: Manufacturing and assembly
- DOWNSTREAM: Downstream distribution – delivery
- DOWNSTREAM: Product use by the buyer (consumer or company)
- DOWNSTREAM: Product end-of-life

The advantage of this approach is to carry out the carbon footprint not via its three scopes but through the Supply Chain components. This allows to compare organizations of a given sector or of different industries and to identify the main emission sources in the value chain. The following example describes the emission sources for a smartphone and cotton jeans across the entire chain. It highlights the major differences in the emission origins for these two products: for a smartphone the greatest part of the emissions originates in the upstream phase, especially from the ore extraction activity. For cotton jeans the product manufacturing phase is the most highly emitting one.

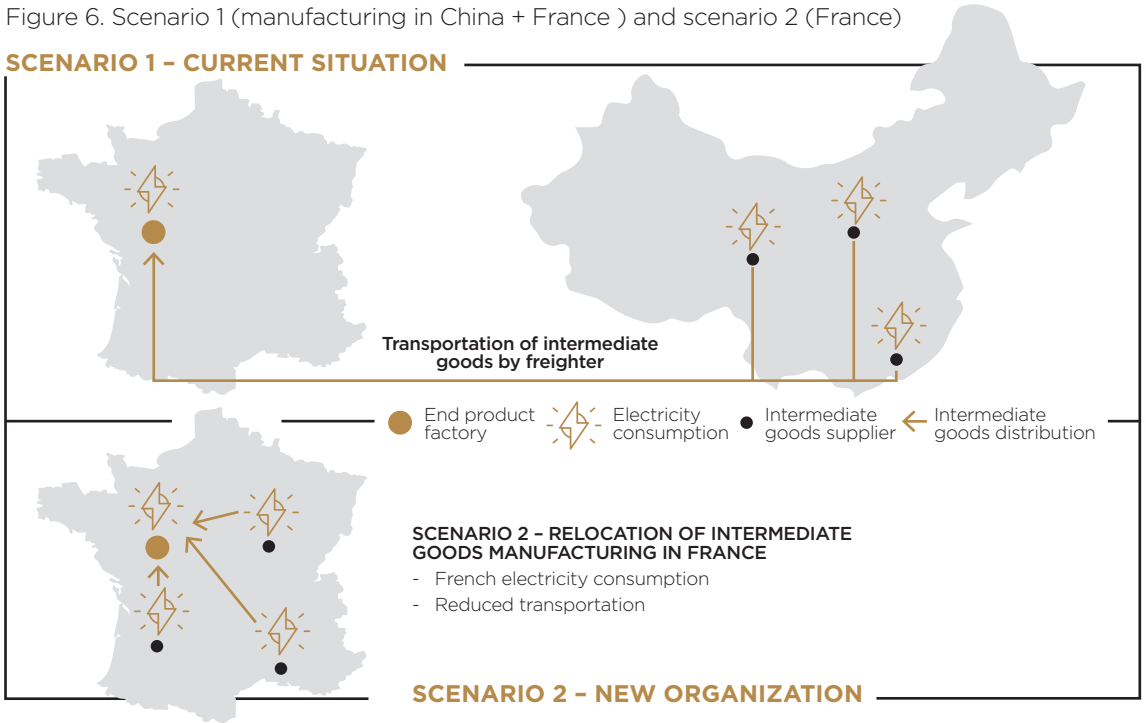
Figure 5. Carbon impact based on the Supply Chain components for two examples.



Such carbon footprint breakouts into individual Supply Chain components also allow to better assess the impact of transformation projects in the framework of ecological transition and to intensify efforts at the right places in the chain by adopting through design a scope 3 global approach taking into account both direct and indirect emissions.

Let us consider an organization which purchases intermediate goods on Chinese soil. Its supplier owns three Chinese factories. It also owns a finished goods factory in France (scenario 1). This company decides to stop purchasing its supplies from China, but directly from a new supplier that manufactures its products on French soil (scenario 2).

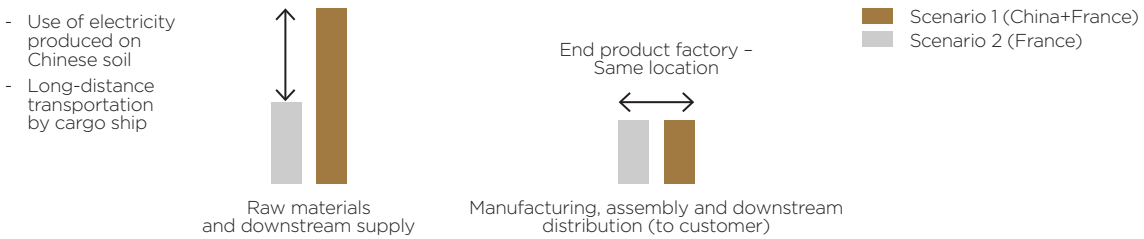
Figure 6. Scenario 1 (manufacturing in China + France) and scenario 2 (France)



Many changes will then affect the carbon footprint. First of all, for the **supply component** since electricity production generates approximately 4 times less emissions in France than in China. The upstream transportation will also dramatically drop. Transport by cargo ship (or plane) to reach French soil will be removed. Evaluating scenarios through Supply Chain components therefore enables a more accurate analysis and more relevant decision-making.

The following step for an organization willing to quantify its carbon impact through its Supply Chain consists in identifying the processes, methodologies and tools that will make it possible to quantify its emissions and thus help decision-making when facing strategic transformation choices.

Figure 7. Carbon footprint comparison – Scenario 1 (China+France) and 2 (France)



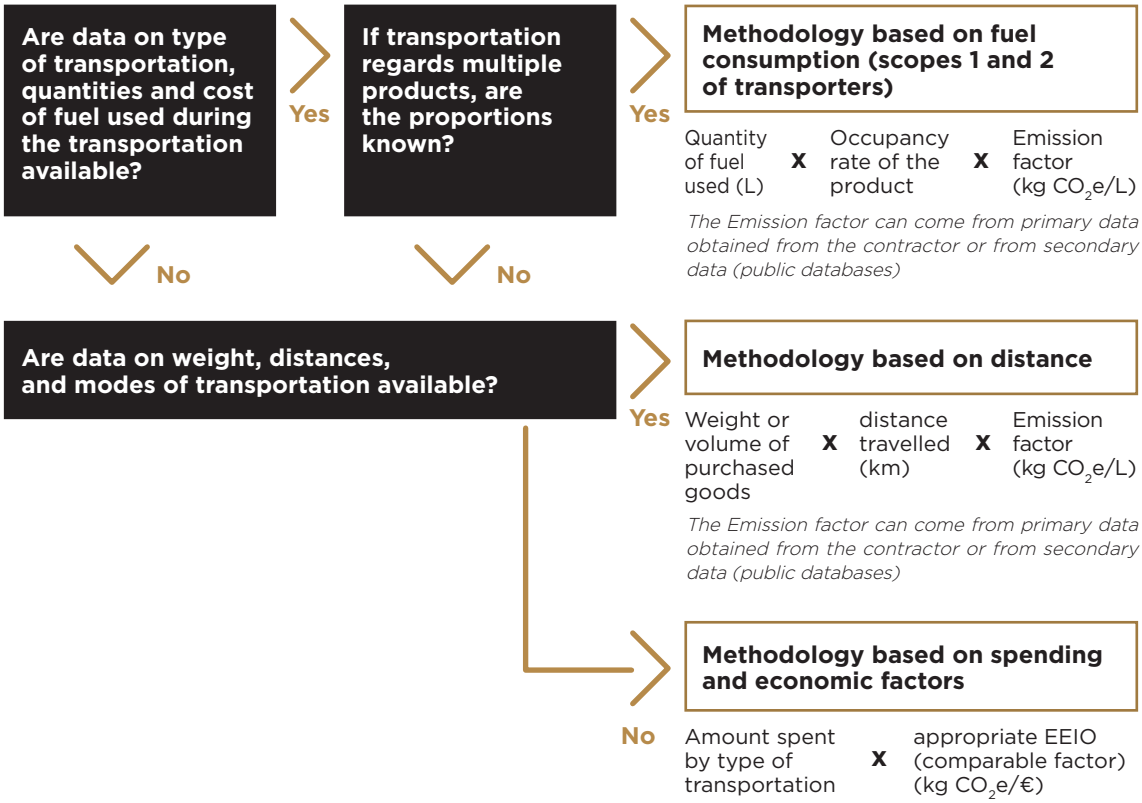
2.3 QUANTIFYING CARBON EMISSIONS LINKED TO AN INDUSTRIAL ACTIVITY

There is currently no single methodology to quantify the emissions linked to a specific activity. Several methodologies can apply and organizations must chose the one most adapted to their reality. This selection depends on data availability, maturity, and knowledge of company processes, both internal and external.

The first methodology, which allows to obtain a figure that is closer to reality, relies on building upon primary data. These data are provided by suppliers or subcontractors and represent the emissions specific to an activity. If these data are not accessible, the organization can then use calculations based on secondary data, which provide a representative and average trend of the emissions of an activity. Such data originate from public databases, statistical data, etc. The EEIO (Environmentally – Extended Input Output), for example, are factors coming from statistical models to evaluate the energy required for or the emissions corresponding to a specific activity (varying depending on regions, sectors, etc.).

