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Report on food chain logistic challenges, electric and biofuel mobility solutions in public policies

summary



PROJECT:
**Greener AgRo-fooD logistics in the
Mediterranean area
(GARDEN)**





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1. Summary of challenges of food chain logistics with focus on urban short food supply chain

In this section, we look at the issues involved in the downstream logistics of food supply chains for supplying towns and cities, with a particular focus on short and local circuits. The content presented draws on research, field experience, and sectoral studies from several countries. After defining the key concepts mentioned in this document, the first part explains why decarbonizing logistics is essential to reduce the environmental impact of the products transported, as well as the various levers that can be used to achieve this (matching means of transport to volume transported, optimizing delivery rounds, choosing clean vehicles). In the second section, we explain why these levers are difficult to implement, particularly in the case of short and local circuits. Thus, in this section, we address the key challenges faced by various stakeholders in the food supply chain, including producers, logistics stakeholders, distributors, final buyers, and local authorities, within short and local circuits. In the third section, we present decision-support tools, information systems, and existing digital platforms that can be used to rationalize delivery routes and/or plan vehicle replacement. We also present feedback from various countries on innovative short-food supply chain initiatives led by producers, wholesalers, logistics operators, sales platforms, shops, and reverse logistics stakeholders. In the fourth section, we list the lessons learned from these experiences in light of the implementation of the GARDEN's project. The content of our state-of-the-art can be summarized as follows.





Logistics represents a high impact in the short food supply chains life cycle analysis, especially the last mile in an urban context. It also represents a high cost for producers who want to access consumers downtown. Short food supply chains and direct sales (producers market, sell in farm) have grown strongly during the COVID as they represented a way to relocate the food system. Even if it sounds like a paradox, traditional wholesalers and new intermediary stakeholders appear as necessary to scale up the short food supply chain enough to enable a sustainable logistics organizational model. A relevant logistics model for short food supply chains is not possible without involving buyers in the discussion (shops, restaurants, etc.). Digital tools and platforms also appear as necessary to support the decision of stakeholders (to choose the best logistics model for example), to connect stakeholders to each other and to link all the steps (command, delivery, billing). Furthermore, the support of public authorities is necessary to finance low carbon mobility infrastructures (e.g. : charging stations, micro-hubs), to promote the development of short food supply chains (e.g. with food hub platforms), the access for all to local and good food (food solidarity) and the transition of food consumption habits starting with school canteens services.



Main learning from the state of the art about challenges in short and local food supply logistics

Initial assessment about food logistics in short and local supply chains

- **The importance of Last-Mile Logistics in reducing the environmental impact of food supply chain:** The last-mile delivery in urban areas remains a major environmental and financial bottleneck. Reducing emissions in this stage through innovative methods like cargo bikes, urban logistics hubs, and cleaner vehicles can significantly enhance the sustainability of food supply chains.
- **Logistics as a key cost factor in SFSC:** Logistics in short food supply chains is a major cost element, often consuming up to 23% of producers' turnover. Optimizing logistics through better planning, pooling of delivery rounds, and investment in transport infrastructure can reduce costs and increase the profitability of small-scale producers.
- **The complex logistical coordination in SFSCs:** Stakeholders in short food supply chains face significant logistical challenges due to fragmented product flows, diverse product types, and limited logistics expertise.



Producers, especially smaller ones, often lack the financial and organizational resources to invest in optimized logistics, making it difficult to achieve cost-efficiency. Additionally, a lack of shared logistics infrastructure further complicates coordination between producers and buyers, which leads to high transportation costs and inefficiencies.



