



Sustainable Urban Consolidation  
Centres for construction

## D2.1 Detailed pilot site description



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## Executive Summary

SUCCESS has chosen to target the construction industry as major impacting sector on city logistics which has un-exploited potentials of improvement of the efficiency of goods, waste and service trips in EU cities, by answering the challenges pinpointed by the European Commission and in particular by improving urban freight understanding and by introducing more resource-efficient, more environmental-friendly, safer and seamless supply chain innovations.

The **D2.1 detailed pilot site description** is part of WP2 of the project, which maps and evaluates the current situation (**AS IS**) and evaluate it according a set of common Key Performance Indicators (**KPIs**).

This deliverable aims to introduce in detail the AS IS situation of the four pilot construction sites: the Neudorf Breweries in Luxembourg, the complex Fontenoy-Séguir in Paris, the Parque Central in Valencia and the Borgo Trento and Borgo Roma hospitals in Verona. The description will improve knowledge and understanding of the construction logistics. The report is divided into two chapters. The first chapter is an overview of the case studies with details on the construction project, the budget, the plan, the stakeholders, the logistics organisation and issues. The second chapter is focused on describing the construction logistics in analysing the distribution network, construction site and reverse logistics.

**NB:** As the construction projects are ongoing, the description below reflects the activity at the time of writing. Some changes such as handling equipment used, storage areas location, suppliers' list, human resources, etc. will happen.





# 1 Overview of the construction sites

## 1.1 Luxembourg

The Luxembourgish case study focuses on the transformation of an abandoned former industrial site into a mixed project of 87 luxury residential units, 4 office spaces, 8 shops, a public square and 111 parking spaces. The Neudorf Breweries complex comprises the construction of two buildings (Buildings A and C, **Figure 4**) and the refurbishment of part of the old breweries while respecting the architectural and industrial heritage (Building B). The project is designed with a maximum of 5 upper levels and 2 basement levels.



**Figure 1: Architectural drawing of the Neudorf Breweries complex**

### 1.1.1 Site location

The site is located in the east of Luxembourg City in Neudorf, one of the 24 districts of the capital, which sits in a valley and is mainly residential. The site is few minutes away from the Kirchberg business district and the city centre of Luxembourg. The Neudorf Breweries are located at the crossing of Neudorf and Kiem streets. The Neudorf street is the main thoroughfare of this district and connects the airport to the city centre without using the motorway. The site is up against the hill.

#### **Site Address:**

Les Brasseries de Neudorf  
266 - 270 Rue de Neudorf  
L-2222 Luxembourg  
LUXEMBOURG







**Figure 2: Neudorf Breweries complex location (overview)**



**Figure 3: Neudorf Breweries complex location (detailed view)**

### 1.1.2 Construction project size

#### Surface area

Gross floor area of the building: 11,400 m<sup>2</sup>  
 Footprint of the building: 3,132 m<sup>2</sup>  
 Site area in square metres: 6,796 m<sup>2</sup>

#### Volume of material

Structural steel work: 1,122 tons  
 Concrete: 9,130 m<sup>3</sup>  
 Earthwork: 45,000 m<sup>3</sup>



**Figure 4: Architectural view of the Neudorf Breweries complex**



### 1.1.3 Project planning

<b>Start date:</b>	December 2014
Delivery date of Building B:	April 2016
Delivery date of Building A:	June 2016
Delivery date of Building C:	September 2016
<b>Finish date:</b>	November 2016

### 1.1.4 Project budget

The global project represents a turnover of €20.8 million.

On average and depending on the type of work, material costs represent 30-40% of the total construction costs.

### 1.1.5 Project stakeholders

Owner/client name:	H.F.immobilier
	Delegated management contract:
Promoter:	ATHENOR group
Designer:	Steimetzdemayer
Main contractor:	Tralux s.a.r.l.
	And 14 main subcontractors

### 1.1.6 Logistics organization

#### Human resources

There is no dedicated logistic team.





### Handling equipment

Except the tower crane, the sub-contractors manage the handling equipment themselves. The sub-contractors use the following handling equipment on the site:

Some of this equipment is used on the construction site:

- 2 tower cranes

### 1.1.7 Logistics issues

#### Congestion

The site is accessible by one road, which is the most highly congested street in the district. There are two major peak periods during the day (07:30 to 09:30 and 16:30 to 18:30) due to commuter traffic (personal cars and buses) and the close proximity of the Kirchberg district, which is the most important business district in Luxembourg.

#### Accessibility to the site

Delivery vehicles can use only two entrance/exit gates to deliver goods to the construction site. There is limited space on the site for vehicles:

- Drivers need to back into the site to unload because there is not enough space to do a U-turn
- The site cannot receive simultaneous deliveries
- Early morning deliveries would need to be unloaded directly in the street when there is not enough available space on the site

Temporary traffic lights regulate the vehicles when they leave the construction site to facilitate reinsertion into the traffic flow.



**Figure 5: Delivery access to the Neudorf Breweries complex**

#### Public space rental

The main contractor is renting public spaces for €7,200 from the city of Luxembourg during the first six months of the project. These public spaces are used to create temporary delivery zones to load and unload delivery vehicles (Fig. 5) and set up a part of living accommodation and offices.

#### Parking for private vehicles

There is no space on the site to park private vehicles. The main contractor pays for permits which cost €375 per car per year for on-street parking.

#### Regulation

The main document which regulates the deliveries is the Luxembourgish Highway Code. Article 102 relates specifically to the construction sector and indicates that the competent authority must set up signs to prohibit, restrict or obligate traffic. At the urban level, the municipalities have the authority to regulate traffic on the local network. They can manage deliveries with delivery windows, parking rules, access restrictions and speed limits.

The site is not located in a specific restricted access area. The speed limit in the street is 50 km/h. A sign is in place indicating to pedestrians to use the opposite pavement.



## 1.2 Paris

The French case study focuses on the redevelopment of the Fontenoy-Séguir complex composed of two adjoining buildings (Fontenoy and Séguir) with an architecture dating back to the 1930's. The 8-storey complex is designed for government departments, including those of the prime minister and several administrative authorities, currently scattered across 35 different sites in Paris. The site will offer 2,300 workplaces, a 1,400-cover restaurant, a 450-seat auditorium, a sports hall, a childcare centre, 98 parking spaces on two basement levels and the reclassification of the inside yards. The contract covers the transformation and maintenance of the property complex.

This work will bring the Ilot Fontenoy-Séguir back in line with standards (accessibility for persons with disabilities, fire safety and getting the BBC label).



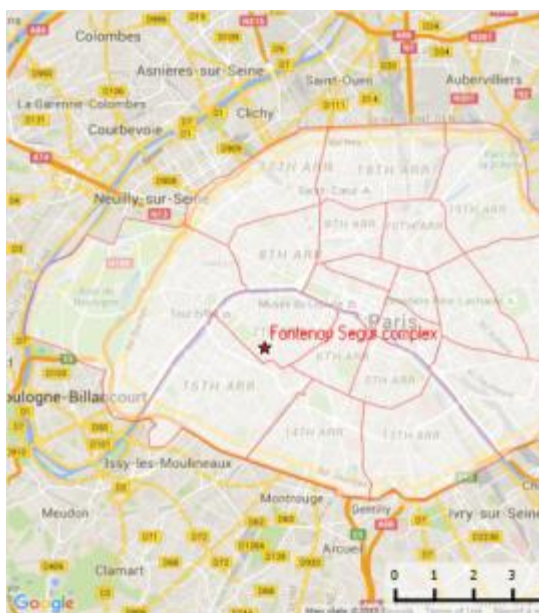
**Figure 6: Architectural drawing of the Fontenoy-Séguir complex**

### 1.2.1 Site location

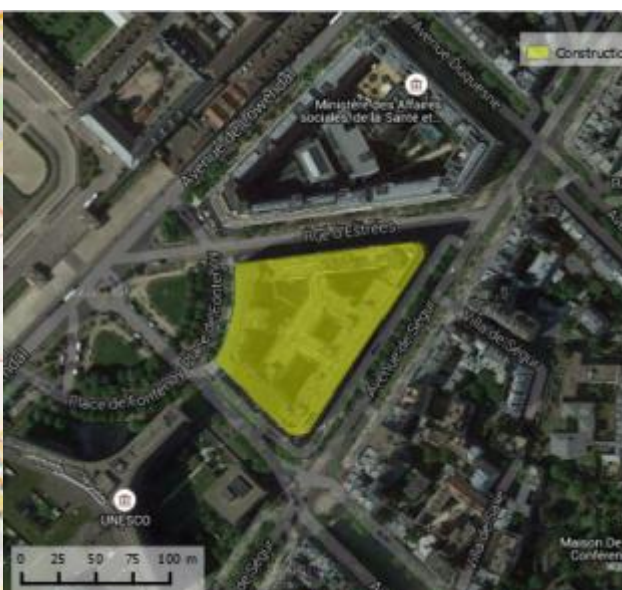
The Fontenoy-Séguir complex is located in the 7<sup>th</sup> arrondissement of Paris, one of the most prestigious neighbourhoods in Paris with proximity of the Eiffel Tower, the army museum and UNESCO headquarter. The site is delimited by four streets Fontenoy square, Séguir Avenue, Saxe Avenue and Estrées street which is a one way street.