To better understand this specific point, let us consider the emissions related to transportation. For this activity, carbon emissions can be estimated through three different methodologies. The first one, which is the most accurate but requires input from logisticians, evaluates the fuel consumption necessary to transport the quantity of goods considered. The second one is based on distance and mode of transportation, while the last one relies on monetary data.

Figure 8. Quantification of carbon emissions for the transportation activity



Different methodologies will provide different results for a same activity, although the orders of magnitude of results are fairly close.

As shown in the elements presented above, major improvements need to be achieved to make emission quantification more reliable. Such higher reliability will be necessary to compare performance between organizations and to manage over time the progress accomplished on emissions. Improvements must regard the entire quantification scope to apply the approach to the entire scope. They also must regard the calculation methodologies themselves so that the share of estimations carried out on "primary" data can be significantly increased.

Supply Chains will need to evolve and improve with regards to data accessibility and control of the procurement, production, distribution and product end-of-life processes. They will also need to work on the consistency of the selected quantification methodologies. These are major projects for which they will need to rely on internal and external expertise.

2.4 NECESSARY TRANSFORMATIONS AND EVOLUTIONS OF THE SUPPLY CHAIN FUNCTION

The Supply Chain function is, for industrial and distribution organizations alike, in the best

position to manage and quantify carbon emissions across the entire organization's value chain. To successfully carry out such control and quantifications, Supply Chains will have to be reorganized, along the following axes:

1. Improve connections between different services of a Supply Chain: indeed, similar to S&OP (Sales & Operations Planning) processes, the management and quantifications associated to carbon footprint must build on cross-functional and transparent sharing of data between various services in order to pilot the carbon activity as fairly as possible, and in a dynamic manner.

2. Strengthen collaboration across the entire supplier network to work jointly on collecting the data necessary. This avenue is similar to the implementation of an extended S&OP.

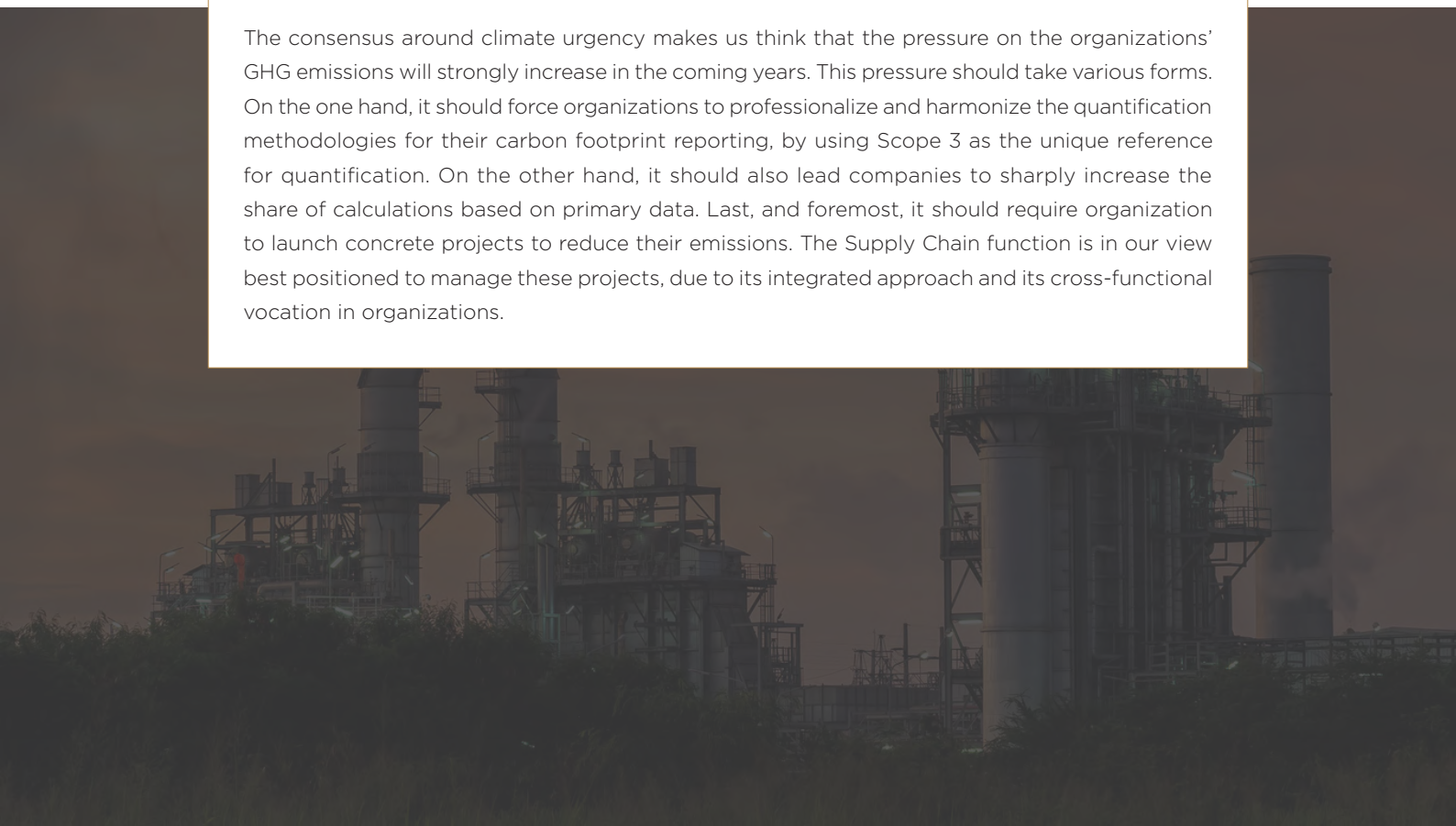
3. Reconcile the strategic vision of organizations and Supply Chains with the environmental goals that were set.

4. Promote digitalization efforts to quantify and collect data on various processes of manufacturing, transportation, etc. The concept of Supply Chain takes its whole meaning in this context and organizations must continue their digitalization efforts in the production, logistics (transportation, warehouse), purchasing fields. All data collected should also be secured to prevent any fraud or falsification. For example, Blockchain applied to the Supply Chain can partly answer this need.

5. Communicate the approach to all employees across the entire chain to launch initiatives having a high carbon reduction potential.

CONCLUSION AND FUTURE PERSPECTIVES

The consensus around climate urgency makes us think that the pressure on the organizations' GHG emissions will strongly increase in the coming years. This pressure should take various forms. On the one hand, it should force organizations to professionalize and harmonize the quantification methodologies for their carbon footprint reporting, by using Scope 3 as the unique reference for quantification. On the other hand, it should also lead companies to sharply increase the share of calculations based on primary data. Last, and foremost, it should require organization to launch concrete projects to reduce their emissions. The Supply Chain function is in our view best positioned to manage these projects, due to its integrated approach and its cross-functional vocation in organizations.




EXPRESS PACKAGE

2.
A NEW CIRCULAR SUPPLY CHAIN

1. INTRODUCTION

The concept of circular economy appeared in the 1970s. It is defined as an economic system based on frugality, which aims across all stages of the product life cycle (goods and services) at increasing the efficiency of resource use and decreasing environmental impact while developing the well-being of individuals[1]. It is opposed to the current economic model based on an unrestricted use of resources to produce goods that users sometimes even abandon before their end-of-life.

Circular economy aims to reduce waste and increase the intensity of resource use while diminishing environmental impacts. It considers three different fields, as shown in the diagram below:

- Production of the supply of goods and services
- Consumption through consumer's demand and behavior (economic or citizen)
- Waste management with recycling as a preferred solution

Figure 9. Circular economy, 3 fields, 7 pillars, Source: ADEME

1. *Definition of circular economy provided by ADEME, Agency for ecological transition*

Once defended by minority and activist groups, the circular economy has encountered a growing success with the general population in recent years. Per a survey conducted by the Edelman firm in 2019, two thirds of the consumers chose, change, avoid, or even boycott a brand based on its societal stand. Such surveys are backed by consumption trends: the sales of some products evidently designed following the old economic model guidelines (products with plastic packaging, manufacturing localized in distant locations, rapid obsolescence products…) stall or wane. The circular economy concept has officially entered the French legislation through the law of 18 August 2015 on energy transition for green growth. This law has given a legal definition to the concept: *"The transition towards a circular economy aims to go beyond the linear economic model consisting in extracting, manufacturing, consuming and discarding by promoting a sober and responsible use of natural resources and primary raw materials as well as, in order of priority, by preventing waste generation, mainly through the reuse of products and, following the hierarchy of the waste processing modes, by reusing, recycling, or, for want of anything better, waste recovery".*

Together with a definition of the circular economy concept, the law included major provisions on sustainable manufacturing (prohibition of plastic bags, legal penalties for programmed obsolescence…) and sustainable consumption (fight against food waste…). It specified structuring goals regarding waste prevention and management[2].
This first law was recently complemented by the anti-waste law for a circular economy of 20 February 2020. This second law, which was born through a large concertation started in 2017, encompasses over a hundred new measures that should allow to include new product categories in the circular economy (toys, sport gear, construction materials, diapers, wipes…). It also adds new bans, mainly regarding the use of disposable plastics and dispositions to support organizations willing to commit to eco-design approaches.
Therefore, France now has a legal arsenal at hand to promote the development of a circular economy. Organizations will need to adapt to this new context and the Supply Chains, owing to their cross-functional nature, will have to face new challenges. They will have to either establish supply chains dedicated to certain aspects of the provisions of circular economy or to make the existing Supply Chains evolve.