Main findings about last mile Logistics challenges faced by SFSC stakeholders

- **The role of digital tools and collaboration in Direct-to-consumer models (D2C):** One way to develop a SFSC business through logistics solutions is by implementing direct-to-consumer (D2C) models (without intermediaries), such as farmers' markets, subscription boxes, and online sales. These D2C models offer valuable growth opportunities for small and medium-sized producers by allowing them to bypass intermediaries and retain a larger share of the retail price. They also foster direct relationships with consumers, enabling producers to tailor their offerings to meet market demand. However, many producers underutilize D2C channels due to logistical challenges like transportation, order fulfillment, and last-mile delivery, especially without digital infrastructure. By addressing these logistical barriers and utilizing digital tools and collaboration, D2C models can become a sustainable, scalable solution that strengthens local food systems. However, it is difficult to scale up the commercial flows (and therefore the logistics one) in a direct-to-consumer context.
- **The importance of scaling up commercial flows before the logistic ones in SFSC:** Many SFSCs encounter significant challenges in achieving scalability, primarily due to limited production and logistical capacities. Producers often struggle to expand their operations to meet the growing demands of larger buyers, such as retailers and restaurants. These challenges stem from resource constraints, including inadequate infrastructure, skills, and capital, as well as logistical inefficiencies. To overcome these obstacles, it is essential to explore innovative approaches to scaling SFSCs, such as collaborative planning and shared infrastructure, which can enhance operational efficiency and support sustainable growth. Another way is to rely on an intermediary. The scalability of the logistics flows comes after the scalability of business flows.



Logistics solutions are attractive for producers when they allow them not only to downsize the cost and environmental impact of the transport but also to develop their business and find new clients. This is especially true for short food supply chains, where producers, distributors and consumers are not yet well connected. Then, it's necessary to follow the steps when setting up a logistics organization. The logistics model needs to evolve as it scales up, with the food logistics platform (food hub) as a possible last step. This last step (the optimal situation a priori) can't usually be implemented directly, as it requires a big amount of commercial flows to be viable from an economic point of view.

- **The role of the intermediaries and facilitators to scale up the logistics model:** Intermediaries (wholesalers) and facilitator (food, retailers association, marketplace, etc.) play a key role in consolidating trade flows, optimizing the logistics of short distribution circuits over the last kilometre and developing the supply of local products at affordable prices in towns and cities. They have the resource, the knowledge and the network to make the offer meet the demand. Having intermediaries in SFSC is frequently considered as contradictory even if the definition of SFSC allows one intermediary. In any case, we can talk about local food supply chains.
- **The need of cooperation with all stakeholders in SFSC models (especially buyers):** Reducing the environmental impact and optimizing the last-mile logistics of CACPs depends directly on the ability of the stakeholders in the supply chain to cooperate, which is only possible if they see an interest in this approach for the development of their business (commercial consolidation for producers, securing and diversifying supplies for distributors). Buyers especially must be included in discussion as it is the condition to optimize the logistics (for example choosing a common delivery day).
- **The importance of the context to find the best logistics organizational model:** The case studies presented emphasize that SFSCs have multiple implementation possibilities in very different contexts and that there are many solutions to operationalise the SFSC concept. Further, recent SFSC initiatives frequently involve inadequately experienced practitioners and a deficiency in a well-established culture of scientific management and optimisation, leading to inadequate results and hindering their scalability [1]. These two elements lead to highlight the importance and necessity of a preliminary phase of context analysis prior to the development or re-engineering of a supply chain model. Indeed, the context analysis will make it possible to identify the operational and strategic choices best suited to the specific context, thus reducing the risks of failure of the project itself.



- **The necessity of support from public authorities to develop the required infrastructures and food policy:** Local authorities must play a proactive role in supporting food supply chain logistics. This includes providing financial support for low-carbon infrastructures, reducing regulatory burdens for small-scale producers, and developing urban food policies that integrate logistics hubs and micro-hubs platforms to facilitate access to local food.
- **The need of adaptation to changing urban and consumer landscapes:** As cities grow and consumer preferences shift towards more sustainable and locally sourced products, supply chain stakeholders need to adapt. This includes rethinking traditional distribution models and embracing flexible, innovative solutions such as direct sales, digital platforms, urban logistics centres, micro-hubs, new public transport services, low carbon mobility infrastructure, etc. The development of sustainable urban logistics plans is a good answer to address this challenge.
- **The need for investment in digital tools and of removing technological barriers to improve SFSC:** The growing complexity of short food supply chains requires innovative digital solutions. Tools like La Charrette and CoopCircuits, which optimize logistics and facilitate connections between supply chain actors, can greatly enhance efficiency. More emphasis should be placed on developing interoperable systems that integrate sales, logistics, and financial management to streamline operations. Additionally, the integration of digital tools and platforms for managing logistics, distribution, and sales. While the implementation of digital solutions, such as e-commerce platforms, logistics management systems, and cooperative networks, has the potential to significantly streamline processes, the scalability of these efforts is hindered by a lack of platform interoperability and limited technological infrastructure.
- **The importance of consumer education and awareness:** Increasing consumer awareness of the environmental benefits and challenges of short food supply chains is vital. Encouraging the public to support local producers and engage with more sustainable food systems can help drive demand for short food supply chains, creating a market pull that reinforces these initiatives.