#### **Site Address:**

Ilot Fontenoy-Séguir  
3, Place Fontenoy  
75 007 Paris  
FRANCE



**Figure 7: Fontenoy-Ségur complex location (overview)**



**Figure 8: Fontenoy-Ségur complex location (detailed view)**

### 1.2.2 Construction project size

#### Surface area

Gross floor area of the building: 55,475 m<sup>2</sup> (46,000m<sup>2</sup> usable floors)  
 Footprint of the building: 13,000 m<sup>2</sup> (3,000 m<sup>2</sup> Fontenoy + 10,000 m<sup>2</sup> Ségur)  
 Site area in square metres: 14,400 m<sup>2</sup>

#### Volume of material

Concrete: 8,751 m<sup>3</sup>  
 Metallic structure: 810 tons  
 Scaffolding: 32,600 m<sup>2</sup>  
 Metallic sheath: 100 tons

### 1.2.3 Project planning

**Start date** of renovation work: Spring 2015  
**Delivery date** of Fontenoy building: June 2016  
**Delivery date** of Ségur building: August 2017



### Project Phases

- Partial demolition (curettage/removing asbestos/partial demolition)
- Recover foundations
- Infrastructure floor (get back up to standard infrastructure floor/reconstruction of stairwell and lift shaft)
- Construction (construction of the connecting building in metal structure)
- Partitioning
- Technical installation (heating, ventilation and air-conditioning/electricity/plumbing)
- Finishing (layout, decoration and furniture)

The project has overlapping production phases. Thus during the SUCCESS project, different project phases are underway at the same time.

#### 1.2.4 Project budget

The global project represents a turnover of €230 million.

The material costs represent 30-40% compared to the other construction costs.

#### 1.2.5 Project stakeholders

Owner/client name:	Sovafim
Promoter:	Sogelym-Dixilence
Designer:	Braun + Associés Architectes
Main contractor:	VINCI Construction France
Building & Facilities Manager:	Dalkia

#### 1.2.6 Logistics organization

##### Human resources

The logistic team comprises:

- 3 persons responsible for logistic (employees of VINCI Construction France)
- 2 managers of the 2 delivery zones
- 4 unpackers in charge of unloading
- 1 forklift driver

The logistic team has set up 2 delivery zones of 500 m<sup>2</sup> each: the *Estrees* delivery zone and the *Saxe* delivery zone.

##### Handling equipment

The main contractor manages the handling equipment and allows the sub-contractors to use them. The handling equipment proposed is:

- 2 tower cranes
- 3 lifts
- Forklifts trucks
- Forklift truck with a rotator attachment for dumping waste container





### Delivery processes

To receive a shipment on the construction site, sub-contractors book a delivery time slot via the software *Lsoft Logistique* ([www.lsoft-logistique.fr](http://www.lsoft-logistique.fr)) seven days before the delivery with the following information:

- Day and time period of the delivery
- Delivery zone (Estrees or Saxe delivery zone)
- Handling equipment (lift, forklift truck, or tower crane)
- Specific storage zone
- Nature of material
- Type of delivery vehicles (utility vehicle, 19 T truck, trailer truck or arm truck)

Packages are usually transported with a lift so they have to measure less than 3 meters in length (3 m is the length of the lift).

For each delivery, the logistics team is responsible for the unloading; they transport the goods from the truck to the appropriate floor in a buffer stock. Then, the sub-contractor who received the delivery has to move the goods to the definitive storage zone within 24 hours.

Each floor offers 11 buffer stock zones, 37 definitive stock zones and 3 waste stock zones. Considering that the building has 7 floors plus the ground floor, there are 88 buffer stock zones, 296 definitive stock zones and 24 waste stock zones in total.

Unpredicted delivery is treated as soon as possible in the best possible conditions.

### 1.2.7 Logistics issues

#### Congestion

The 7<sup>th</sup> arrondissement is a very dense area which has to handle complex traffic situations.

#### Accessibility to the site

The delivery vehicles access the site by two entrances located on Estrées and Saxe streets. The entrance and exit gates are distinctly marked.

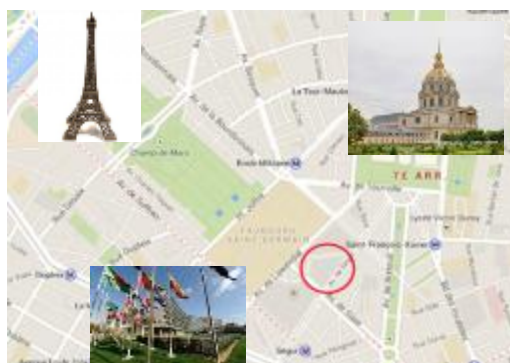




**Figure 9: Delivery access to Fontenoy-Séguir complex**

### Sensitive buildings

There are several ministry official buildings and high standing residences in the area. UNESCO is located in Saxe avenue, The Minister of Social Affairs, Health and Women's Right is located in the one-way street Estrées street and the Military School Fontenoy square. When constructing the complex, the urban environment, such as trees, needs to be protected.



**Figure 10: Sensitive building around the complex**



### Other nuisances

The working site has a charter to reduce potentially harmful inconveniences (noise, dirt, etc.).

### Public space rental

The main contractor is renting public spaces for €1 million from the city of Paris during the project. These public spaces are used to create temporary delivery zones to load and unload delivery vehicles (**Figure 9**), set up living accommodation and offices and set up the lifts.

### Parking

There is no space on the site to park private or delivery vehicles and the basement levels are not yet operational to park vehicles. Workers use public parking for their private car.

### Regulation

Since 2007, special regulations have been in place for deliveries in Paris. The “Charter of good practices for transport and deliveries of goods in Paris” (Charte de bonnes pratiques des transports et des livraisons de marchandises dans Paris) was updated in 2013 and aims to optimize the entrance into the city and simplify deliveries while controlling negative impacts such as air or noise pollution. The charter is simple and basically based on the organization of deliveries in two main circulation periods: from 22:00 to 05:00, vehicles with a surface smaller than 29m<sup>2</sup> are allowed to enter Paris; from 22:00 to 07:00, vehicles with a surface smaller than or equal to 43m<sup>2</sup> can enter the city. Only “clean” vehicles (electric, gas or hybrid) with a surface smaller than 29m<sup>2</sup> are allowed to deliver 24h/24h.

The pace of deliveries has been validated by the road authorities and the construction company has to guarantee the good circulation of vehicles and pedestrians. The company has to use traffic workers, who regulate the traffic when there is a delivery, to take care of the work signalization. These dispositions are validated by the road authorities.



### 1.3 Valencia

The Spanish case study focuses on the urbanization of a park area in Russafa. This area is included in a wider transformation project named Valencia Parque Central. This initiative is the most important project currently underway in the city. Valencia Parque Central is one of the last large-scale pieces of the urban puzzle missing from the city's development. The Valencia Parque Central design aims to completely transform over 66 hectares of former railway yards in the middle of the city. The old railway line, which will be buried in order to make way for the city's new enhanced local underground railway network, will be covered by a new 23 hectare park, resulting in a major urban revitalization. The project was drawn up by the landscape architect Kathryn Gustafson.

For the purpose of the SUCCESS project, only a part of this vast project will be considered: the park area in Russafa. This part, which has already been assigned to a construction company, will be completed during the first stage of the Valencia Parque Central project. The following stages of the project are not yet tendered and do not fit in with the timeline of the SUCCESS project. The urbanization of the Russafa zone includes the refurbishment of 4 buildings, the erection of 3 buildings (not in the scope of the SUCCESS project because planned for the second stage), 2 fountains and 1 waterfall. Because the final purpose/destination of the building has not yet been identified, the refurbishment of the building will be minimal.



**Figure 11: Architectural drawing of the Valencia Parque Central**



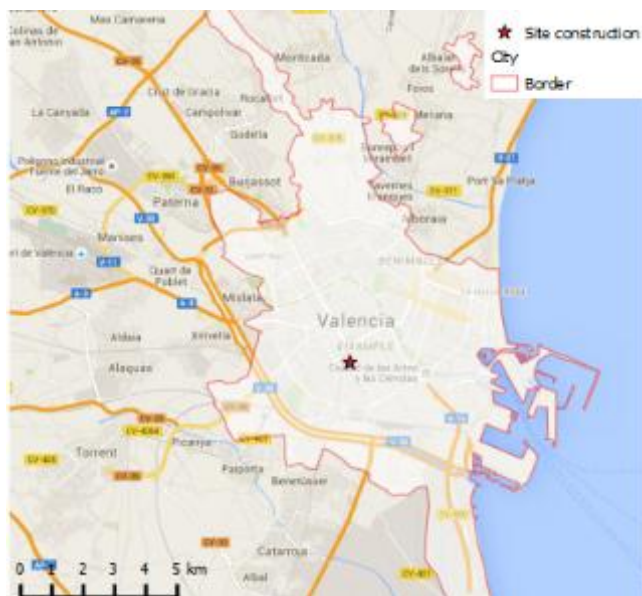


### 1.3.1 Site location

The park is located in the Example district, one of the most important commercial areas of Valencia, and is close to the Russafa area, one of the oldest parts of the city which is going through an era of renovation. The site is also very close to the Extramurs district, also named the “poor enlargement” of the city centre (as an alternative to the “rich enlargement” represented by the neighbouring Example district). The Valencia Parque Central is located between two of the main arterial thoroughfares connecting the city centre to the surrounding neighbourhoods of the city. The Russafa zone is delimited by the railroad tracks, Filipinas street and Peris y Valero street.

