

An Integrated and Cooperative Approach Between Regional and Local Public Authorities to Sustainable Development: City Logistics Projects in Calabria

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Abstract. The freight transport is essential to the functioning of cities, but impacts on sustainability and its effects negatively affecting urban development. In more cities, this problem has motivated public administrators to plan, program and executed a process to realize integrated interventions of urban logistics by CO_2 free zones. The aim is to reduce the negative effects and to improve individual and collective well-being in urban areas. Few Regions at EU level have implemented an integrated and cooperative approach to plan and program urban logistics interventions. An experimental case study is analyzed regarding a Region in Southern Italy. The collaborative process of regional and cities authorities produces the realization of city logistics projects in the cities of Calabria and in some towns with a strong tourist attraction that have traffic problems at certain times of the year. In terms of sustainable development, the results of city logistics projects are reduction of freight flows and of polluting emissions, with the increase of low-emission vehicles. The example of Calabria Region is a good practice to facilitate urban policies towards sustainability according to Agenda 2030, too.

Keywords: City logistics · Urban strategies · Sustainable development · Agenda 2030 · Public engagement · Cooperative process

1 Introduction

The urban freight transport has acquired, in the last decades, growing importance: it is an essential service for citizens because it is the main component of the supply chain and therefore of the commercial activities on one side and of the consumers on the other. The increasing number of deliveries and freight vehicles in residential areas generates heavy impacts on city sustainability and livability, also due to the Covid-19 pandemic [1, 2].

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The freight transport involves air and noise pollution, congestion, energy consumption, deterioration of architecture, safety problems, etc. It contributes to non-sustainable effects on [3–6]: environment, economy, society.

Environment, economy and society are the three fundamental components of sustainable development introduced in 1987 in the Our Common Future report, better known as the Brundtland Report [7].

Sustainable development is the focus of policies and strategies adopted at international level. In 2015, UN affirmed this principle by strengthening and integrating it into a program of action for people, the planet and prosperity by Agenda 2030 [8, 9].

At European level some documents that push for sustainable transport are Action Plan on urban mobility [10], the Europe 2020 strategy [11], Transport White Paper [12] Moreover, in 2019 the European Commission has product the Country Report for Italy [13]. The goals with regard to the sustainability of transport are 2, 3 and 5.

Public authorities are primarily responsible for livable cities, where people and goods move in urban areas, and they should to work to plan movements while reducing impacts. To tend a cleaner and sustainable city they should be inspired by the Agenda 2030 also for urban freight transport and logistics.

The goal is to find a shared planning solution that satisfies the many actors involved with different perceptions and objectives [14–16]. Traditionally, public authorities promote city logistics initiatives [17]. Higher authorities also can have a role of moral suasion and can encourage the development of plans and projects at the lower authorities by and integrated approach finalized to sustainable cities [18–20]. In Italy, some example are Emilia-Romagna Region [21] and Municipality of Milano [22].

The literature shows a lack of an integrated and cooperative vertical approach between public administrations of different levels to tackle the problems deriving from urban freight transports respect to a sustainable development prospective.

Regions often have the financial resources to implement sustainable development programs, but they do not have the executive role. On the other hand, cities have the executive role, but often do not have adequate resources. The problem is how to find the correct balance between regional decision-making and cities decision-making. More generally, the problem always arises between administrations of different levels.

The paper shows how to build and realize a way towards CO2 free zones in general planning process [23, 24] through and integrated and cooperative approach. The central theme is to connect different urban centers, without obligation, within a general framework of sustainability, starting to city logistics, but also looking at the other aspects of the city linked with sustainable development.

The paper describes the technical-administrative path that leads to the realization of city logistics projects starting from the delimitation of the areas where freight traffic is regulated, named City Logistics Areas (CLA). The case study is Calabria Region, in Southern Italy. The paper reports what the results are obtained from the realization of city logistics projects by time windows, dedicated no material and material infrastructures, use of low-emission vehicles. The results are respect to estimates of the reduction of affects between actual and project scenario in terms of reduction of freight flows, emissions and economic costs.