2. SUMMARY OF TECHNOLOGICAL SOLUTIONS TO REPLACE FOSSIL FUELS IN TRANSPORT

This section will outline the technological solutions to replace fossil fuels in transportation, focusing on electromobility and biofuels. It explores various electric vehicle (EV) technologies, including battery electric vehicles (BEVs), hybrid electric vehicles (HEVs), plug-in hybrids (PHEVs), and fuel-cell electric vehicles (FCEVs) highlighting their features, benefits, and limitations. Additionally, it examines biofuels such as biodiesel, bioethanol, biogas, and biomethane, detailing their production processes, materials, and potential for reducing carbon emissions in the transport sector. The summary emphasizes renewable alternatives to achieve sustainable mobility.



Electromobility solutions to replace fossil fuels in transport

- **Battery electric vehicles (BEV)**

Fully electric vehicles with rechargeable batteries without any gasoline engine. The battery electric vehicle (BEV) has a powerful electric motor and a well-dimensioned battery system. The vehicle is propelled only by the electric motor so that no combustion engine, fuel tank, or even exhaust system is needed. Transshipment points must be located close to or inside the city. Although BEV vehicles are not yet a common occurrence in the agri-food logistic chain, there are numerous solutions that can encourage their introduction. One such solution is battery swapping.

- **Hybrid electric vehicles (HEV)**

Hybrid Electric Vehicles (HEVs) feature both **a gasoline engine** and **an electric motor** to power the car. The battery's energy is obtained through regenerative braking, which captures energy typically lost during braking to help the gasoline engine during acceleration. In conventional internal combustion engine vehicles, this braking energy is usually dissipated as heat in the brake pads and rotors. Standard hybrids cannot be recharged by plugging into the grid and are not compatible with EV charging stations.



- **Parallel Hybrid System:** the ICE and electric motor can both power the truck independently or work together. This allows the truck to utilize its electric motor for low-speed driving and regenerative braking, improving fuel efficiency.
- **Series Hybrid System:** the ICE generates electricity to power the electric motor, which in turn propels the vehicle. This system allows for greater fuel economy, but it may not be as powerful as a parallel hybrid system.

- **Plug-in hybrid electric vehicles (PHEV)**

Plug-in Hybrid Electric Vehicles (PHEVs) combine an engine and an electric motor to power the vehicle. Similar to regular hybrids, they recharge their battery through regenerative braking.

PHEVs have a significantly larger battery and can be plugged into the grid for recharging. Once the electric range is exhausted, PHEVs operate like regular hybrids and can cover several hundred miles on a full tank of gasoline. All PHEVs can be charged, but most are not equipped for fast charging.

- **Fuel-cell electric vehicles (FCEV)**

Fuel Cell Electric Vehicles (FCEVs) represent the cutting edge of electric vehicle technology. These vehicles use a fuel cell, typically powered by hydrogen, to generate electricity. The only by-product of this process is water vapor.

Similar to plug-in hybrids, FCEVs have batteries that store energy produced by the fuel cell. As hydrogen-powered vehicles, FCEVs are entirely emission-free.

Summary of good practices identified in electromobility solutions

From the gathered repository of good practices in the agri – food logistics, a simple conclusion can be drawn and it's that green logistics options are already in use, they work well and have numerous benefits over conventional delivery practices. However, these solutions should be replicated on a larger and broader scale.

First example of such practice is brewery Kamenitza AD which operates in Bulgaria. The company has number of offices spread across the country and their well – established distribution system features electric vehicles used for local deliveries. EVs they use specifically designed to be efficient in urban areas, and their distribution centres are equipped with charging infrastructure enabling minimal downtime and operational efficiency.