#### **Site Address:**

Valencia Parque Central  
Calle Filipinas, Avenida Peris y Valero  
46 004 Valencia  
SPAIN



**Figure 12: Valencia Parque Central location (overview)**



**Figure 13: Russafa location (detailed view)**



### 1.3.2 Construction project size

#### Surface area (Russafa project)

Gross floor area of the building:	7,772 m <sup>2</sup>
Footprint of the building:	7,514, 85 m <sup>2</sup>
Site area in square metres:	110,578.2 m <sup>2</sup>
Urban road network:	32,112.58 m <sup>2</sup>
Surface area of Russafa Park:	78,470.4 m <sup>2</sup>

#### Volume of material

Concrete:	3,049.07 m <sup>3</sup>
Earth moving equipment:	104,373.81 m <sup>3</sup>
Ground demolitions:	33,091 m <sup>2</sup>
Building demolitions:	13,479.47 m <sup>3</sup>
Land clearing:	61,114.00 m <sup>2</sup>
Steel:	47 tons
Pavements:	30,894.73 m <sup>2</sup>

### 1.3.3 Project planning (Russafa project)

<b>Start date</b> of renovation work:	May 2015
<b>Finish date:</b>	May 2017

### 1.3.4 Project budget (Parque Central project)

The global project including the Russafa area represents a turnover of €15.8 million.

Depending on the type of work, the material costs can vary largely. Excluding earth works and demolitions, it can be considered that the material costs represents on average:

- 80 to 90% for gardening
- 75 to 85% for pavements
- 70 to 80% for hydraulic installations
- 60 to 70% for electrical installations
- 60 to 70% for structural elements built with reinforced concrete
- 50 to 60% for concrete decks
- 50 to 60% for steel structural elements
- 50 to 60% for insulation
- 40 to 50% for coating facades

### 1.3.5 Project stakeholders (Parque Central project)

Owner/client name:	City hall of Valencia
Promoter:	Valencia Parque Central Alta Velocidad 2003 S.A.
Designer:	UTE GUSTAFSON PORTER, BORGOS PIEPER, GRUPOTEC, NOVA INGENIERÍA.
Main contractor:	Pavasal



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 633338.



### 1.3.6 Logistics organization (Russafa project)

#### Human resources

There is not an exclusive team dedicated to the logistic organization of the construction site. The project manager, production manager and foreman of the construction site are the people in charge of the different logistic aspects.

The project manager, in collaboration with the production manager, is in charge of contacting the different suppliers of material during the planning period. However, during the construction period, the production manager is in charge of order management. Finally, the foreman is dedicated to checking that the orders arrive at the right time and place according to the construction planning. In addition, the administrative department of the construction site collaborates with all of the above helping with the invoicing and paperwork related to logistics.

#### Handling equipment

The sub-contractors manage the handling equipment themselves. They use the following handling equipment on the site:

- 2 Forklifts trucks
- Face shovel
- Backhoe
- Motor Grader
- Mobile crane
- Truck crane
- Dumper
- Lifting platform
- 2 Pavers
- Roller (Tandem)
- Pneumatic compactor
- Pallet truck
- 3 Vibrators

### 1.3.7 Logistics issues (Russafa project)

#### Congestion

The site is located in the city centre with a high density of traffic and congestion. The average daily traffic volume is over 61,783 vehicles in some of the avenues closest to the site and the traffic in this zone is congested in peak periods causing traffic jams or low speed traffic. The area is also one of the busiest commercial and business zones of the city, since a lot of offices and shops are located in the neighbourhood. In addition, the two current train stations in the city of Valencia are located there. This means that the zone is congested not only in terms of vehicle flows but also due to the flow of people.





### Accessibility to the site

The site is accessible by two entrance/exit gates. The south access is used for heavy trucks.



**Figure 14: Delivery access to Valencia Parque Central**

Finally, the construction site is fenced in and appropriately signalled in order to maintain the safety and security of the facilities, protect the historic buildings that will be renovated during the project and avoid interference to the pedestrians and vehicles in the neighbourhood.

### Operations

The site is located near the railway track. For this reason, the construction company will be coordinated with the railway infrastructure manager (ADIF) to avoid interfering with the railway traffic.

### Regulation

The legislation which regulates the urban deliveries is the city traffic regulation, approved on 28.05.2010. In this law, Articles 27-28 relate specifically to trucks and dumpers, whereas Articles 94-96 relate specifically to loading and unloading operations and finally, Articles 112-114 are for cranes. According to Spanish legislation, the municipalities have the authority to regulate traffic within the local network and they can manage deliveries with delivery windows, parking rules,



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access restrictions and speed or weight limits. Some of the special exceptions that affect the construction vehicles are:

- There is no time restriction window for trucks and dumpers related to construction deliveries, or for concrete mixer trucks
- There are no weight restrictions for construction trucks and dumpers
- Permission to use the public area is by special authorization from the City Hall. In the case studied, storage will be located inside the site area
- There are no restrictions regarding the number of vehicles
- Local circulation legislation requires special permissions for vehicles delivering material to the construction site. There is no upper weight limit.

Regarding the reverse logistics, specifically demolition waste, the Spanish law RD 105/2008 of 1st February regulates the production and management of construction and demolition waste. In addition, Art. 11 of the law RD 396/2006 regulates the work plan. Annex V of the RD 833/1998 regulates the registration of the transporter, vehicle and materials.

Finally, regarding the transportation of dangerous goods, the legislation which regulates the traffic of vehicles that carry dangerous products inside the city is the traffic municipal ordinance of Valencia, approved 28.05.2010. In this regulation, Articles 33-34 relate specifically to dangerous goods and regulate the transport of these products on all roads within the city of Valencia, which are prohibited without express written permission.





## 1.4 Verona

The Italian case study focuses on the construction of hospital buildings on two distinct sites, Borgo Trento and Borgo Roma. The Borgo Trento site consists of the construction of two buildings, one for outpatients and the other for pregnant women, children and emergencies. The Borgo Roma site consists mainly of the renovation of part of a building and in the construction of an eight-floor building for all types of outpatient surgery (polyclinic).



**Figure 15: Architectural drawing of Borgo Trento**



**Figure 16: Architectural drawing of Borgo Roma**

### 1.4.1 Site location

The Borgo Trento site is located between the Goffredo Mameli and Lungadige Attiraglio streets in the Trento district in the north of the city centre on the bank of the River Adige and close to the old town and the ring road. The east side of the hospital is exposed on Stefani Square, a relevant reference point for the whole construction system of Borgo Trento and its garden, the “Parco dei Cedri”, represents a “green lung” and relaxing area for the whole surrounding area. The west side connects to the ring road.

The Borgo Roma site is located between the Golino street and the Giuliani channel in Roma district in the south of the city centre. The site is surrounded by the university, an industrial area, the exhibition centre, a motorway junction, a bypass access and many residential buildings and their related services.



### Site Addresses:

Ospedale Maggiore Borgo Trento  
Piazzale Aristide Stefani, 1  
37 126 Verona  
ITALY

Policlinico Borgo Roma  
Piazzale Ludovico Antonio Scuro, 10  
37134 Verona  
ITALY

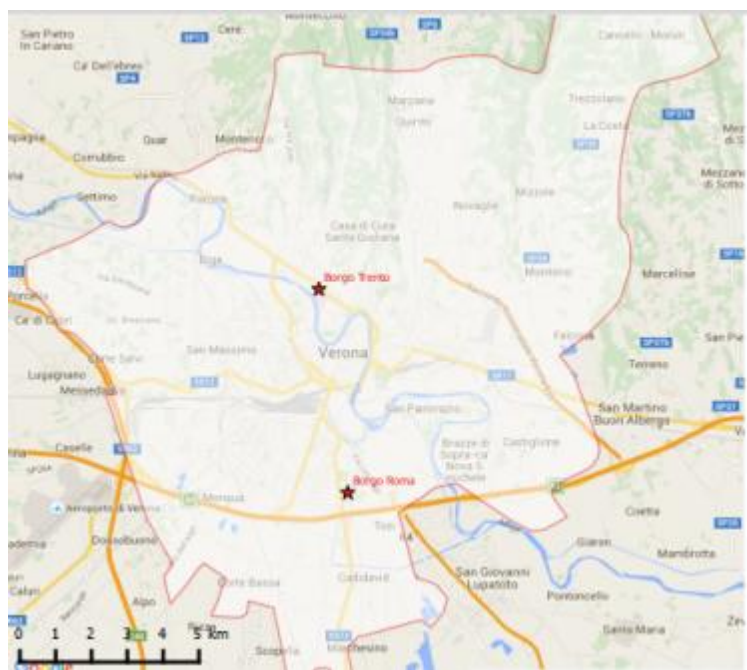


Figure 17: Borgo Trento and Borgo Roma Hospitals location (overview)