In Calabria, it is interesting to implement an integrated approach, because there are several relatively small cities and towns, with the exception of Reggio Calabria (in the South) which about 200,000 inhabitants and the considered urban areas have similar problems. In this way, Sect. 2 reports the city logistics process and the description of all its components starting from indications given by the Regional Transport Plan. Section 3 reports public engagement activities. Section 4 describes the main characteristics of city logistics projects and their territorial impacts. Section 5 reports the conclusions.

2 City Logistics Process

Calabria Region has developed, from Regional Transport Plan (RTP), a way to promote city logistics initiatives at local level to get to zero C02 emissions by 2030, according to Agenda 2030, the EU and the Italian directions for sustainable development, and ready projecting itself towards the European policy objectives 2021–2027 [25].

The RTP supports regional policies for the transport and logistics system, in the medium and long term. The RTP defines a general vision that consist of 4 goals [26]: economic development; external accessibility; internal accessibility; sustainability.

According to the goals, RTP defines 10 strategic objectives and actions and 100 operational measures, 10 for each action (see Fig. 1). In particular, objective 2 Urban areas, concerns the strengthening of infrastructures and services in urban areas. Among the 10 related measures, measure 2.5 refers to City logistics [27].

The way toward CO2 free zones in urban areas is according to measure 2.5 of RTP, by a technical-administrative path integrating the responsibilities that each public actors has respect to city logistics. Other initiatives of RTP pushes to reduce CO2 emissions in a general framework to increase the livability of cities, as Green and Safety School for traffic-free, green ad equipped areas near schools [28].

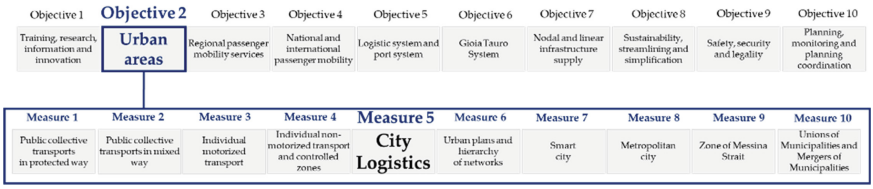

Fig. 1. RTP and city logistics

Calabria Region, as promoter and financier, has designed and realized technical and administrative process, according to indications of international authorities. The path includes the process evolution from planning, to programming, executing and Public Engagement [29, 30].

The cities and towns, as decision makers and actuators, have designed the interventions for the city logistics (see Table 1) and, after their realization with the programmed resources of the Region, they are responsible for management and monitoring.

The results of the monitoring must be returned to the Region carrying out a general monitoring. Figure 2 shows the activities of the Region with the documents accompanying each activity (on the top), and the activities of a generic local authority (on the bottom).

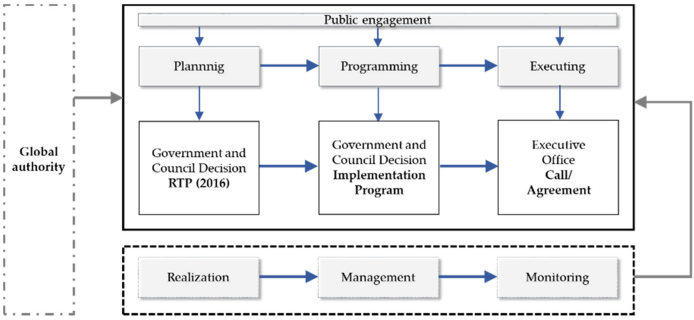

Fig. 2. City logistics activities

Table 1. City logistics interventions

Group	Interventions
Supply regulation	Time windows
	Accesses by dimensions of vehicles
	NDA*- proximity logistics areas
	UDC** - integration with long-distance intermodal transport
Infrastructures	Parking network realization (booking)
	NDA and UDC realization
	Pick-up Point realization
ICT and ITS	App or services for access control
	App or services for parking control (booking)
	Freight traffic control
Vehicles	Enhancement of zero impact fleets
	Access by environmental performance

* NDA = Nearby Delivery Area, ** UDC = Urban Distribution Center

The Region has published 2 Calls (Call 2018 and 2019) to define the rules to grant financing corresponding to: local authority that can submit a project, fund respect to the size of CLA, interventions of projects, can be (see Table 2), minimum level of project, can be (see Table 3 and Table 4), selection of projects to assign the funds on three classes of criteria.