2. CHALLENGES BROUGHT UPON SUPPLY CHAINS BY THE CIRCULAR ECONOMY

The concepts of circular economy require Supply Chains to reinvent themselves. They bring about four challenges of complementary natures:

2.1 Procurement does not solely depend on the usual cost, quality and delay factors. The issue of ecological responsibility becomes central and constrains procurement to broader and sometimes less predictable specifications.

2.2 Inventory management must adapt to keep the productivity levels achieved by classical Supply Chains.

2. *Reducing the amount of residential and assimilated waste by 10% and stabilizing the amounts of waste generated by economic activities in 2020, compared to 2010 ; reaching 65% of recycling for non-dangerous, non-inert waste by 2025 ; cutting the landfill waste in half by 2025, compared to 2010.*

2.3 Information systems must be enriched with new data and functionalities.
2.4 Commercialization of used products must be adjusted so that customers are well informed and legislation is respected.

2.1 UNPREDICTABLE PROCUREMENT

The first challenge brought upon Supply Chains by the circular economy regards the procurement of goods. The circular economy, especially the sale of used products, requires companies to mobilize new procurement sources: companies can get supplies internally from products on display at stores, defective products, or from products returned by customers. They can also buy externally, directly from their customers and/or consumers through recycling or rebuying offers.

To "source" such used products the procurement service is no longer able to select the products (types, quantities, and quality) that it wants to purchase and is no longer in an exclusive relationship with its external suppliers. In the context of internal procurement, it must establish specific and frequent relations with the various internal services considered. Its main interlocutors are, among others, quality service for defective products and customer service for returned products. In the case of external procurement (i.e. from its clients or consumers), it must collect information on the products and their characteristics and implement external sourcing policies. Limits can also be set on quantities by specifying minimum and/or maximum purchase thresholds.

To ensure that such a model is economically viable, it is essential for an organization to define purchase forecasts despite the issue of lower predictability. As we will see in the following sections, defining a dedicated S&OP policy is necessary. With regards to internal procurement, the quality service and customer service already have data available and forecast exercise has most likely already been carried out. With regards to external procurement, forecasts can first build upon the assessment of previous years. Year after year, data analysis will make meaningful information stand out (seasonality, peak periods, low periods, etc.) and will allow to define expected numbers. Current and future trends will also need to be integrated into these forecasts.

2.2 APPROPRIATE INVENTORY MANAGEMENT

The second challenge brought upon Supply Chains by the circular economy regards inventory management. Used products are indeed particular in that they do not offer a great depth of inventory for each of the reference.

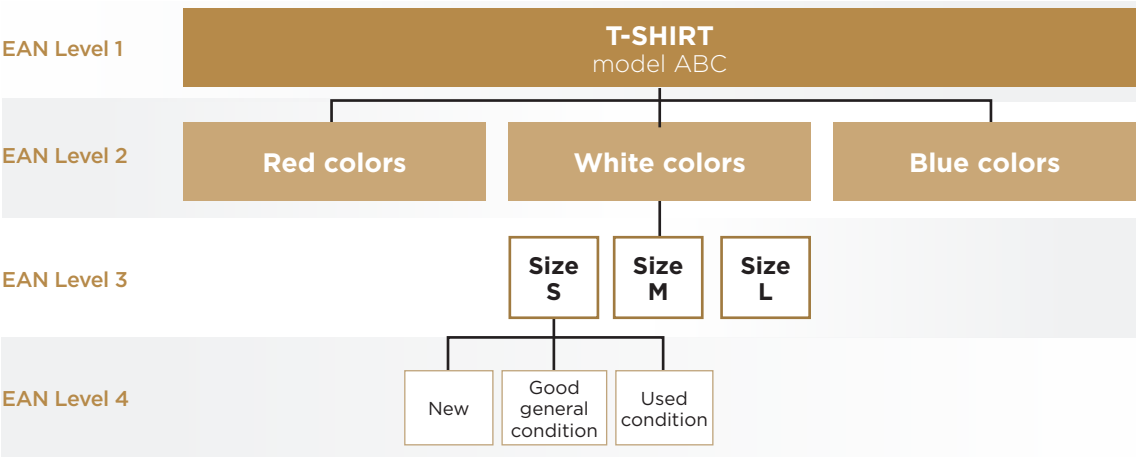
These are offered for purchase with a granularity that extends beyond the classical product hierarchy defined by the EAN (European Article Number). The product condition is systematically described. Although categorization has been standardized and is applicable to all products, a fourth identification criteria has been added, as shown on figure 10, which covers product condition in order to define a resale price. Having an additional level increases the number of references for each model and reduces the inventory depth.

The inventory management activity must be managed using retail logistics. The optimal storage space for used products must be flexible. Since procurement is less predictable, storage

space must adapt to products and their various form factors. It must be made of multiple compartments that allow to populate one by one all the references up to the condition notion. Because the products do not have a great inventory depth, it is however not necessary for the compartments to be deep.

A system of modular shelves that can be moved thanks to robotics can perfectly meet the needs of used products storage. This activity can be performed in a dedicated location of an e-commerce warehouse simultaneously handling new products.

Figure 10. Product nomenclature



2.3 A RICHER INFORMATION SYSTEM

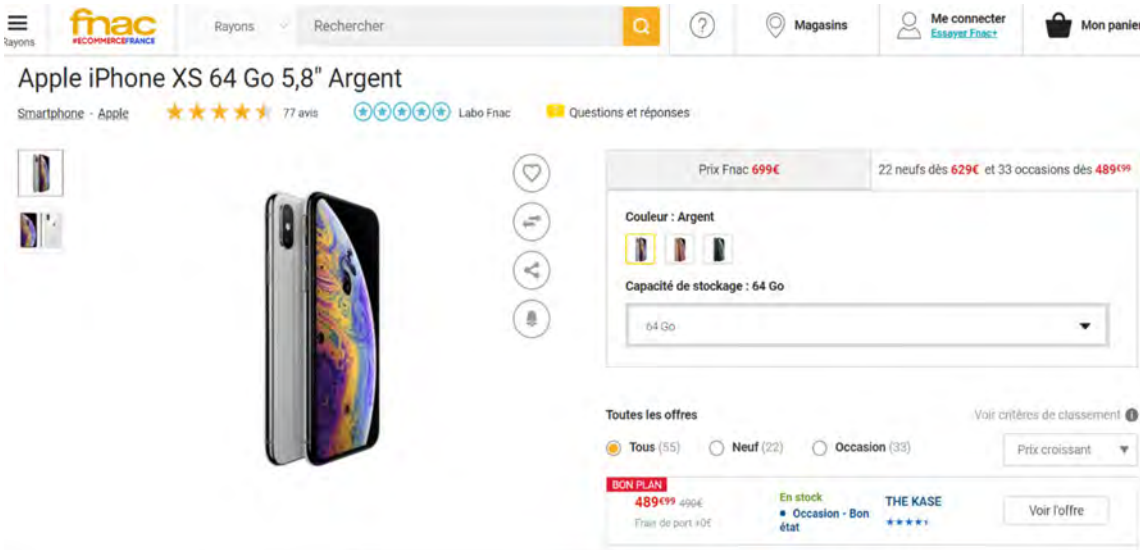
The third challenge brought upon Supply Chains by the circular economy regards the organization's information system (IS). As we just saw, used articles have an additional level of categorization, which multiplies the references for sale. During their back office integration, such products will need to be identified up until the last level characterizing their condition. This additional level significantly increases the number of variations for one model. This requires IS to be capable of expanding the available quantity of product identification criteria. Should this fail, margin management will be nearly impossible and differentiation will be done manually only in the storage space, which will increase the risk of errors for customer orders.

This goes one step further in the case of luxury goods. The sale of used luxury items is indeed made at the unit level. Grouping together two articles of a same brand, color, size and condition cannot be considered. Because buyers are

attentive to the smallest detail, a defect can have different outcomes depending on its characteristics. In this precise instance, items will need to be labelled one by one, which considerably increases the amount of item IDs. It is recommended to create one ID for each product with the same EAN code and same condition.