Figure 18: Borgo Trento Hospital location (detailed view)



Figure 19: Borgo Roma Hospital location (detailed view)



#### 1.4.2 Construction project size

<u>Surface area</u>	Borgo Trento	Borgo Roma
Gross floor area of the building:	44,034 m <sup>2</sup>	39,880 m <sup>2</sup>
Footprint of the building:	7,339 m <sup>2</sup>	4,985 m <sup>2</sup>
Site area in square metres:	16,891 m <sup>2</sup>	12,475 m <sup>2</sup>

##### Volume of material-Outbound material:

Soil excavation: 135,000 m<sup>3</sup> (equivalent to 8,400 trucks)

Demolition rubble: 5,000 m<sup>3</sup> of (equivalent to 320 trucks)

##### Volume of material-Inbound material:

Concrete: 40,000 m<sup>3</sup> of (equivalent to 4,000 tankers)

Steel: 7,500 tons of (equivalent to 250 trucks)

#### 1.4.3 Project planning

##### Borgo Trento

**Start date:** October 2014

**Finish date:** March 2017

##### Borgo Roma

###### First phase:

**Start date:** October 2014

**Finish date:** March 2017

###### Second phase (renovation):

**Start date:** May 2017

**Finish date:** October 2018

##### Project Phases

From October 2015 to July 2016 all the activities needed for the construction of a hospital will be carried out, including the completion of reinforced concrete structures, waterproofing, drywalls and false ceilings, screeds, ceramic and resilient pavements, external doors and windows, and some of the internal doors, and the expansion joints, etc. Concerning fittings, in the cited periods, the following activities will be carried out: the pipeworks, wiring, laying of cables, etc.



#### 1.4.4 Project budget

The global project represents a turnover of €126 million.

The material costs account for 30-40% of the total construction costs for both sites.

#### 1.4.5 Project stakeholders

Owner/client name: Azienda ospedaliera universitaria integrata di Verona (A.O.U.I.)

Promoter: Arena Sanità

Designer: Studio Altieri S.p.A

Main contractor: CMB

#### 1.4.6 Logistics organization

##### Human resources

There is no dedicated logistic team.

##### Handling equipment

Except the tower crane, the sub-contractors manage the handling equipment themselves. The sub-contractors use the following handling equipment on the site:

Borgo Trento:

- 2 tower cranes
- 1 forklift truck

Borgo Roma:

- 2 tower cranes
- 1 forklift truck

##### Delivery processes

Deliveries are planned several days beforehand by a dedicated person who manages the overall flow of vehicles including loading and unloading times.

Due to the nature of the construction, a dedicated person checks the origin and quality of the provided material and the construction. Particular attention is paid to checking that materials are not linked to mafia activities.

All vehicles and people are tracked on arrival. The situation is checked by authorities in order to avoid illegal workers. For this, a guard at the site entrance is in charge of tracking delivery vehicles. People use an electronic card to access the site.

#### 1.4.7 Logistics issues

##### Congestion

The Borgo Trento site is located in a highly congested area, in a population-dense residential area between the river Adige and the old centre of Verona, and also close to the highly congested ring road. To reach Borgo Trento, we highly recommend using the ring road from Verona Nord.







The Borgo Roma site is located in the southern part of the city in a highly urbanized and congested area.

The fact that the sites are located in congested and densely inhabited areas and close to relevant infrastructures make the sites complex to manage especially in terms of congestion.

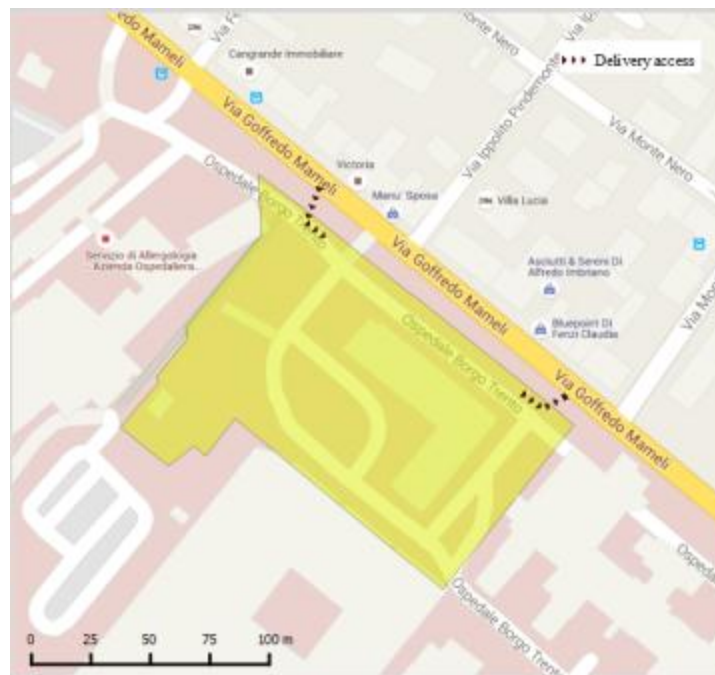
The two major peak periods are in the morning just before schools and workplaces open and late in the afternoon between 17:30 and 19:00 for both sites.

#### Sensitive buildings

The renovation and construction occur in an existing hospital complex. The close proximity of buildings in activity requires staff to take care concerning noise and dust.

#### Accessibility to the site

Borgo Trento - The site is accessible by one gate located on Goffredo Mameli street, that can be considered as a one-way street, because trucks can enter and exit from the construction site only when coming from one direction. The entrance and exit gate are separate, but located on the same street.



**Figure 20: Delivery access to Borgo Trento**

Borgo Roma – Accessibility to this site is also very limited because the site is accessible by one gate only for both entering and exiting vehicles, located on Piazzale Ludovico Scuro.

A detailed schedule of the entrance of the incoming trucks is required for both sites.

#### Regulation – Time restrictions

The document that regulates roads and transportation at a national level is the “Codice della Strada”. At the urban level, the municipalities have the authority to



regulate traffic within the local network. They can manage deliveries with delivery windows, parking rules, access restrictions, speed limit, and regulations against noise.

The regulations that most affect the Verona building sites are the District Noise Regulations. According to these, heavy goods can be moved between 06:00 and 21:00 for both sites.

### 1.5 Conclusion

Project activities are similar for all sites except the Valencia Parque Central because of the nature of the project, which is park urbanization.

The ratio between building renovation and building construction is different for the three similar projects. Building renovation represents 100% in Valencia, 75% in Paris, 25% in Luxembourg and 13.5% in Verona.

For the same type of projects, we will have the same type of logistical problems (type of material, transportation, packaging, etc.).

#### 1.5.1 Luxembourg – Neudorf breweries

The pilot is a transformation and renovation of an old factory into office/residential/commercial buildings in a district situated in a valley.

Facilities: 87 luxury residential units, 4 office spaces, 8 shops, a public square, 111 parking spaces.



**Figure 21: Architectural view of the Neudorf Breweries complex**

#### 1.5.2 Paris - Fontenoy-Séguir complex

Transformation and renovation of two office buildings near prestigious locations, such as the Eiffel Tower, UNESCO, the military school.

Facilities: 2,300 workplaces, 450-seat auditorium, 1,400-cover restaurant, sports hall, childcare centre, 98 parking spaces.



**Figure 22: Architectural drawing of the Fontenoy-Ségur complex**

### 1.5.3 Valencia – Russafa park in Valencia Parque Central

Transformation of former railway yards near train station as part of the urbanization of a park area. Existing buildings will be renovated.

Facilities: 4 renovated buildings, 2 fountains, 1 waterfall.



**Figure 23: Architectural drawing of the Valencia Parque Central**

### 1.5.4 Verona – Borgo Trento Hospital

The pilots comprise the construction of two hospital buildings.

Facilities: 1 building for outpatients, 1 building for pregnant women, children and emergencies.



**Figure 24: Architectural drawing of Borgo Trento**

### 1.5.5 Verona – Borgo Roma Hospital

This pilot is the renovation and construction of a hospital building.

Facility: 1 building for all types of outpatient surgery.



**Figure 25: Architectural drawing of Borgo Roma**

### 1.5.6 Site location

All projects are located in congested areas in medium sized and large cities. **Table 1** summarizes the characteristics of the four cities studied. Paris has the biggest population density compared to other cities which have a much lower density. Luxembourg is the smallest city and has the lowest number of residents.