Then, a local authority who wants to participate in the call must submit a project proposal with Type 1 or Type 2 interventions, and understand even fixed time windows in the Call 2018 or time windows and ITS in the Calls 2019 that regulate traffic flows in the CLA [31, 32].

Each project submitted is evaluated by assigning a score [33]. The score is assigned respect to ex ante estimate of variation between actual and project scenario by a set of indicators. The fund is assigned to projects in order score until the programmed resources are exhausted.

The cities and towns have been analyzed to draw a typical profile. The modelling system applied is a combination of two levels [34, 35]:

- commodity level, to analyze the quantity flows (Eq. 1);
- vehicle level, to convert quantity flows in vehicle flows (Eq. 2).

By a zoning, o is the origin zone and d is the destination zone, H is the period, $Q^{H}_{od}[s]$ is the average quantity flow of goods of type s generated by o; $Q^{H}_{.d}[s]$ is the quantity of goods s attracted by d, named attraction model; $p^{H}[o/ds]$ is the probability that goods s, attracted by d, arrive from o, named acquisition model.

Commodity level can be formalized:

$$Q^{H}_{od}[s] = Q^{H}_{d}[s] \cdot p^{H}[o/ds] \tag{1}$$

The average flow of commercial vehicles of type i is $VC^{iH}_{o,d}[s,m]$ related to the type of service m; p[m/ods] is the probability that the goods s, attracted by d, arrive from o and are distributed by type of service m, named service model; p[i/mods] is the whole model and calculates the probability that the goods s, attracted by d, arrive from o, are distributed by service m and vehicle i; q^{i}_{sm} is the quantity of goods s delivered by service m and vehicle i.

Vehicle level can be formalized

$$VC^{iH}_{od}[s,m] = \frac{Q^{H}_{od}[s] \cdot p[m/ods] \cdot p[i/mods]}{q^{i}_{sm}} \tag{2}$$

Table 2. City logistics interventions financeable

Group	Interventions	Type 1	Type 2
Supply regulation	Time windows	X	
	Accesses by dimensions of vehicles	X	
	NDA* - proximity logistics areas		X
	UDC** - integration with long-distance intermodal transport		X
Infrastructures	Parking network realization (booking)		X
	NDA and UDC realization		X
	Pick-up Point realization		X
ICT and ITS	App or services for access control	X	
	App or services for parking control (booking)	X	
	Freight traffic control		X
Vehicles	Enhancement of zero impact fleets		X
	Access by environmental performance		X

* NDA = Nearby Delivery Area,** UDC = Urban Distribution Centers

Table 3. Type 1: Time windows

Vehicle	Load	Engine	Euro	Time windows
N1, N2	Up to 12 t	Combustion	Up to 6	Max 3 h in 6 am–22 pm
N3	Over 12 t	Combustion	Up to 6	Possible in 22 pm–6 am With authorization on path and time
Lx (freight)		Combustion	Up to 6	Max 4 h in 6 am–22 pm

Table 4. Type 2: Time windows

Vehicle	Load	Engine	Euro	Time windows
All	All	Electric		Transit always open
N1, N2	Up to 12 t	Combustion	6	Max 3 h in 6 am–22 pm Max 4 h in 22 pm–6am
N1, N2	Up to 12 t	Combustion	Up to 5	Possible in 22 pm–6 am With authorization on path and time
N3	Over 12 t	Combustion	Up to 6	Possible in 22 pm–6 am With authorization on path and time
Lx (freight)		Combustion	Up to 6	Closed to transit

3 Public Engagement

Calabria Region has developed a prototypical Public Engagement process (PE) as a part of the technical and administrative path realized for city logistics to give a scientific support in addition to the financial one.