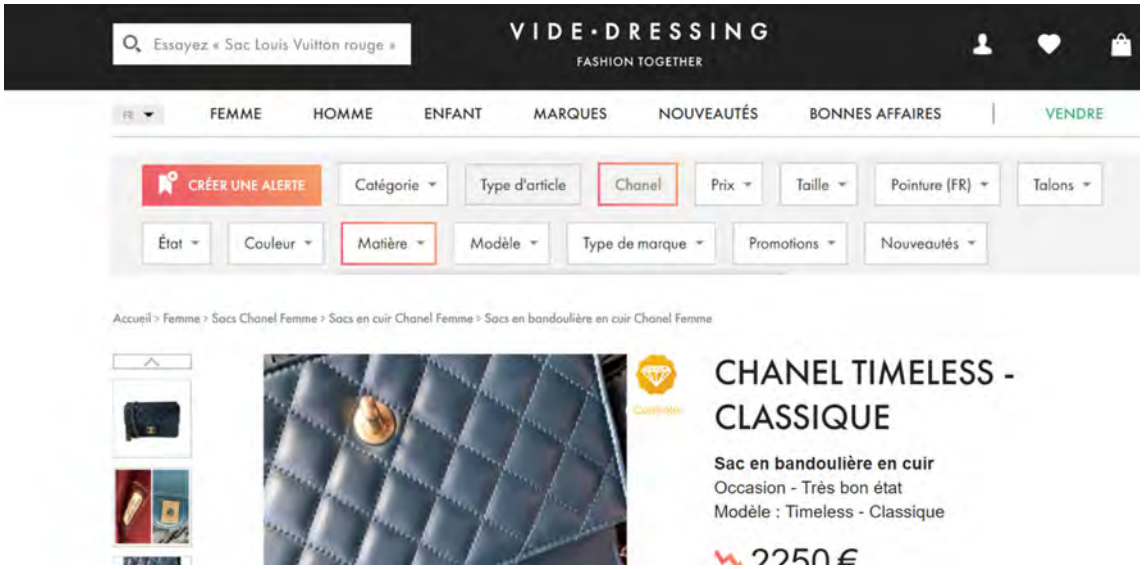
Putting used products online also has an impact on the front office architecture. The product condition will be added to the usual characteristics (color, size, performance of electronic products), which requires, from an IS point of view, an additional option as can be seen on figure 11. However, the item master record does not need to be duplicated. This can be clearly seen on the Fnac.com e-commerce website presented on figure 11. To keep the front office design light, they chose to have one item master record per model, with a picture of the model, a description of its characteristics, and letting the customer select the desired attributes, such as color, storage capacity, and condition (new or used).

Figure 11. Front office design of Fnac.com



Quite on the opposite, for luxury items, the front office designs must be extended because item master records cannot be standardized. As can be seen on figure 12, each item must have its own item master record with a precise description of the product, specific pictures, etc. In order to make the user journey seamless and allow customers to easily and rapidly find the articles that would suit them, a system of detailed filters must be implemented. This is what the e-commerce website Videdressing.com offers.

Figure 12. Front office design of Videdressing.com



Such new functionalities demand a reorganization of the front office architecture and a strengthening of the filter detail levels to achieve quick and simple understanding and seamlessness in the purchase journey.

2.4 SUPERVISED COMMERCIALIZATION

Commercialization represents the fourth challenge brought by circular economy. This challenge especially applies to the commercialization of used products, which cannot follow the same principles as the commercialization of new products.

To sell such products, communication must be transparent. To ensure customer satisfaction and minimize return rates, communicating on the product condition and actions engaged is paramount. From a functional point of view, describing tests, verification points, and cleaning actions that were performed is necessary. With regards to the physical aspect of products, a precise classification allows consumers to easily find their way and purchase serenely and with all facts in hand.

The sale of used goods is governed by law. They receive a compliance legal warranty of 6 months, against 24 months for a new product. This warranty covers failures, malfunctions, and performance limitations. Hence the importance of being transparent on the product description and condition. Latent defects warranty applies for 2 years, similarly to new products. Product verification is imperative before offering these for sale. Finally, commercial warranty is optional and contractual, left to the seller's judgement. Customer service must also adapt to this legislation and integrate it in their return and repair journeys.

3. THE NEED OF A DEDICATED SUPPLY CHAIN

As described above, the dispositions on circular economy have been numerous and constitute major challenges for the Supply Chain. For some of these aspects, a dedicated Supply Chain has to be set up. This need is all the more pressing owing to the ever-growing customer's appetite and product volumes. It mainly concerns three new needs emanating from the circular economy:

3.1 "Sales & Operations Planning" (S&OP)
3.2 Operational processes for reconditioning used products
3.3 Setting up local distribution networks

3.1 NEW GUIDELINES FOR S&OP

Sales and Operations Planning (S&OP) is a Supply Chain tool used by general management. It allows to deliver the service promised to the customer at optimized costs (optimal choice of a "route-to-market" from the production source to the end customer) and with the right levels of service and inventory at all stages (factories, warehouses, distribution platform and point of sale). The S&OP is generally managed at an 18-month horizon and is adjusted monthly or quarterly (sometimes weekly during a crisis). Different scenarios are discussed at the senior management team level.

The ramp-up of used products sales requires an adjustment of the S&OP process. Sales forecast must factor in the sales of used products and take into account the related fluctuation in the sales of new products. They must also accommodate lower procurement predictability. Reactivity, sales planning flexibility and communication between services are essential assets to make the S&OP sales assumptions more reliable, the objective being to make the sale of the right product at the right time possible.

In addition to sales forecasts, operations supporting used products sale are also specific. On the one hand, repair delays should be estimated accurately: they are indeed less well characterized than those for new products. They can vary depending on initial product condition and it is therefore crucial to put products in the correct category right from the start and to standardize repair steps in order to maintain an optimal productivity to the process.

On the other hand, the organization's marketing strategy should be given a new direction so that the entry of used products in the offering range is taken into account. The challenge often lies in winning a new customer base and improving their loyalty, while directly controlling the sales of its own used products (control of sold products, their prices, and thus of the margin, etc.). External communication campaigns must be reactive and flexible and follow the adjustment of the sales planning.

Finally, human resources must also adapt to this new activity. This involves adjusting the quantity and type of resources. New jobs emerge and targeted trainings and/or recruitments are needed.

3.2 THE RECONDITIONING PROCESS FOR USED PRODUCTS

Some used products need to be controlled and sometimes refurbished. This is especially the case for electronic products.
To optimize the reconditioning process, products

must, as soon as they are returned, be correctly oriented. Establishing evaluation criteria allows such objective and adapted orientation. In a circular economy logic, products that cannot be reconditioned or resold should be directed towards recycling networks.

The first step of reconditioning involves verification. Ensuring that the good has not been declared stolen is essential. Afterwards, the data and settings of previous owners must be entirely deleted.

For each type of product, a series of tests must be performed and specific control points must be checked. This can potentially result in additional repairs. This step of the process can turn out very costly. It requires a dedicated and qualified personnel with technical expertise, specific equipments, and certifications guaranteeing the quality of service. To control costs, defining a non-repair threshold must be systematic. If exceeded, the product must be transferred to a recycling channel. As for spare parts, they do not necessarily have to be new or original. They can also come from the circular economy or be compatible.

Products must subsequently be cleaned and packaged. Identification and storage will depend on EAN and product condition, as detailed before.

To go even further in the circular economy approach, the company can, during its tests and control points verifications, formalize quality sheets for products. Such sheets summarize the most common malfunctions, defects and failures for each brand. They can be transferred to the various brands in the optic of continuous improvement of their products and current or future parts (a process similar to after-sales).

3.3 LOCAL NETWORK DISTRIBUTION

Offering used products for sale originates, among other reasons, from a will to limit the environmental impacts of consumption. To go even further in this vision, setting up reconditioning and distribution centers that are either local or close to the point of sales is paramount to limit transportation-related CO_2 emissions.

Local networks also allow to reduce the transportation duration and thus the product downtime since for the greatest majority of products, the older the inventory, the harder it is to sell. New product models or firmware updates come into the world that make used products less attractive, greatly helped in that by advertising.

4. LHE NECESSARY EVOLUTION OF TODAY'S SUPPLY CHAINS

As stated above, the surge of measures related to circular economy requires that new Supply Chains be set up. It also has to be able to build on existing Supply Chains to the extent that they have "Assets" allowing to integrate the new elements necessary for a circular economy.

4.1 PRODUCT ECO-DESIGN

Eco-design accounts for the environmental preservation at all stages of the product lifecycle. This approach involves selecting eco-responsible raw materials, using environmentally friendly manufacturing processes or promoting recycling of the entire product and its constituting parts. Well aware of the surge of second-hand

demands, organizations have a vetted interest in making the lifetime of their products longer. The more products are available on the market in good condition, the more they will contribute to the bottom line of the organization, provided the company does organize their second life through its own used channels. The use of parts that are more robust, more sustainable also gives rises to fewer repairs upon reconditioning and thus lowers costs. The quantity of spare parts can then be re-evaluated downwards, similar to the associated storage volume.

Reconditioning centers, through the multiple tests they can carry out, have an opportunity to provide to brands valuable data on the failures and malfunctions of their products. These analyses must help organizations to better design and improve their future products.

4.2 RETURNED GOODS

Collect can take place on site for companies that have a space that can be accessed by customers (stores, warehouses, ...). In such case, the brand has a space dedicated to the return of used goods and can perform the first controls that will allow to correctly orient the products. The control and direction process will need to have been defined beforehand from a global point of view in order to optimize the reconditioning process as detailed previously.

On the opposite, for companies that are doing e-commerce exclusively, collect can only take place through products shipment. The used products flow must however be distinguished from customer return flows so that customer satisfaction is not damaged due to errors and/or processing delays and productivity does not suffer.

4.3 AFTER-SALES SERVICE

The warehouse in which the after-sales service takes place can also be the entry point of a reconditioning center.

Employees working on these sites are authorized and trained to detect the causes for failures and malfunctions of products returned by customers. To accommodate a reconditioning process, additional training and ongoing support could allow them to become rapidly operational in performing and analyzing tests and control points as well as for cleanup and packing. Bringing together these two activities is legitimate, based on their similarities. Investment could be reduced thanks to the mutualization of costs, workforce, equipments, etc.