	Population (inh)	Total area (km <sup>2</sup> )	Population density (inh/km <sup>2</sup> )
Paris [2012]	2,240,621	105	21,339
7 <sup>th</sup> arrondissement	57,092	4.09	13,958
Luxembourg	107,247	51.46	2,100
Neudorf [2011]	4,127	2.51	1,645
Valencia [2014]	786,424	134.63	5,841
Verona [2014]	260,125	206.63	1,259
Borgo Trento [2013]	12,269	1.71	71.75
Borgo Roma [2013]	29,166	18.08	16.13

Source: *citypopulation.de*

**Table 1: Population and geographic statistics**





In Paris, it is difficult to park private delivery vehicles. Nevertheless, two delivery zones, managed with a web application, have been created. In terms of traffic jams, the project is located in the city centre of the capital where congestion is permanent.

In Luxembourg, parking is the main issue: there is no space on site to deliver and park. Thus, the main contractor rents public spaces in order to park personal cars. The traffic jams oblige heavy goods deliveries to be made the morning before 06:00 on the street while double parked.

In Verona, there is space for trucks but due to regulations, they only allow 4 heavy goods vehicles per day.

In Valencia, the main problem is related to accessibility, due to there being some private buildings in the surrounding area. Thus, it will be important to guarantee the accessibility to these private properties during the project. In addition, the site is located near to the railway track. For this reason, the construction company will coordinate with the railway infrastructures manager (ADIF) to avoid interfering with railway traffic. Finally, the site is located in the city centre with a high density of traffic and congestion.

The urban logistics are the main reason for many nuisances, including noise. The noise exposure caused by the activities on sites disturbs the surrounding areas. However, the level of inconvenience is different depending on the sites. The table below evaluates the level of inconvenience according to the nature of the surrounding areas.

Paris	Luxembourg	Valencia	Verona
Medium	High	Low	High
The site is in close proximity to office buildings.	The site is in close proximity to a residential area.	The site is in close proximity to the railway station.	The sites are very close to other hospital buildings still in activity.

**Table 2: Impact to noise exposure**

### 1.5.7 Construction project size

In order to compare each site and to find the best optimisation for logistic in the city, we have different type of projects.

The global surface of each project is not the same. The biggest site is the Spanish one with 115,460 m<sup>2</sup>, but this is not only the surface of the buildings, it is also the area of the entire site including the development part of the project. In terms of buildings, we can evaluate the gross floor area for this project as 7,772 m<sup>2</sup>. In terms of building renovation, it's the smallest and there is no building construction.



The second biggest project is Verona (but it is split into two parts: 12,475 m<sup>2</sup> and 16,891 m<sup>2</sup>) with a total of 29,366m<sup>2</sup> for a gross floor area of the building evaluated at 55,475 m<sup>2</sup>.

The last project, in Luxembourg, is the smallest one with 6,796 m<sup>2</sup> for the site, but with 11,400 m<sup>2</sup> of gross floor area, it is the third biggest.

With these four cases, we have a range of global surface areas of projects underway in construction sector.

Unit: m <sup>2</sup>	Paris	Luxembourg	Valencia	Verona
Gross floor area of the building	55,475	11,400	7,772	44,034 (Trento) 39,880 (Roma)
Footprint of the building	13,000	3,132	TBC	7,339 (Trento) 4,985 (Roma)
Site area in square metres	14,400	6,796	115,460	16,891 (Trento) 12,475 (Roma)

**Table 3: Construction projects size summary**

On a construction site, material management is a very important process since material costs represent 30 to 40% of the project turnover. Considering the lack of space on site and the dynamic nature of the activities, logistics of materials is challenging. Each sub-contractor manages its own material and the potential storage area increases with the construction progress by using floors as material storage. With the renovation of the complex in Paris floor storage is a unique solution for stocking materials.

In Italy and in Luxembourg, the material storage space increases with the construction progress of the buildings.

### 1.5.8 Project planning

During the data collection period, all sites will be able to collect the same type of data.

On each site, there is a building renovation part. For the building structural work part, the Valencia project is the only one where there is no renovation (linked to the type of project where the main part of the project is park urbanization).

The first step on each site is the completion of reinforced concrete structure followed by waterproofing and ceilings. On each site, during the data collection period we can also follow the technical fitting parts and some parts of the finishing.

In each project, we have all parts of a construction cycle but it will be necessary to clarify whether it is the entire phase or just a part of it (for example, at the beginning





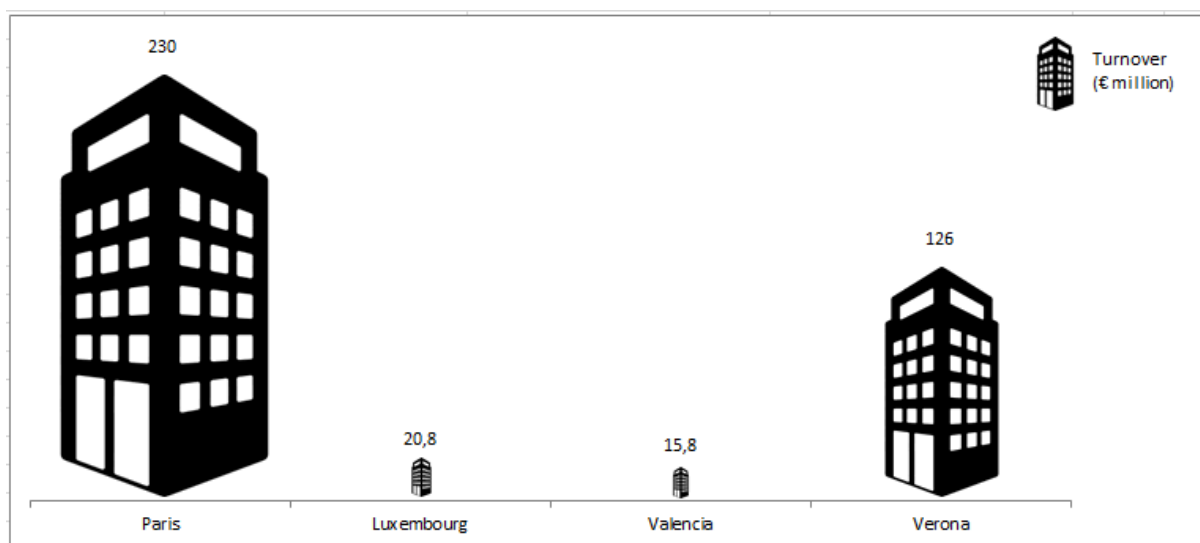
of October, on the TRALUX site, regarding the construction plan, we will be able to analyse only the end of the structural work of the last building (building C)).

### 1.5.9 Project budget

Paris has the biggest turnover with the project representing €230 million. The two Italian sites represent a similar turnover with €126 million.

The turnover for the sites in Luxembourg and Valencia are much smaller and represent €20.8 million and €15.8 million respectively. Because of the small surface of buildings to renovate, the turnover of the Valencian pilot is the least expensive.

For all sites, material represents 30-40% of the project turnover.



**Figure 26: Turnover overview**



### 1.5.10 Project stakeholders

A lot of stakeholders are involved in each project. The table below identifies the most important of them (the owner who is the proprietor of the land and the building, the promoter who is in charge of the marketing, the designer who designs plans and the main contractor who is in charge of the building construction).

	Paris	Luxembourg	Valencia	Verona
Owner	SOVAFIM	H.F. IMMOBILIER	City hall of Valencia	Azienda ospedaliera universitaria integrata di Verona (A.O.U.I.)
Promoter	SOGELYM-DIXILENCE	ATHENOR Group	Valencia parque central alta velocidad 2003 SA	Arena Sanita
Designer	Braun + Associés	STEINMETZDEMAYER	UTE Gustafon Porter, Borgos Pieper, Grupotec, Nova Ingeniria	Studio Altieri S.p.A
Main contractor	Vinci Construction France	TRALUX SARL	Pavasal	CMB

**Table 4: Projects stakeholders overview**



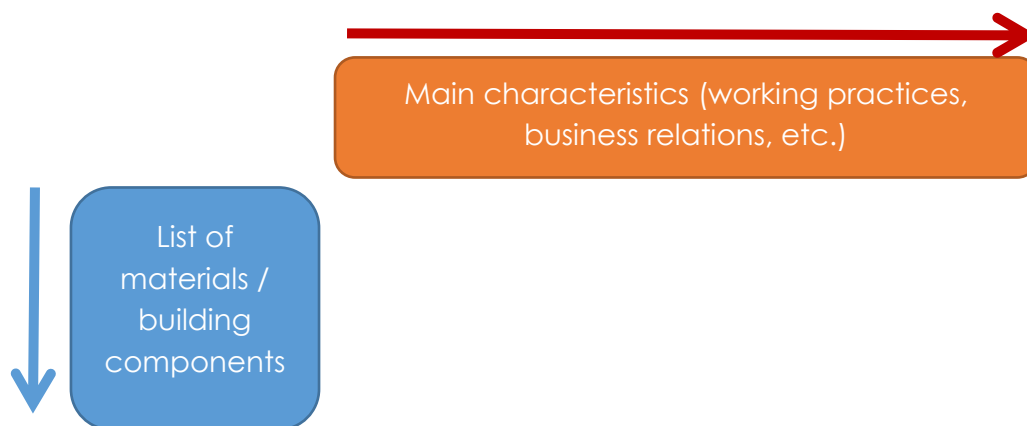
## 2 Detailed analysis of the construction logistics chain

The detailed analysis aims at obtaining a complete and detailed description of the construction logistics chain of the four sites. For every pilot, the local research centre supported the construction company to analyse their own pilot. This chapter first describes the templates used to ensure the data exploitation and ensure the homogeneity of the data before giving the results of the analysis.