Another good example is The Carlsberg Group who is advancing their commitment to electromobility by piloting several initiatives across Europe and Asia. Their ever-growing electric delivery truck fleet is accompanied with forklift trucks converted from LPG to electric. This way, warehouse decarbonisation is also utilized. Their efforts are very important as they are setting example for other businesses in the region. Agios Efstratios – Green Island located in Greece is putting their efforts towards complete energy – autonomous operation and as a part of the project basic infrastructure for the use of EV will be created. This will enable future development and utilisation of green logistics on the island. In the Valencian Port of Valencia 100% electric truck is used for heavy transport in container loading and unloading operations. This example showcases the usage of EVs in heavy local transport is not only possible but yields numerous benefits such as minimisation of CO₂ emissions, noise and air pollution. Similarly, Sustainable port of Bar procured BEV and installed a fast-charging station together with hybrid bus used for on – site transportation in Montenegro. Both of these show significant progress in lowering port's carbon footprint as hybrid bus replaced hundreds of private cars otherwise used for transporting workers and visitors. In addition to this, Public Utility Company Zelenilo from Podgorica, Montenegro advanced their fleet with three electric cars which will streamline operations, improve efficiency and save costs during their usual tasks. Company specialises in maintaining green spaces, designing, constructing and arranging green areas, and other. Another way to excel decarbonisation logistics in the urban areas in showcased by Synchronicity in Marseille, France. Their aim is to create shared collection systems for waste from artisans and merchants using cargo bikes. The project also includes a component dedicated to raising awareness, training professionals and support social jobs paving the way for development of effective equipment procurement and development of cycling infrastructure in dense urban areas. Another example is Lidl Croatia's collaboration with Volvo Trucks that resulted in integration of 100% electric truck into the logistics chain between the central warehouse and Lidl stores. Truck can travel up to 250 km on a single charge which is more than enough to supply two stores and return to the central warehouse. One of the key benefits, in addition to reducing CO₂, is reduction of noise during deliveries. Their efforts also serve as a role model for other retail chains in Croatia. Moreover, in Milan, Italy, project So. De. Social Delivery that is focused on delivering goods using eco – friendly cargo bikes is good example on how to replace motor vehicles and help reduce traffic congestion and pollution. Furthermore, The Bologna WholeSale Market (CAAB), within their efforts towards environmental sustainability, is implementing electric mobility to transport goods.



Additionally, their aim is to utilise surplus energy produced by the existing photovoltaic plant so the CAAB can be self – sufficient and thus avoid significant amounts of CO2 emissions. Equally important are efforts in broadening of the recharging stations network as well as various projects aimed on e – mobility support policies which are enabling usage of EV and their easier integration into the existing distribution networks.



Biofuels solutions to replace fossil fuels in transport

- **Biodiesel**

Biodiesel and bioethanol are the most common biofuels used in transport, with other biofuels also in use but with more limited market penetration. First-generation biodiesel technologies are well-established, producing biodiesel from oil crops and animal fats. Second-generation biodiesel includes a broad range of products generated by conventional technologies but based on novel starch or energy crops.

- **Bioethanol**

Together with biodiesel, bioethanol is the most common biofuels used in transport. At the international level, a variety of vehicles are currently using bioethanol.

Raw materials for the production of first-generation bioethanol are sugar beet, starchy plants, while for the production of second generation bioethanol are agricultural and forestry crop residues, fruit and forestry tree residues.

In terms of production cost, the primary barrier to bioethanol production is the cost of producing it. The process of production could surpass the cost of fossil fuels. Using agricultural waste as a bioethanol source can significantly reduce this cost. Bioethanol can be used in blended form, with gasoline or alone.

- **Biogas**

Biogas is a renewable biofuel. Various varieties of basic materials can be used to produce biogas. Biogas is primarily produced by microorganisms that graze on organic matter. These bacteria decompose food to produce methane, which can be used locally as-is or converted into biogas with properties similar to those of natural gas to allow the biogas to be transported over greater distances.



- **Biomethane**

Biomethane is a renewable fuel produced by upgrading biogas and syngas to natural gas quality. It meets all technical requirements set by vehicle manufacturers and natural gas transportation system operators. Biomethane can be used interchangeably with natural gas in all applications. Biogas production is an element in the environmental management of such wastes; biogas plants can also deliver digestate, which contains most of the nutrients in the feedstock and can be an excellent biofertilizer.