4.4 SPARE PARTS INVENTORYS

Selling used products requires, as observed previously, reconditioning and sometimes repairing products. In the absence of a compatible part for use, a reconditioning center must be able to access spare parts for a duration greater than that of the original product commercialization. This greater lifetime of spare parts requires to be able to store these at the warehouse.

Automated vertical storage system is ideal for this type of products. Verticality allows a reorganization of the storage space and results in an approx. 90% gain of the floor area. The multitude of spare parts can be stored there without requiring a large floor area. Storage towers enable rapid loading operations. Thanks to automation, inventory movements are more productive and efficient. Small and or medium-sized parts are perfectly suited for such a storage system.

4.5 CUSTOMER RETURNS

The customer return center is nowadays very frequently the entry point for all returns (satisfaction, defects, return, recycling, etc.), especially for e-commerce.

A product orientation step must be included as soon as products arrive on site, at the risk of impacting the correct operation and productivity of other activities taking place on site. Management of a defective product requires time and expertise. The defect must be detected if it has not been specified by the customer. Therefore, specific verifications are necessary to ensure that the return is not fraudulent. This process must be isolated from the start. If the product reaches the classic refunds chain, an untrained operator may not carry out the expected process. This could result in a bad appreciation of the product, potentially a wrong refund, a bad orientation of the product and consequently a financial loss for the company.

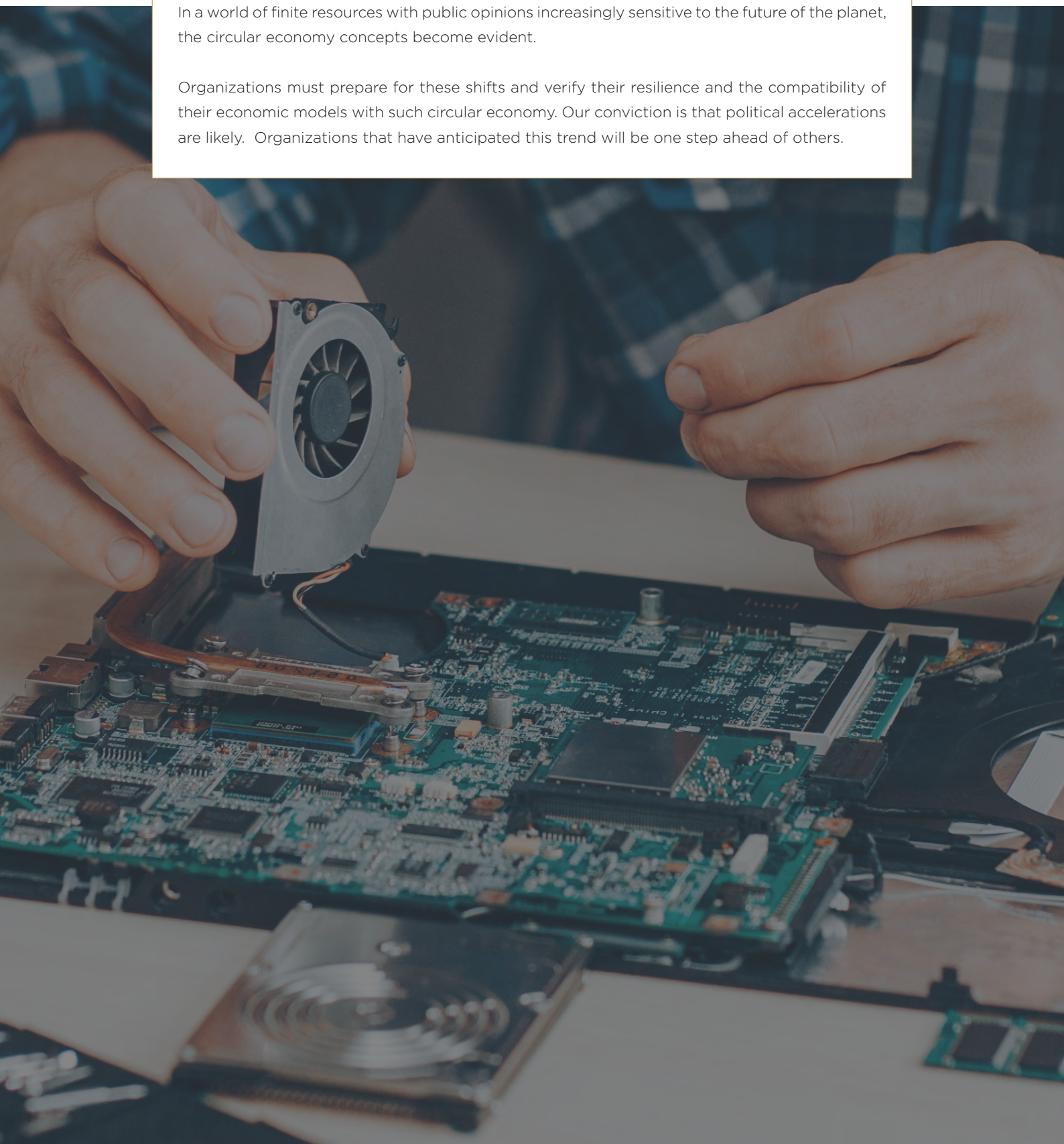
Product orientation must also be thought through for the site exit. To meet the stakes of the law on circular economy and fight against waste, organizations must take measures to promote product reuse or recycling. Therefore, revising all the management policies is necessary. An organization must think of all the possible use cases for all types of returns and their end-to-end processing, the objective being to process each return by monitoring the cost, quantity and delay dimensions.

Physical and information flows must also be reorganized based on the new management rules and the new processes defined.

CONCLUSION AND FUTURE PERSPECTIVES

In a world of finite resources with public opinions increasingly sensitive to the future of the planet, the circular economy concepts become evident.

Organizations must prepare for these shifts and verify their resilience and the compatibility of their economic models with such circular economy. Our conviction is that political accelerations are likely. Organizations that have anticipated this trend will be one step ahead of others.



3.

ECO-RESPONSIBLE DELIVERY

1. INTRODUCTION

The “last-mile” challenge has become a recurring issue in the recent years, both for logistics and distribution players and for various political groups. And the topic will most likely remain a priority in the coming years for a number of reasons.

First, the e-commerce growth appears infinite. In 2019, e-commerce exceeded 100 billion euros of revenues in France and sales have grown by 11.6% compared to 2018. The online offer continues to rise greatly, with a 15% increase in the number of market sites within a year. The stay-at-home orders of 2020 have confirmed this upwards trend and have even significantly encouraged it, especially with the surge of drive (in-store pickup service) and home delivery, as shown by the greater than 50% growth of some retail players during the lockdown period. Several experts agree that this new trend will stay and will likely become a part of the consumption habits of the French people. To this should be added the return flows, a key argument of e-commerce. Currently, about 20% of the online purchases and sales in some sectors result in returns (50% in the apparel sector in certain countries). This trend will thus intensify the need for delivery.

Second, last-mile delivery is the most expensive step for logistics and transportation professionals. In 2019 the last mile represented about 50% of the total delivery costs (upstream logistics costs, micro-fulfillment centers storage, cost of the last mile). The topic is therefore an economic one.

Third, the “last mile” delivery presents a major impact on the quality of life in cities. The desire to deliver a parcel to the end customer in shorter time results in a booming number of delivery vehicles in cities, which give rise to a significant noise pollution and an increasing number of blocked roads (with delivery trucks taking up to 30% of the roads). This challenge is therefore societal as well.

Finally, and foremost, the major “last mile” challenge is the resulting air pollution. In urban areas the transportation of goods represents about 20% of the traffic and generates 30% of the greenhouse gas emissions and 40% of the

particulate matter emissions. The stake is therefore environmental and keeping in mind the ecological crisis through which we are going, combined with the commitments made at the Paris agreement of 2015, the topic takes a much greater dimension than the sole economic and societal aspects.

Due to such e-commerce growth and new consumption trends, deliveries in urban areas are likely to become the new face of traffic in cities: it thus becomes urgent to propose alternative solutions, or even new legislation, to limit the environmental and societal impacts of the transportation of goods. The urgency is all the more pressing that the share of population living in urban areas is steadily increasing. In the early 2000s approximately 75% of the French population was living in urban areas, against more than 80% in 2019.

Two scopes are considered in this study: the first one is the freight transportation towards city center stores (B2B) and the second one covers the delivery of orders to the end customer (B2C).

2. FREIGHT TRANSPORTATION TOWARDS CITY CENTER STORES

Multiple players have been working for a number of years on new directions for eco-responsible deliveries for Business-to-Business flows and especially on the following axes:

- Optimizing the freight truck load
- Decreasing the number of kilometers
- Mutualizing the last kilometers
- Betting on micro-fulfillment

2.1 OPTIMIZING THE DELIVERY TRUCK LOAD

Covering the topic of truck loading means considering two dimensions: the surface available (and thus the stuffing of pallets on the ground) and the volume available (and thus the height available in the modes of transportation). The ground load is generally relatively well managed, although it can still be optimized. On the contrary, the volume load remains unsatisfying to this day.

The height available for goods in a trailer is most often circa 2.5 meters. In order to maximize the use of transportation, it is necessary to take advantage, as much as possible, of the height available. In the case of a trailer, the ideal load would be 33 pallets with a height of 2.4 meters each, thereby using all the cubic meters available in the truck. However, handling cargo units (products, carton boxes, etc.) positioned at a height of 2.4 meters is hard and especially painful and harmful for operators when equipment is not adapted.