### 2.1 Structure and philosophy

The actors and roles involved in the four construction sites mainly depend on the type of work to be performed and the materials used. The main idea is to tackle the pilot site characteristics in terms of working practices and business relation for each material.

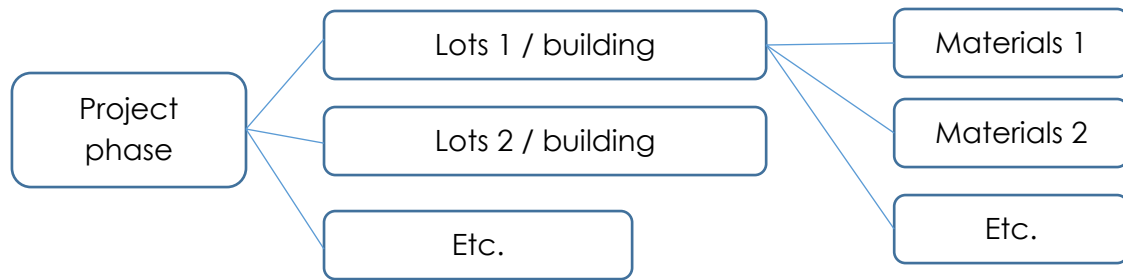
Consequently this preliminary data collection tool is based on a double-entry table (Excel file) with the following structure:



**Figure 27: Templates structure and philosophy**

As we need to compare and analyse the specificities of each pilot site and considering that the level of detail of material is too complex to compare the pilot sites together we have implemented a material classification based on three levels:

- Project phase: the overall activities carried out on a site
- Building components: the group name of the material that will be assembled
- Material: the detailed name of each material



**Figure 28: Structure of the material classification**

The material classification may be specific to each project. Indeed, on each project we can use different types of material, and linked to the type of site, different techniques.

The project phases are common to each project except the Valencia Project. The last step is specific. The common project phases are defined below:

The five main project phases:

- Structural works
- Casing
- Technical trades (HVAC, Electricity, Sanitary, Fire protection)
- Finishing
- Landscaping work

For example the structural work phase is divided into the five building components listed below:

- Rental equipment
- Erection
- Non-bearing masonry
- Façade insulation
- Basement insulation
- Roofs

The complete two first material classification levels are defined in an attached document (**Appendix 1: Pilot Site Description data collection Board**).

**NB:** We have included the equipment (first project phase “rental equipment”) because equipment takes up a great deal of space and is managed as materials, at least during the structural work phase. Indeed, during the structural work phase, the storage of equipment (formwork, stay, etc.) covers a substantial surface area and must be managed as materials: there is an available stock, they must be ordered internally or rented, and they are delivered and returned, etc.

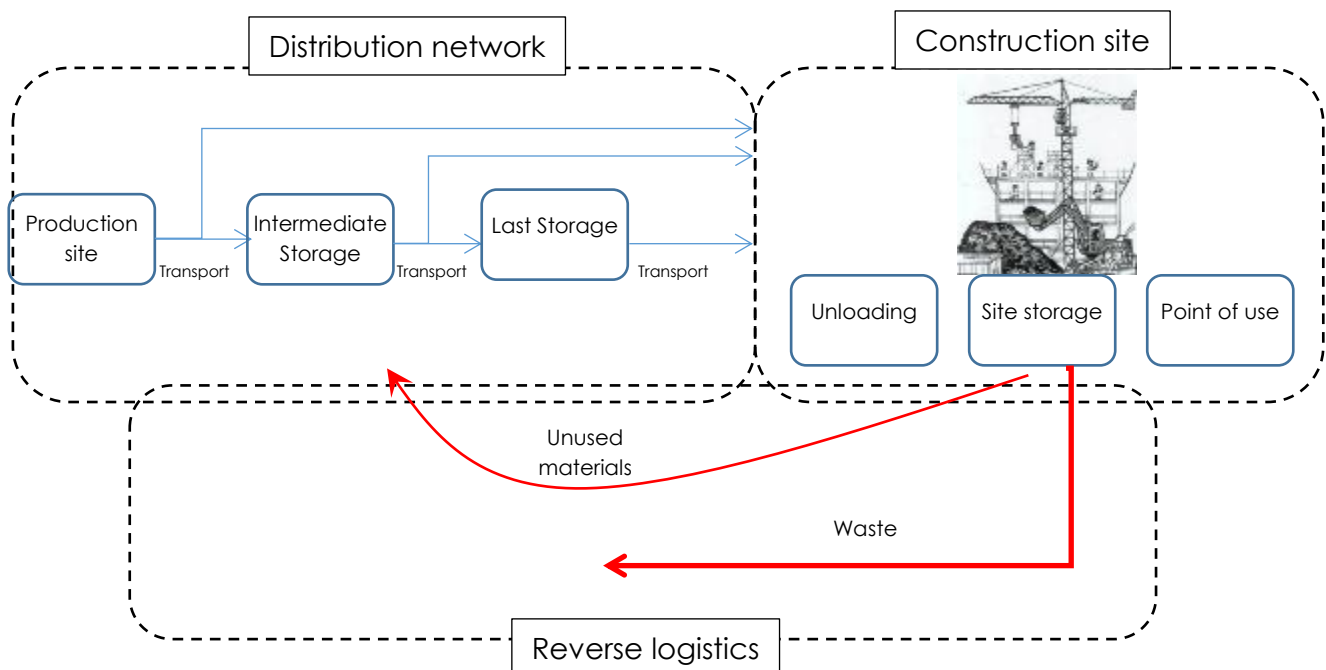


**Figure 29: Examples of important equipment to take into account**

## 2.2 Detailed information expected

In a complexity reduction perspective we divided the data collection tool into three main components:

- Distribution network: This first component of the construction supply chain ideally starts at the material production facility to the entrance of the construction site
- Construction site: This second component includes all of the construction site activities, from unloading activities to point of use of materials
- Reverse logistics: This last component includes waste management flows and material returns (unused and unsuitable materials)



**Figure 30: Description of the three main construction supply chain components**



These three main components aim at analysing the entire construction Supply Chain. Indeed in our **case we are considering that the construction supply chain is not limited to the actors and activities that bring the material to the construction site.** We include two kinds of activities as well as all of the actors and activities that manage the material flows until the point of use.

Each of these three main components is also divided into several sub components.

For the **distribution network** component the main characteristics we would like to analyse are divided into two parts:

- **Material origin and route** which aims at describing the different storage location, means of transportation, etc. ideally from the supplier to the construction site
- **Contractual aspects** which aims at describing the contractual elements that could impact the overall efficiency of the supply chain

For the **construction site** component the main characteristics we would like to analyse are divided into five parts:

- **Description of materials**
- **Persons in charge of logistic**
- **Surface area dedicated to logistic**
- **Urban constraints** which aim at describing all the constraints related to each specific city and district. This will make it possible, for example to compare and to analyse the costs generated by these constraints
- **Current working practices** which aims at analysing logistics management with a more detailed focus on each type of material and piece of equipment

For the **reverse logistics** component the main characteristics we would like to analyse are divided into three parts corresponding to the types of construction site outputs encountered on a construction site:

- Waste
- Material surplus
- Unsuitable materials

Each part aims at defining the type of material, the way to handle it, who is in charge of it, the destination and route of the material, the transport means used, etc.

The detailed data expected for each sub-component are described in the chapters below.





## 2.2.1 Distribution network analysis

### 2.2.1.1 Material origin and route

The material origin and route section is divided into three sub-parts:

- **Production location:** where the goods are produced
- **Intermediate storage:** storage between the production site and the construction site
- **Last storage location:** the location just before the pilot site. It could be a distributor or a sub-contractor warehouse or the production location in case of a direct shipment

The aim is to understand the origin, and the trip of the goods. We analyse if the goods are shipped directly from the production to the construction site or if they go through distributor storage.

For each site we have a map of the last storage location. We can determine the distance between the construction site and the warehouse.

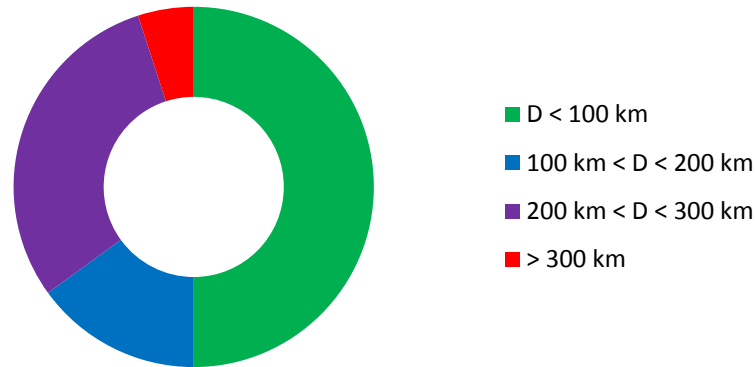
On maps and graphs here after, the same convention is used for all sites: each circle represents 100km around the construction site (in green: 100 km, in blue: 200 km, in purple: 300 km, in red: 400 km and in yellow: more than 400 km).