Summary of good practices identified in biofuel solutions

Biofuels are yet another possible solution to decarbonize the logistics sector. Although their current usage is mostly as a blend with fossil fuels, their potential is significant, so any effort to promote their adoption is valuable. The showcase of best practices of biofuel usage is listed in the tables above. Biofuels are a great way to practice circular economy as they can be produced from various food industry, agriculture and domestic sector waste. Despite that, there are still some obstacles to overcome in the terms of their usage in the agri – food logistics as can be seen in the best practices examples.

In Bulgarian brewery Kamenitza AD a lot of effort is put into the optimization of its transportation routes and increased shipment weights to minimize emissions. To fulfil their sustainability goals, they emphasise the use of renewable energy sources as well as biofuels in their energy management systems. Also, as a part of their sustainability strategy they replaced most of their vehicles with hybrid models. Additionally, remaining fleet will also be replaced by the end of 2024. Another example of biofuel usage in Bulgaria is Kaufland Bulgaria which utilises CNG trucks for their hypermarket deliveries. Both examples are showing how can biofuels be integrated into otherwise fossil fuel dominated sector and yield good results whilst being beneficial towards the environment. Very good example of circular economy and biofuel usage is La Ribera's public service "Biodisel in la Ribera". The main idea of the service is to collect and recycle used vegetable oils from restaurants, industry and domestic sector. Collected oil is used for the production of the renewable fuel, biodiesel, which is then distributed to local petrol stations. The service offers a wide range of benefits, from reduction of the impact of the used vegetable oils on sewage systems to reduction of emissions and implementation of circular economy. Similarly, in Greece and Republic of North Macedonia, as a part of the AGROWCHAIN project, sustainable management of solid agricultural residues is promoted.



The aim of the project is to utilise these agricultural residues into production of thermal energy via wood chips and pellets or in biomass boilers. As biomass is already collected there is window of opportunity to integrate production of biofuel that could be further used, for example in said biomass transportation or in other sectors. In Croatia, there are few biofuel usage examples. Firstly, project CLIMATE demonstrated how utilising residues can turn potential waste into raw material. Project also procured number of scientific studies and articles raising awareness about biofuels and their importance. On the other hand, there is company BIODISEL VUKOVAR, that is the largest biodiesel plant in Republic of Croatia with production of 35,000 t/a. They mainly use rapeseed as a raw material in the production process. Produced biodiesel is sold on the market. Osatina Group Ltd. which mainly deals in food production, has integrated biogas plant into their portfolio thus utilising circular economy. They use waste from food production as well as livestock manure to produce biogas that is later used in three biogas plants that produce electricity. This is an excellent example of sustainable waste management and circular economy, although lacking in usage of produced biofuel for transportation needs. This is mainly due to government regulations and lack of support towards more biofuels in the fuel portfolio. Moreover, in Toulouse (France), effort towards biofuels broader usage is showcased by construction of CNG station that creates opportunities for local wholesalers and distributors to switch their vehicles running on gas to biogas. This example outlines the importance of energy infrastructure in transition towards low carbon mobility. Another way to assist transition towards broader biofuel usage is showcased by French startup Lypech which is specialised in retrofitting diesel engine to GNV / Bio GNV. Retrofitted engines offer 90% reduction in fine particles emissions, 60% reduction in NOx, and 30% in CO2 emissions. The whole retrofitting process takes about a week thus offering their customers quick solution to decarbonise their existing vehicles. As can be seen, there are numerous examples of good practices on the biofuel usage but there is still a lot of space for improvement and integration of biofuels into agri – food logistics.

Main learnings from analysis of sustainable solutions to replace fossil fuels in logistics

- **Importance of understanding the role of light electric freight vehicles (LEFV) in city logistics:** LEFVs are usually applied as a solution among other solutions in city logistics.



A mixed fleet of different vehicle types is necessary to guarantee flexibility needed to provide certainty that customer demands can be met. Not all shipments and deliveries will result in profitable use of LEFVs. Advanced planning and control systems are required to develop optimized routes and loading of each vehicle in the fleet. Transshipment points must be located close to or inside the city. The further the distance to transshipment points, the less suitable LEFVs become. For trips with long initial distances (more than 5km to the first stop) and long journeys (more than 30 km), the LEFV is often not an appropriate option.