New software tools based on Artificial Intelligence make it possible to play “Tetris” games with pallets and thus ensure the stability of high pallets carrying cargo units of different dimensions and shapes. Such software is cross-functional to the logistics function (transportation + warehouse) and allows, based on in-store orders and logistics routes, to arrange the order preparation so as to optimize pallet loading and reach an optimized height while minimizing the physical risks to the operator.

An eco-responsible idea would therefore be to provide to all players solutions that allow to handle products placed high above the ground

without generating occupational health risks to users with the help of adapted docks, stacking machines and "depalletization" posts.

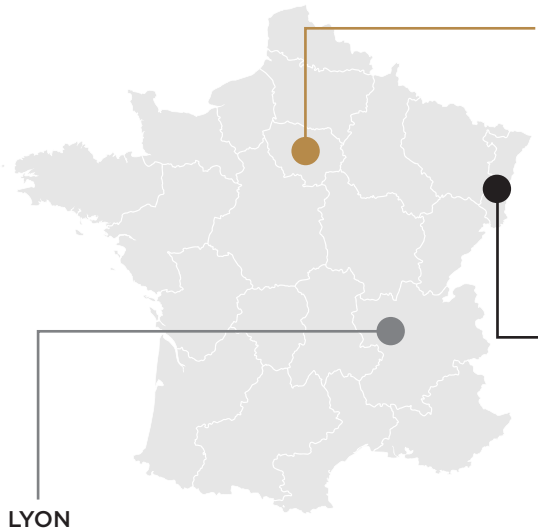
Furthermore, certain practices exist that are not widely used and do not necessarily require a "powerful" software to reach a more optimal height than usual. For example, putting carton pallets on top of each other (with one carton pallet per reference), with a classical wood pallet as a common support, allows to reach a more optimal height if store orders are relatively small (e.g. for proxys)

2.2 DECREASING THE NUMBER OF KILOMETERS

Optimizing the number of kilometers covered by trucks during delivery rounds or direct deliveries is also quite complex. There are indeed multiple criteria that must be taken into consideration: starting location for trucks, delivery location(s), end location, delivery schedule constraints, regulatory traffic constraints, weight and dimension of trucks, consumable return needs, etc.

As an example, regulatory constraints are relatively hard to take into account since they can change and differ between French cities. A few examples for the metropolitan areas of Paris, Lyon and Strasburg are detailed below.

Figure 13. Regulatory constraints for some French metropolitan areas (Paris, Lyon, Strasburg)



PARIS

Delivery times
- From 10 pm to 5 pm for vehicles with a surface smaller than 29 m².
- From 10 pm to 7 am for vehicles with a surface smaller than or equal to 43 m².
- No restriction for "clean" vehicles (smaller than 29 m², electric or gas or hybrid or compliant with the EURO norm).

In 2020
- Pedestrianization of some streets

STRASBOURG

In 2018
- Maximum weight of 7.5T except for exceptional events (against 19T originally)
- Longer delivery times: 10.5 hr (against 10 hr).
- Traffic banned for diesel vehicles with a Crit'Air5 sticker

In 2019
- Traffic banned for diesel vehicles with a Crit'Air4 sticker

In 2021/2022
- End of diesel deliveries in the city center

LYON

In 2020
- Traffic banned for Euro IV heavy duty trucks and Euro III vans.
- Traffic banned for diesel vehicles with a Crit'Air5 sticker

In 2021
- Traffic banned for Euro V heavy duty trucks and Euro IV vans.

Currently, GPS systems are widely used and the Estimated Time of Arrival is globally accurate.

Itinerary management tools (including TMS - Transport Management Systems) are now sufficiently mature and make it possible to take into account a large number of criteria and traffic duration. Such software mainly allows to decrease the number of "empty" kilometers by helping to optimize the delivery and collect routes. This is even truer since most software tools can instantaneously quantify greenhouse gas emissions, consequently reporting the environmental impact of a specific activity more easily and guiding decision-making.

Another solution - that is not based on IT - involves using double-door entrance. Such secure spaces make it possible to deliver goods at night and when the recipient is absent. They allow to relieve stakeholders from time constraints, optimize routes at best, and reduce the number of kilometers. All buildings should be designed in such as way as to offer a delivery spot with a double-door entrance using equipments adapted to the optimal use of the space height available.

2.3 MUTUALIZING THE LAST KILOMETERS

For a shopping street of about twenty stores, there are likely twenty distinct deliveries of a few parcels (or pallets) coming from twenty central warehouses taking place, each one of them working with a different transporter. This obviously generates a certain level of anarchy for deliveries as well as parking difficulties, noise and other nuisances. Some stores can also have several supply sources and thus multiply the arrivals of transporters in the shopping area.

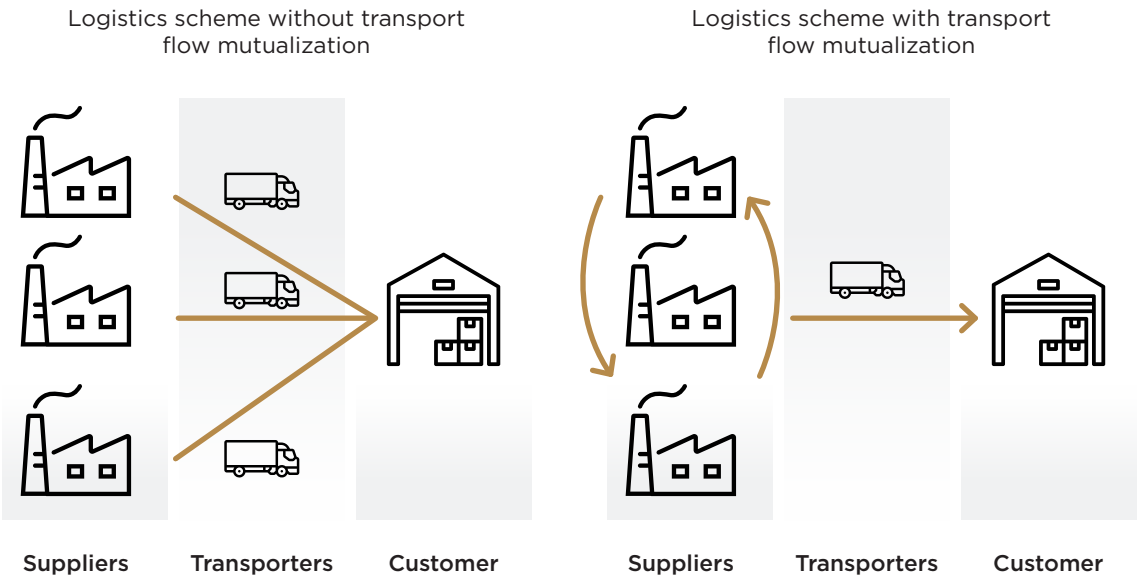
An existing, although complex in its implementation, solution is flow pooling. The complex set up arises from the need to have very good visibility and management of one's supplier network, and requires engaging reflections with the latter to develop a "win-win" approach.

Mutualizing warehouses and transportation brings several advantages such as reduction of the storage logistics costs mainly through mutualization of B2B/B2C flows, optimization of delivery routes with trucks that are loaded more effectively, improved service quality and of course reduction of the carbon impact resulting from a limitation of urban transportation flows.

The exchange of information between companies for last-mile deliveries – or even sharing deliveries themselves – are two often neglected levers to improve the service. Some logistics contractors claim transporting each day half-stuffed trucks for various companies that deserve the same customers, often at the same time. Through good cooperation and data sharing, companies could envision grouping shipments together. They could save money and have a positive environmental impact by significantly reducing their carbon footprint. Neutral entities could emerge to collect logistics data from companies without fearing to reveal confidential data.

The challenge therefore lies in creating universal interconnection for logistics networks through the standardization and inter-operability of all modes so as to allow a more efficient use of resources (capacity of warehouses or truck loading). Currently, and especially in airport areas, stores must organize their supplying from a single location. From this unique location, an electric vehicle could perform a single delivery round. Why not extend the subject more broadly and ramp up the deployment of such solutions in urban areas?