#### 2.2.1.1.1 Luxembourg site

For Luxembourg, 50% of the last storage locations are less than 100 km away from the site location, 15% are located under 200 km away, 30% are located between 200 km and 300 km away and only 5% of goods come from a last storage location more than 300 km from the construction site.



**Figure 31: Distance between suppliers and Luxembourg construction site**

80% of the materials pass through a distributor with an additional storage location. Only 20% of the materials are shipped directly to the construction site (mainly the structural materials that are produced near the site (less than 50 km away).

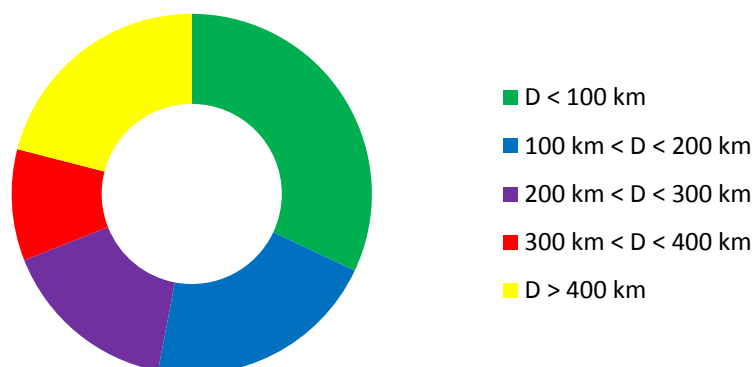


**Figure 32: Location between suppliers and Luxembourg construction site**



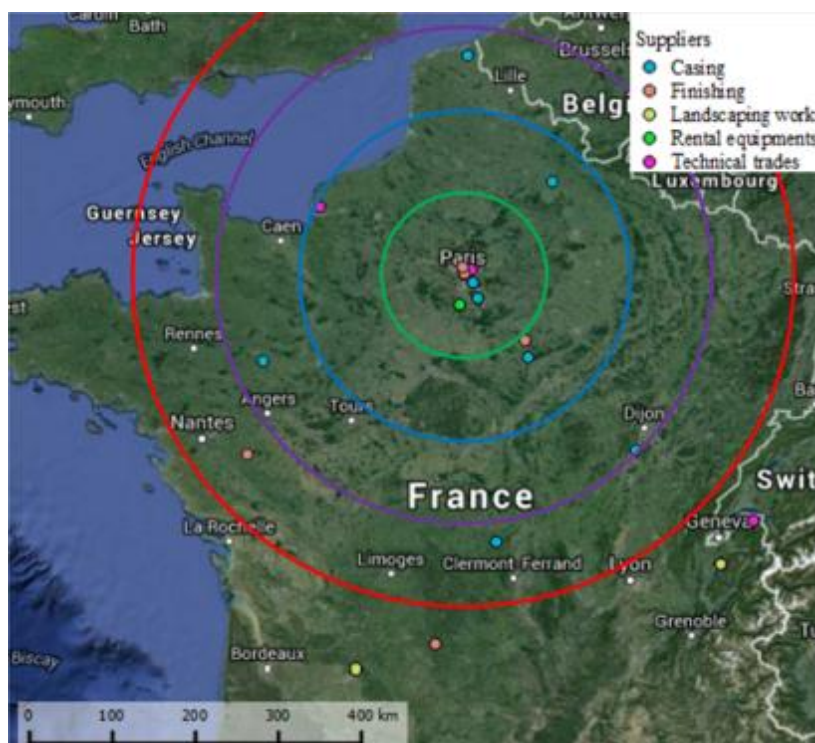
### 2.2.1.1.2 Paris site

For Paris, 32% of the last storage locations are less than 100 km away from the site location, 21% are located under 200 km away, 16% are located between 200 km and 300 km away, 10% are between 300km and 400 km away and 21% of the goods come from a last storage location more than 400 km from the construction site.



**Figure 33: Distance between suppliers and Paris construction site**

74% of the materials pass through a distributor with an additional storage location. Only 26% of the materials are shipped directly to the construction site from the producer.

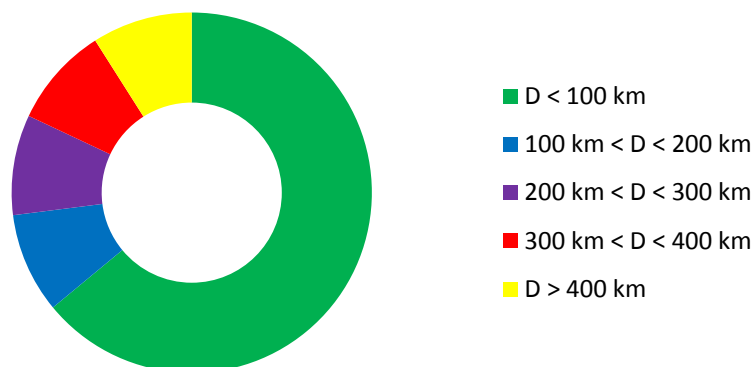


**Figure 34: Location between suppliers and Paris construction site**



### 2.2.1.1.3 Valencia site

For Valencia, 64% of the last storage locations are less than 100 km away from the site location, and 9% of last storage locations are located in each distance category (100km/200km, 200km/300km, 300km/400km, more than 400km).



**Figure 35: Distance between suppliers and Valencia construction site**

66% of the materials pass through a distributor with an additional storage location. Only 34% of the materials are shipped directly to the construction site from the producer, mainly for landscaping and earthwork.



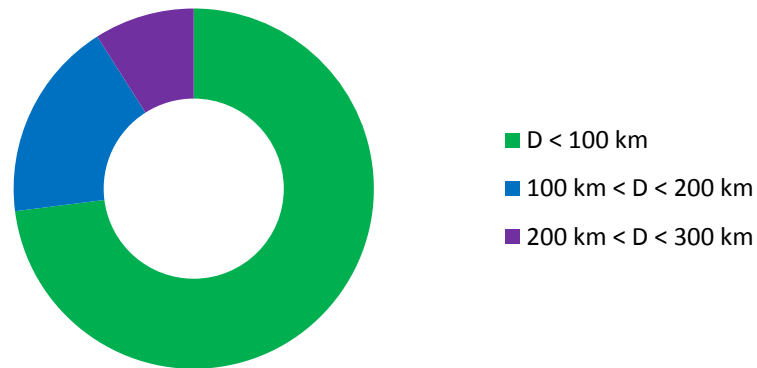
**Figure 36: Location between suppliers and Valencia construction site**





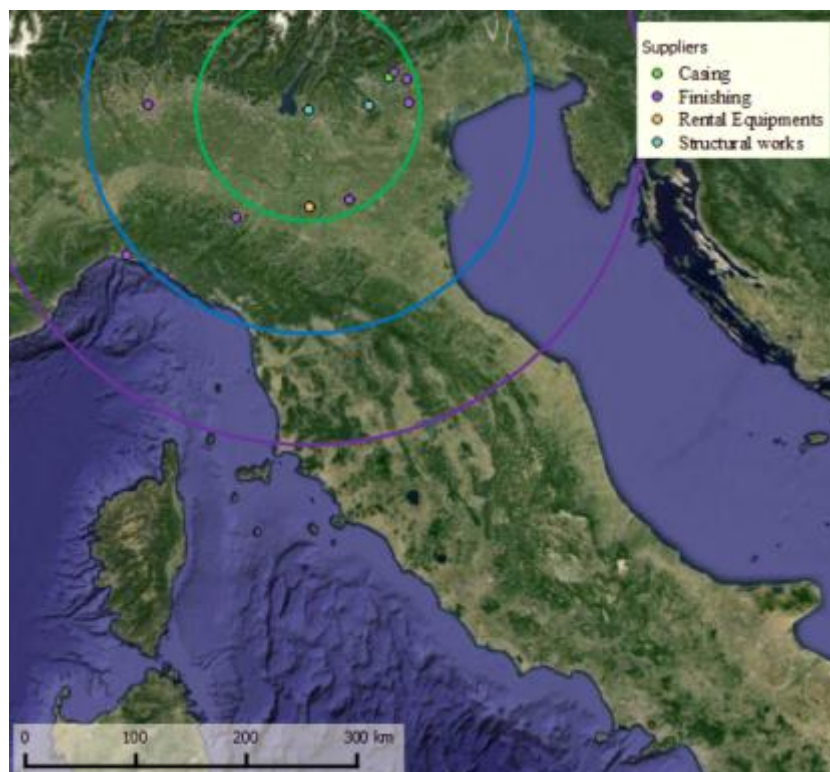
#### 2.2.1.1.4 Verona site

For Verona, 73% of the last storage locations are less than 100 km away from the site location, 18% are located less than 200 km away and 9% are located between 200 km and 300 km away.