- **Full potential of LEFVs can only be exploited with proper infrastructure and management:** LEFVs require adequate infrastructure to be properly utilized in urban supply chains. Aside from charging stations, this also implies new concepts such as smart networks based on IoT, smart charging, V2G etc. city logistics with LEFVs require good locations for hubs in the distribution network, robust processes, cooperation between customers, logistics service providers and suppliers, good insight into costs involved, modern Information and communication technologies and good organization.
- **Retrofitting as a solution in accelerating uptake of electricity in light and heavy-duty vehicles:** Retrofitting transforms an I.C.E. vehicle into an electric one by replacing the petrol/diesel engine and fuel tank with an electric motor and battery. The cost saving of converting existing vehicles into electric vehicles is estimated to be about 50% the cost of buying a new eLCV. In recognition of how retrofitting can be important in transitioning to cleaner transportation, governments are increasingly offering incentives and support programs to facilitate retrofitting.
- **Biomethane as a viable biofuel option for light duty vehicles in supply chain logistics:** Biomethane can be supplied to light duty vehicles (LDV) (also heavy duty) in two ways: 1) Dedicated retail filling stations supplying only biomethane (compressed or liquefied), which often comes from a plant nearby or is shipped in liquefied form (similar to LNG), or 2) Fuelling stations that are connected to the gas grid and offer natural gas blended with biomethane. Bin2Grid project [3] assessed technical requirements for usage of biomethane in local filling stations was assessed, with particular focus to transportation sector (e.g. waste management trucks).



3. PUBLIC POLICIES AND MECHANISMS



Current European Legal and Policy Framework

This section examines the legal and policy framework supporting energy transition in the food distribution logistics chain, emphasizing regulatory measures, requirements, and financial initiatives to promote green solutions, especially sustainable mobility.

Key EU Policies for Sustainable Mobility

The EU framework supports clean, efficient transport, reducing greenhouse gas emissions, increasing electric vehicle adoption, and developing integrated transport systems.

- **European Green Deal**

The European Green Deal seeks climate neutrality by 2050. Key initiatives include the Circular Economy Action Plan, Biodiversity Strategy for 2030, Farm to Fork Strategy, and decarbonization of energy. Financial tools like the Just Transition Mechanism support affected regions. Challenges include securing adequate funding and ensuring cooperation among Member States.

- **Legislative Package Fit for 55**

This package aligns policies to reduce net greenhouse gas emissions by 55% by 2030. Key transport measures include:

- Stricter CO₂ standards for cars and vans.
- Promotion of sustainable aviation fuels.
- A carbon border adjustment mechanism.

Implementation involves adopting national laws, balancing growth with sustainability, and ensuring fairness among Member States.

- **European Climate Law**

The Climate Law legally binds the EU to reduce emissions by 55% by 2030 (compared to 1990 levels) and achieve climate neutrality by 2050. It includes:

- Progress monitoring and intermediate targets.



- Independent advice from the European Scientific Advisory Board on Climate Change. Implementation challenges include ensuring compliance and sufficient emissions reductions across all sectors.

- ***Sustainable and Smart Mobility Strategy (SSMS)***

The SSMS targets a 90% reduction in transport emissions by 2050. Measures include:

- Boosting rail and inland waterway transport.
- Promoting sustainable fuels.
- Improving urban mobility with digital technologies. Initial efforts include alternative fuels promotion and expansion of the Trans-European Transport Network (TEN-T). Success depends on collaboration among Member States and industry.

- ***Regulation (EU) 2019/631***

This regulation sets CO₂ standards for new cars and vans, targeting zero emissions by 2035. Current targets include:

- 2020–2024: Cars: 95 g CO₂/km, Vans: 147 g CO₂/km (NEDC test).
- 2025–2029: Cars: 93.6 g CO₂/km, Vans: 153.9 g CO₂/km (WLTP test).
- 2030–2034: Cars: 49.5 g CO₂/km, Vans: 90.6 g CO₂/km.
- From 2035: 0 g CO₂/km for all new cars and vans.

This fosters zero-emission innovation, supporting EU technological leadership and job creation.