In the planning and design of transport systems, PE is usually activated at international level for big infrastructures. The process in Italy is regulated by specific norms in the national law for public works. In these cases, PE would like to search a transparent decision-making process with the involvement of the interested parties, against a DAD approach (Decide, Announce, Defend) that could have induced NIMBY-like behavior [36]. The PE is requested, in fact, only for railway and motorway belonging to TEN-T [37, 38], and any application exists for diffuse intervention as the one of city logistics.

The PE guaranteed participation and sharing of the choices, but at the same time increase knowledge and skills [39, 40]. In Calabria, it often happens that the decision-makers have little knowledge of urban logistics and its impacts, but the knowledge is important to solve the problem of the freight distribution. Calabria Region supported the decision-makers with dissemination of models and methods to analyze the current scenario and design the future one.

The PE was developed as training activities in discussion-based form, through meetings characterized by the active participation of the stakeholders involved. The parts have been chosen based on a potential profile of knowledge and skills, which had to be, from time to time, consistent with the specific aspect of the city logistics treated, to guide and maximize the effectiveness of the expected result. All the training activities have provided for by the discussion-based model have been carried out with increasing complexity from seminars, workshops, tabletops and games [30].

4 Territorial Results

The proposals project submitted at Call 2018 were 6, 3 of which funded. They are the proposal projects of some of the cities and largest towns with more than 30,000 inhabitants: Rende, Vibo and Reggio.

The proposals project submitted at Call 2019 were 7, 6 of which have been funded. They are the proposal projects of others cities with more than 30,000 inhabitants: Corigliano Rossano and Catanzaro; and of touristic towns with less 30,000 inhabitants and characterized by high flows of tourism: Paola, Fiumefreddo, Pizzo and Tropea.

After Ricadi, which is the first destination in Calabria with about 1 million of visitors per year but with a specific tourist typology linked to the high number of sea villages, Corigliano Rossano is among the main tourist destinations with more 550,000, as well as Pizzo and Tropea with almost 300,000. Moreover, Corigliano Rossano, Catanzaro, Rende, Vibo and Reggio are among the 8 largest cities in Calabria. Thus, the projects of 5 of the 8 largest cities were financed.

After the admission to financing, the Region has signed the agreements with the winning local authorities. The agreement regulates the relationships between the entities including the monitoring frequency of the project, the results of which must be transmitted to the Region for general monitoring.

The agreement also establishes that the local authority draws up an executive project, which, according to Italian law, is the most detailed project level on the basis of which it is possible to start the procedures for carrying out the interventions.

Respect to the Call 2018, Rende has closed the executive project, named Rende City port [41], and is in the realization phase. Reggio has closed the final projects, named Reggio Calabria City Log, with a lower level of detail than the executive [42]; Vibo is currently preparing the executive project.

Respect to Call 2019, executive projects have been closed and are under realization for Corigliano Rossano, named ZTL merci [43], Fiumefreddo, named Fiumefreddo Bruzio Eco-Logistic-City [44], Paola, named Paola Inblue [45], Pizzo, named Pizzo city logistic [46] e Tropea, named Tropea city log [46]. Catanzaro is currently approving the final project.

In Table 5 are reported the main characteristics of total Calabria Region and the same characteristics for the set of cities and towns for which are proposed projects of city logistics. In 2021, the people in Calabria were almost 2 million in 404 urban municipalities, of which about 618,000 in 8 largest cities. By the calls, the 23% of people and the 67% of people in largest cities is affected of city logistics projects, where the effects of the freight transport on sustainability are greater for the high concentration of the people, employees, retailers and all the other services present.

Table 6 reports the main characteristics of the cities and towns interested by the projects, the territorial intervention included in the projects: NDA, UDC and ITS. All projects have the intervention of supply regulation as the minimum time windows indicated by the calls. In Table 6 V is Vibo, R is Reggio; R is Rende; Corigliano Rossano is CR; F is Fiumefreddo; Pa is Paola; Pi is Pizzo; T is Tropea.

Except Reggio, all projects have obtained the maximum allowable amount because they have established a large CLA. Respect to interventions, all projects are Type 2 and respected the minimum level for time windows. Except Reggio, all projects include the realization of at least 1 NDA or UDC. All the projects of the Call 2018 provide for the use of ITS for the control and monitoring of flows which, on the other hand, is mandatory for the Call 2019.