Figure 14. Logistics schemes with and without transport flow mutualization



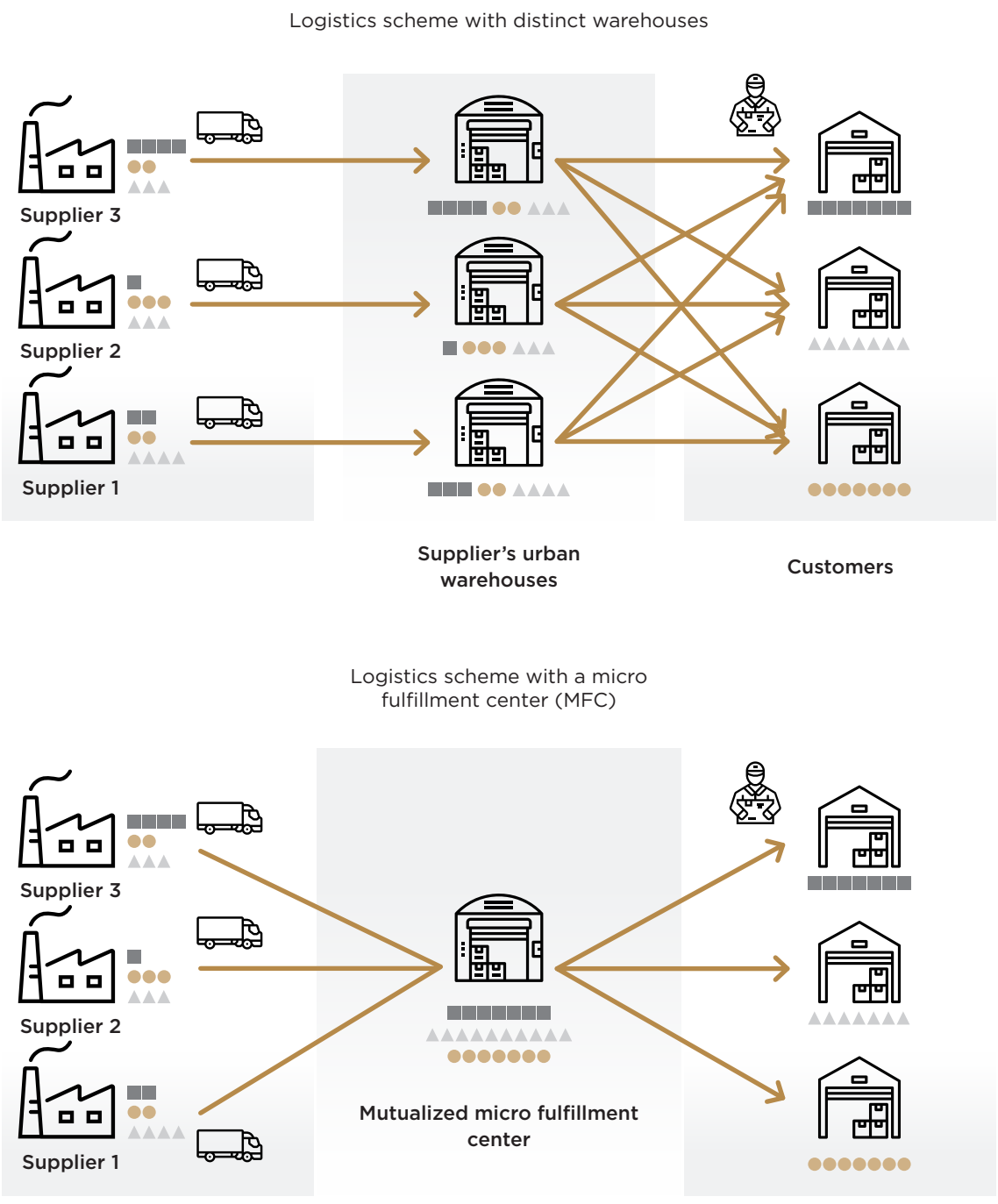
Since the early 2000s, different types of more or less elaborated mutualization schemes have emerged. Multipicks replenishment aims to mutualize transportation in a single, common delivery round stopping by the warehouses of the different participants. Pooling goes one step further and mutualizes both transportation and logistics by setting up a unique logistics platform, in which orders of the different players are consolidated. Palmolive, Reckitt Benckiser, Coty, Swania and Unilever have chosen a pooling solution for an FM Logistic warehouse in the Oise department. Petit Navire and Europe Snack have also chosen a pooling solution in an FM Logistic warehouse in the South of Nantes. Nevertheless, as long as the subject is not supported by public authorities, the ecological stake will be secondary only, while the economic interest will remain the priority.

2.4 MICRO-FULFILLMENT CENTERS

Beyond such initiatives taken by organizations for managing and reducing their costs, our conviction is that tomorrow's city councils and cities will contribute to this green dynamic by providing "greener" micro-fulfillment centers located closer to the consumer and generating less pollution. Projects such as the exploitation of decommissioned rail stations or entire parking levels in cities could thus see the light.

In 2016 the Paris city council launched a call for projects on this topic. This constitutes a major action of the City of Paris as well as a significant progress of the public action in terms of goods transportation and urban logistics, for operation modalities (diversity of use over time), types of vehicle used to serve MFCs (micro fulfillment centers) or organization of the last kilometer alike.

Figure 15. Role of an urban logistics center in the simplification of transportation flows



However, the impact of such a plan on the firms' logistics must be considered. Seeing such plans being implemented implies an additional interfacing point. It is therefore essential that such centers are automated and equipped with the most recent tracking technologies to reduce the break-bulk constraint. All the more so since such micro fulfillment centers could be multi-services (B2B/B2C) or multi-customers in order to further reduce operating costs.

3. PACKAGES FOR CITY CENTERS CONSUMERS

The second aspect covers B2C deliveries, which are growing steadily in urban areas. Trucks and vans are increasingly part of the city center landscape and intensify the impression of congested streets while emitting particulate matter in the atmosphere.

Several avenues exist today that limit the increasing number of vans delivering parcels in city centers:

- Charging for delivery
- Promoting out-of-home deliveries

3.1 CHARGING FOR DELIVERY

In 2014, a French law commonly named "Anti-Amazon" banned online bookstores from proposing both a 5% discount on book prices and free delivery. This represents a first example of measures that will step in to limit the anarchic growth of e-commerce deliveries in urban areas. Online purchase, which would seem at first more environment-friendly since it removes a polluting ride to a store, is estimated to have a 25-fold greater ecological impact than physical retail because of next day (or day +1) deliveries, which are currently made at a loss from an economic point of view and are extremely constraining for vendors but have become the new norm for consumers.

However, such "no charging for shipment" does not bring about more virtuous or eco-conscious behaviors in consumers. We suggest that, due to the Covid-19 health crisis and a stronger ecological awareness, we will see new laws emerge in the coming years to regulate and govern the topic of shipment fees.

One of the most frequently discussed avenues would consist in forcing e-retailers to sell products while charging for delivery at its real cost. Such a regulation would force e-commerce managers to know in great details their unit logistics costs and be able to justify these and thus impose upon them less costly and greener solutions such as the use of out-of-home delivery locations (parcel delivery outlet).

3.2 OUT-OF-HOME DELIVERY SOLUTIONS

Companies are therefore starting to reflect on ways to reduce home deliveries. Home delivery itineraries generally have 50 to 150 stops a day, depending on the type of vehicle (about fifteen for food deliveries). In comparison, the city center B2B deliveries have itineraries made up of 5 to 10 deliveries. The single process of looking for a parking spot – and in practice double-parking when none can be found – is the main factor for inefficiency and economic loss. Giving a greater importance to mutualized delivery locations, commonly called "point relais" (parcel delivery outlet) is part of the solution.

In this field, innovations are starting to be deployed such as automated parcel lockers

offered by La Poste. Connected shelves allow users to collect their parcel without having any human interaction. Such a solution decreases the risk of delivery failure to close to zero while increasing efficiency and diminishing the costs and carbon footprint of the delivery.

Click & Collect solutions are also increasingly adopted by brands since this approach encourages customers to visit their retail locations while removing the logistics costs of the last kilometer. Although almost non-existing only ten years ago, more than 75% of domestic brands now offer a Click & Collect solution. It presents an ecological and economic interest since customer orders can be pooled with the store order flow (if the product is not already present in the store).

Delivery outlets and locker systems thus allow to dramatically reduce the carbon footprint of the last kilometer, even more so because end customers are used to picking up their packages using bicycles or simply by walking to the pickup place in urban areas.

4. INNOVATIVE MEANS OF TRANSPORTATION AND DELIVERIES

For several decades, French companies have tried to use certain means of transportation to optimize their urban freight.

4.1 EXAMPLE: INLAND NAVIGATION

Franprix has for example betted on inland navigation to supply 80 out of its 350 Parisian stores through the Seine. Cost savings were estimated to more than 90,000 liters of fuel and 234 tons of C02 per year. Such transportation is also economically competitive compared to road transportation. However, Franprix had to face natural limitations: because the level of the Seine does not remain constant throughout the year, transportation is blocked during several weeks each year when boats cannot go under bridges in Paris.

4.2 EXAMPLE: RAIL TRANSPORTATION

Monoprix has chosen rail transportation to ship its goods. Every evening a rail shuttle ships several hundreds of pallets carrying 800 to 1,000 tons of goods from warehouses located in Ile-de-France to Paris. Deliveries are done the following morning using natural gas-powered vehicles. This arrangement made it possible to cut 12,000 heavy-duty trucks and reduce CO_2 emissions by 337 tons each year but the cost of these nighttime operations turns out to be significant.

4.3 EXAMPLE: MOBILE PICKUP

Amazon, with its major research budget, has made the bet of investing on tomorrow's delivery systems. A solution of automated locations for mobile pickup has been described in a patent recently filed by Amazon. Its aim is to allow customers to collect their Amazon packages from public buses or similar types of vehicles. This arrangement would be valuable in urban areas where pickup locations are scarce and residential areas scattered.

4.4 EXAMPLE: USING DRONES

We are currently witnessing the rise of drones and other autonomous devices. Urban delivery and freight have rapidly adopted this innovative technology to optimize the downstream logistics

chain and last kilometer deliveries. By 2025 estimates show that as much as 80% of the deliveries could be done through autonomous vehicles.
Giants such as Amazon, UPS, or even Google, are making big strides in their research on flying drones and robot scouts. Other, more specialized companies such as Zipline and Matternet are already using drones to operate emergency deliveries of blood and medicines in Africa. In a country such as Rwanda where not all roads are practicable, especially during rainy season, this constitutes a real advance and responds to a vital need.