Regional and National Policies

Mediterranean region policies focus on sustainable mobility, often impacting food logistics indirectly. These include:

1. **Sustainable Urban Mobility Plans (SUMP)** - Promoting public transport, non-motorized transport, and efficient public space use.
2. **Sustainable Energy and Climate Action Plans (SECAP)** - Addressing renewable energy use and emissions reductions.
3. **Low Emission Zones (LEZ)** - Reducing emissions in urban areas.

Although not specific to food logistics, these measures support decarbonization by embedding sustainability into urban mobility. Efforts emphasize long-term guidelines, participatory decision-making, and improving information systems.



Main learnings from analysis of public policies and frameworks

- **Alternative and sustainable mobility solutions, as well as advanced agro-food logistic systems are key drivers for local legal or policy frameworks such as LEZ in cities, or SUMP and SECAP plans:** Mainly local authorities in the Mediterranean area make use of 3 types of regulations in the field of sustainable mobility: 1) development and implementation of Sustainable Urban Mobility Plans (SUMP), 2) Development and implementation of Sustainable Energy and Climate Action Plans (SECAPs), 3) Creation of Low Emission Zones in urban areas (LEZ). By integrating sustainable logistics and mobility solutions, local authorities can create synergies across SUMP, SECAPs, and LEZs, accelerating their implementation and fostering a transition toward greener, more livable cities.

4. DISCUSSION

The analysis of short and local food supply chains (SFSCs) highlights the central importance of logistics—especially the last-mile segment—in enabling sustainable, economically viable, and socially beneficial solutions. Urban contexts present unique challenges as the transportation of small, diverse food product volumes often leads to high costs and environmental impacts, pressuring producers and distributors to optimize their logistical models. Although direct-to-consumer (D2C) models have gained traction during disruptive events such as the COVID-19 pandemic, many producers still struggle to efficiently organize their deliveries and scale their commercial flows. The use of intermediaries—often seen as contradictory to the “shortness” ideal—emerges as a pragmatic necessity to pool volumes, streamline logistics, and ensure affordability and accessibility for end consumers.

A key lesson is that logistics improvement must follow commercial growth. Before logistics can be optimized through advanced models like food hubs, a critical mass of trade volumes and a strong network of stakeholders must be established. Producers, buyers, logistics service providers, and local authorities all need to be aligned in discussing and defining common delivery days, shared infrastructure, and investment in suitable vehicle technologies. This alignment is particularly challenging because each stakeholder group has its own priorities and constraints. However, the potential rewards—reduced transportation costs, lower environmental impacts, and enhanced food accessibility—are significant.

Digital tools, platforms, and decision-support systems are pivotal for improved coordination, transparency, and cost reduction. They facilitate collaboration and can help producers select appropriate logistics models or new transport technologies. Yet, the complexity of integrating these platforms and ensuring their interoperability remains a barrier. Additionally, support from public authorities is indispensable. By investing in low-carbon mobility infrastructure, creating micro-hubs, and encouraging the development of local food policies, authorities can pave the way for successful SFSC initiatives. Such measures align well with broader European Union policies designed to promote renewable energy, reduce emissions, and achieve climate neutrality goals by 2050.

Another critical aspect is the adaptation to a rapidly changing urban environment and evolving consumer preferences. The demand for sustainable and ethically sourced food continues to rise, offering a powerful market driver for SFSC development. Heightened consumer awareness and education around local supply chains can further reinforce this trend and create stable demand, making scaling efforts more feasible.



Technological transitions, such as electromobility and biofuels, also offer promising pathways for decarbonizing logistics. Although they present opportunities—demonstrated by a variety of pilot projects and innovative startups—they require proper infrastructure, retrofitting support, and stable policy frameworks to achieve widespread adoption.



5. CONCLUSION

In conclusion, creating sustainable short and local food supply chains in urban contexts depends on a set of interconnected factors. It requires scaling commercial flows before logistics optimization, forging alliances across all stakeholder groups, and leveraging digital platforms. Embracing low-carbon mobility options, supported by suitable infrastructure and policy mechanisms, is essential. Local authorities, through regulatory frameworks such as SUMPs, SECAPs, and LEZs, can stimulate necessary changes and investments. Ultimately, a holistic, context-sensitive approach that blends technological innovation, policy support, stakeholder cooperation, and consumer engagement is key to ensuring the long-term viability, resilience, and sustainability of SFSCs.





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