Table 5. Main characteristics

	Total			Cities > 30,000 inhabitants		
	Surfaces [hectares]	Inhabitants [number]	Retailers [number]	Surfaces [hectares]	Inhabitants [number]	Retailers [number]
Calabria	1,522,200	1,947,131	45,603	117,913	618,121	14,680
Cities interested	90,041	449,696	10,962	79,993	415,543	9,937
Incidence [%]	5.92	23.10	24.04	67.84	67.23	67.69

Table 6. City logistics characteristics

Project/data	Call 2018			Call 2019					
	VV	RC	R	CZ	CR	F	Pa	Pi	T
Inhabitants [number]	33,455	180,369	35,526	89,065	77,128	2,918	15,688	9,278	6,269
Inhabitants in CLA [number]	4,923	1,200	9,961	14,198	1,481	263	2,283	892	561
Surfaces [hectares]	4,657	23,904	5,500	11,272	34,660	3,206	4,288	2,234	320
Surfaces in CLA [hectares]	124.62	24.2	198.47	175.93	20.8	8.19	36.76	15.35	12
Retailers [number]	915	3,946	1,030	2,275	1,771	73	349	277	326
Retailers in CLA [number]	612	368	426	152	53	6	31	176	168
NDA	2	–	–	2	2	1	1	2	1
UDC	–	–	1	–	–	–	–	–	–
ITS [Y/N]	Y	Y	Y	Y	Y	Y	Y	Y	Y

In Table 7 are reported, for urban areas involved in city logistics projects, the percentage of inhabitants, surfaces and retailers of CLA respect to total areas. From Table 7 emerges that the percentage of inhabitants in CLA respect to total areas varies between 0.67% for RC and 28.04% for R; VV, CZ and Pa have a value of about 15%. The percentage of surfaces varies between 0.06% for CR and 3.75% for T; R has a value of 3.61% and VV of 2.68%; the percentage of retailers varies between 2.99% for CR and 66.89% for V; Pi has a value of 63.54%, T of 51.53% and R of 41.36%.

Table 7. Percentage of inhabitants, retailers and surfaces of CLA respect to total areas

	Call 2018			Call 2019					
	VV	RC	R	CZ	CR	F	Pa	Pi	T
Inhabitants	14,72	0,67	28,04	15,94	1,92	9,01	14,55	9,61	8,95
Surfaces	2,68	0,10	3,61	1,56	0,06	0,26	0,86	0,69	3,75
Retailers	66,89	9,33	41,36	6,68	2,99	8,22	8,88	63,54	51,53

5 Conclusion

Some Regions at EU level have implemented an integrated and cooperative approach to plan and program urban logistics interventions. The case study of Calabria Region is an example of how is possible to realize city logistics projects from integration and cooperation between regional and cities authorities respecting the roles and pursuing the same goal of sustainable development.

Sustainable development and the achievement of the targets defined on an international scale, through differentiated interventions, are among the main objectives of Calabria Region. These targets also reach by intervention to reduce environmental impact of cities. The central theme is to connect different urban centers, without obligation, within a general framework of sustainability, starting city logistics interventions, but also looking at the other aspects of the city.

Calabria Region has promoted initiatives in urban areas to realize CO2 free zones. The process for city logistics is an example of good practice to facilitate urban policies towards sustainability according to Agenda 2030, too. Another example is Green and safety school that finance the realization of traffic-free zones near schools also equipped.

Starting to RTP, the city logistics process has been implemented to contribute to reduce the negative effects of freight transport and to improve individual and collective well-being in urban areas, in a collaborative approach regional-local authorities.

The responsibilities are different: Calabria Region plans, programs and executes; local authorities realize, manages and monitors. The responsibility returns to the Region, which must receive a feedback of the monitoring data for general monitoring.

At now, 9 projects have been financed, some of which are already underway.

The projects, refers to the institution of CLA, include the time windows or the time windows and ITS mandatory, the realization of NDA or UDC and the use of new electric vehicle.

The estimated result of city logistics projects show that the sum of the interventions contributes to reduce traffic flows and CO2 emissions.

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