4.5 EXAMPLE: COLLABORATIVE DELIVERY

Using a completely different model, SNCF has partnered with Livingpackets to promote a co-delivery method. This new, direct logistics model between retailers and consumers is a source of major and virtuous economies of scale. It is based on a network of individual travelers and connected, unique, and patented bags to deliver packages against a discount on their travel fares.

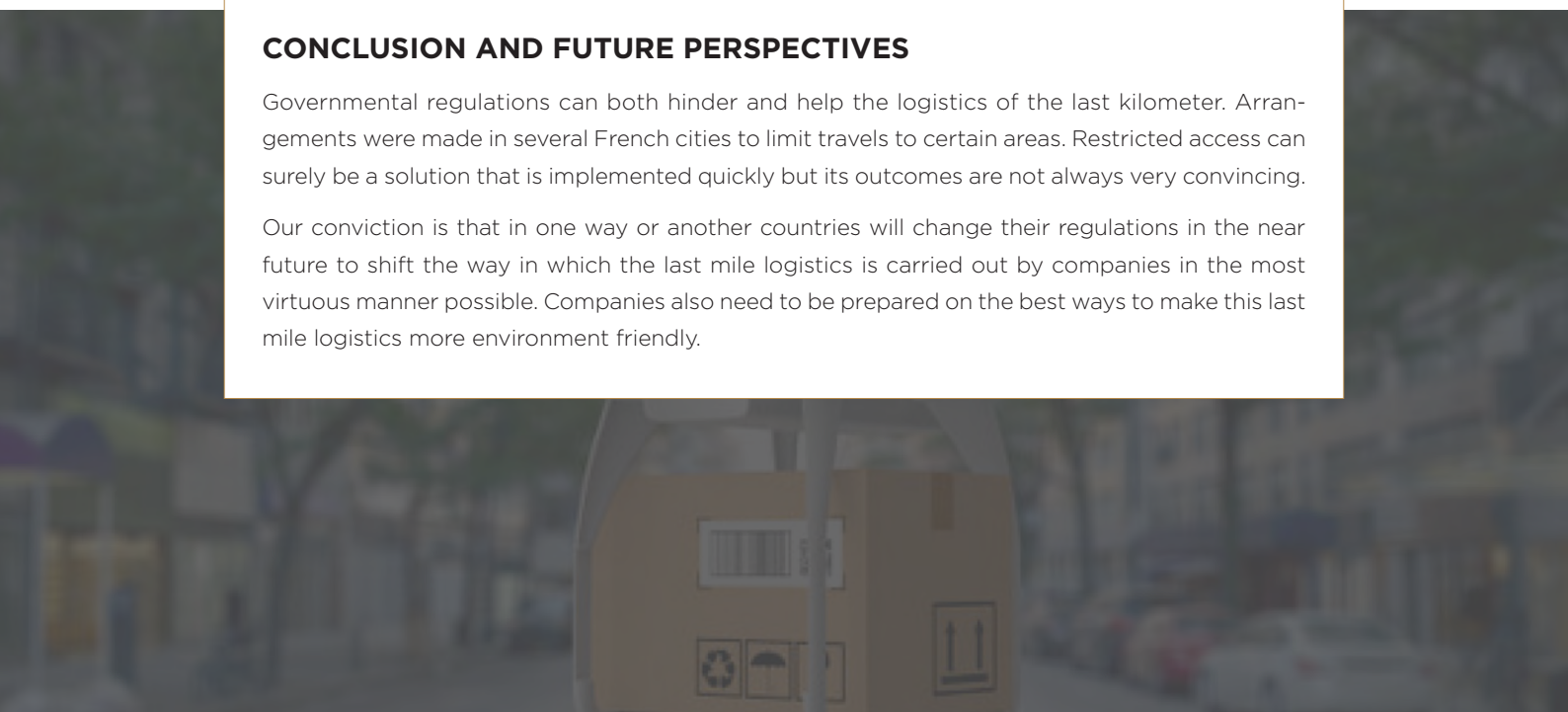
4.6 EXAMPLE: BICYCLES IN CITY CENTERS

Finally, European metropolitan areas are increasingly betting on cargo bikes, with the ambition to decarbonize the last kilometer. In addition to being zero-carbon, such solutions generate less noise and are faster than vans. The company Olvo, a specialist of cyclo-logistics in Paris and its greater area, owns about thirty cargo bikes able to transport 90 kilograms of goods for businesses and individuals alike.

CONCLUSION AND FUTURE PERSPECTIVES

Governmental regulations can both hinder and help the logistics of the last kilometer. Arrangements were made in several French cities to limit travels to certain areas. Restricted access can surely be a solution that is implemented quickly but its outcomes are not always very convincing.

Our conviction is that in one way or another countries will change their regulations in the near future to shift the way in which the last mile logistics is carried out by companies in the most virtuous manner possible. Companies also need to be prepared on the best ways to make this last mile logistics more environment friendly.



4.

CONCLUSION

In the past decades, Supply Chains have been the exaggerated symbols of the evolution of the economy towards an increasingly globalized structure. Thanks to free-trade regulations that are almost unanimously shared, the decreasing trend of transportation costs, and the diffusion of technologies, medium and large enterprises have been able to get organized so as to get their supplies, manufacture and distribute at the best price all over the planet. The comeback of economic protectionism, Covid pandemic, and climate crisis have revealed a sudden breach of the acceptation of the Supply Chains globalization.

The conviction presented in this document is that Supply Chains will not only adapt to the need to preserve a more stable world for our children, which respects biodiversity and saves its natural resources, but that they will rather become a driving force thereof, especially on greenhouse gas emissions topics. This conviction is illustrated through the three examples detailed: Carbon footprint quantification and management, gradual deployment of the principles of circular economy and the advancement of eco-responsible designs for e-commerce deliveries.

Beyond the economic and industrial stakes, the sustainable transformation of Supply Chains also takes place in a context where societies are prone to strong tensions caused mainly by extreme inequalities. Indeed, the climate question encompasses in practice that of the “pollution” disequilibrium between economic classes. As per a recent report from Oxfam and the Stockholm Environment Institute, the 1% richest of our world are responsible for twice as many emissions as the poorest half, corresponding to 100 times more CO_2 emissions per capita per year.

Between 1990 and 2015 emissions have jumped by 60%. The 10% richest people are responsible for 46% of this increase, which contradicts the stereotypes according to which the surge in emissions would be primarily due to China, India and the development of middle classes.

In the future, Supply Chains will need to take into account the reality of these inequalities in their transformation projects in order to contribute to the shift of our economic model towards a model both less polluting and fairer.

In this context, it is highly advisable that organizations anticipate such shifts rather than discover them, for example by doing projections using "what-if" scenarios in order to adapt their model as early as possible.

As detailed in the first section of this book, the Supply Chain function appears best positioned, through its integrated approach and its cross-functional vocation, to manage the company's carbon footprint quantification on a global scope, and therefore to propose sustainable and fair solutions.

The Flow&Co consultancy, a member of the Square group, supports organizations in their Supply Chain transformation projects. Through its both strategic and operational approach, the consultancy is able to bring solutions allowing companies to address challenges of the "Green Supply Chain", be that current challenges or challenges that will inevitably come up in the coming years.

CONTACTS

SARAH AZRIA
Manager

+33 6 71 88 02 20
s.azria@flowandco.fr

PHILIPPE LACHAIZE
Senior Manager co-fondateur F&C

+33 6 84 29 36 34
p.lachaize@flowandco.fr

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GIVING A FUTURE TO TALENT

Founded in 2008, Square is a strategy and business consulting group that bring together 7 medium-sized firms in France, Belgium and Luxembourg. Circle, Tallis, Viatys, Vertuo, Adway, Initio Belgique, Initio Luxembourg et Flow&Co are consulting firms specialized in trade, activity sector or level of intervention.

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Square helps its clients to acquire, integrate and develop their organization's human capital. In order to create greater commitment within teams, our interventions focus primarily on adapting work methods to operational and cultural changes, the effectiveness of human resources departments and skills development.

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SUPPLY-CHAIN
Square ensures the operational excellence of logistics, from procurement to the last mile, with differentiating customer journeys. Our experts design omnichannel solutions that implement best practices in information systems, mechanization and robotization.

For a long time the Supply Chain has been an almost exaggerated example of globalized economy. Through ever-lower transportation costs and free-trade expansion, firms have tried to optimize their Supply Chain with a cost reduction objective in mind. The climate urgency and the Covid crisis abruptly collided with these globalized Supply Chains, which appear today as energy-intensive and incompatible with the pressing needs of national sovereignty. This document argues that after having been the symbol of an energy-hungry economy, Supply Chains will on the contrary become the lever through which organizations will transform their business models towards models that are more environment-friendly. It presents three illustration to back this conviction: the first one describes how the Supply Chain allows to manage the carbon footprint of a company, the second one details how a Supply Chain can adapt to the priorities of a circular economy, and the third one presents avenues to make home deliveries more environment-friendly. These use cases are mere examples of a very deep transformation that Supply Chain will need to undergo in the coming years. Flow&Co, a consultancy of the Square group specializing in Supply Chain topics, has the required expertise to support organizations in this mutation. It works with the industry, distribution, and e-commerce sectors, and well as in services.

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