**Figure 37: Distance between suppliers and Verona construction site**

64% of the materials pass through a distributor with an additional storage location. Only 36% of materials are shipped directly to the construction site from the producer.



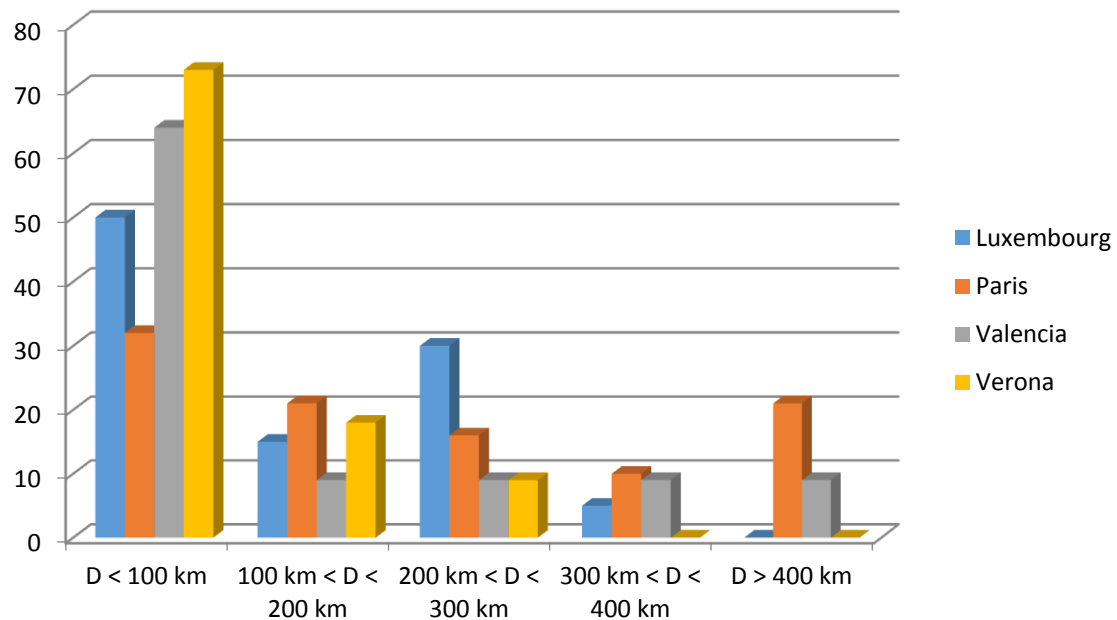
**Figure 38: Location between suppliers and Verona construction site**





#### 2.2.1.1.5 Overall analysis regarding origins of goods

On average, 51% of goods come from a nearby production location (<100 km away) and 69% come from a temporary storage location and not directly from the producer.



**Figure 39: Summary of location between suppliers and construction site**

With the address of the producer and the supplier, we can foresee determining the best method of transportation (train, trucks, boat, etc.) during the simulation in order to optimize the CCC delivery.

This analysis is only a partial one, due to two main difficulties preventing access to more detailed information at this stage of the project:

- Suppliers are not directly involved in the project
- Some materials are not currently defined

**NB:** These results are linked to the distribution network information. It appears that most suppliers are located less than 300 km from the construction sites. At the end of the data collection phase, it will be interesting to take in account the European Commission white book (COM (2011) 144 final, 28.3.2011), which defines objectives in order to reduce the CO<sub>2</sub> and NO<sub>x</sub> emissions. They are divided into two categories based on distance:

- Less than 300 km: Urban transportation, with technological or organisational optimisation
- More than 300 km: Long distance transportation, with modal shift optimisation



#### 2.2.1.1.6 Shipment issues

Based on the current state of our knowledge, the batch size of each shipment is linked to the needs of the site but also to the transport optimization suggested by the supplier.

The frequencies of shipments for some goods (doors, windows, etc.) are based on a schedule defined at the beginning of the project, or during the commercial discussions. These types of shipments are not in accordance with the real production plan and the real needs of the site during the course of the project. In these cases, deliveries are stored on site. For some materials (that do not require storage, i.e. concrete, etc.), shipments are linked to the necessity of site needs. These deliveries are made each day and sometimes several times a day.

#### 2.2.1.1.7 Trucks issues

In the data, we do not find specific models of truck for specific materials. But we have identified some requirements necessary for loading specific materials.

For example, for earth it's necessary to use a dump truck; a flatbed truck cannot be used.

This issue will be addressed at a later stage of data collection. Indeed, due to the fact that there are no specific types of trucks mentioned, we cannot get this information without observing actual deliveries.

It appears that all trucks currently used for site deliveries have a diesel engine. But this information can be verified during the data collection.

#### 2.2.1.1.8 Route issues

The most important type of road used is the highway (approximately 90%). The highway is the most common way to reach the city. Afterwards, the remaining 10% of the route is over urban roads in order to pass through the city centre.

Few trucks used rural roads.

#### 2.2.1.1.9 Example of analysis for some selected items

On each site, we can see many different types of materials. In order to more easily compare the same types of material, we analysed seven common items (concrete, internal doors, windows, vertical framework, water pipes, HVAC piping, washbasins).

##### *Standard items*

Concrete: The delivery of this material is specific because this raw material cannot be stored. This is the reason why the production location is also the last storage point, and a specific truck is needed. For this type of material, the average trip is 26 km. A CCC cannot be the solution, because concrete is a raw material and cannot be stored between the production and use locations.



### *Semi-Standard items*

HVAC piping: They are usually linked to a larger contract with a wholesaler and HVAC piping is directly sent by the wholesaler's storage warehouse. For this type of good, a CCC can be interesting in order to locally store all of the material, with some surplus in order to meet site needs.

Water pipes: They are usually linked to a larger contract with a wholesaler and pipes are directly sent by its storage warehouse. For this type of good, a CCC can be interesting in order to locally store all of the material, with some surplus in order to meet site needs.

### *Material items*

Vertical framework: Usually this is rental material and is rented directly to the company or to a parent company (50 km away). For this type of material, a CCC can offer an available storage area to the site, and for the construction or the parent company, it can be an advantage to have a storage area near a city for all construction sites in this city.

### *Specific items*

Doors: This material is specific for each site and depends on the choice of the architect; this is the reason why it is produced far from the site (300 km away on average). For this type of material, a CCC is very interesting as the production location is potentially far from the construction sites and a CCC can offer the producer a local storage location closer to the point of use. For the site, it's possible to have a local storage location and to store goods not on site but close to it.

Windows: Like the doors, the windows are selected by the architect and are produced in a factory not necessarily close to the site (within a perimeter of 200 km). And like the doors, a CCC can offer a good solution, both for the site and the producer.

Washbasin: This is a specific product, linked to the architect requirements. The supplier can change for every contract and sometimes, different suppliers can be found within the same project. For this type of product, a CCC can control the quality of the product and deliver the right quantity of the right product each day, providing reactivity in case of changes to the site schedule.

In conclusion, except for the raw material (like concrete), a CCC can be interesting and advantageous both for the construction site, and the producer/supplier or the carrier in order to save time, and to store materials near the site but not on the site.



### 2.2.1.2 Contractual aspects

#### Type of contract

For all sites (Paris, Luxembourg and to be confirmed for Verona and Valencia), standard materials (concrete, pipes, etc.) contracts are managed by framework contracts.

For the specific material (depending on the choice of the designer), contracts are specific to each site and material.

#### Price List

For all sites, it is not possible to find a price list based on kilometres travelled or kilos transported. All prices are overall prices included in the price of materials and not separated by the delivery mode.

#### Delivery time

Currently, we do not have specific information regarding the delivery times, but this question will be answered during the data collection with the indicator number 6 (Delivery request). We will analyse all deliveries and the time between delivery request and receipt.

#### Transport costs

Currently, we do not have specific information regarding the transport costs. It seems to be difficult to separate delivery price and the price of the goods. But during part 2.2 of this project, we will aim to analyse all deliveries and to communicate with the transport team in order to identify the transport costs.

### 2.2.1.3 Conclusion regarding distribution network

It is difficult to have a complete view due to the current phase of the project. Many materials have not been selected yet. But it is important to track all items during the data collection in order to complete our view regarding the organization of the distribution and to compare construction sites. Ultimately, this analysis is crucial to understanding the current distribution rules of the construction sector, and to define a new business model for a CCC.

## 2.2.2 Construction site analysis

### 2.2.2.1 People in charge of logistics

In Paris, a dedicated team organizes unloading activities. For Luxembourg, Valencia and Verona, the logistics work was managed by the workers available.

#### Reception of materials:

In Paris, the reception team is managed by a sub-contractor. On the other sites, the construction team orders the materials and is in charge of their reception.



#### Quality control:

In Italy, two quality controls are undertaken, one by the guardian at the entry of the truck and another one by the quality team. This is quite specific due to the public sector customer. For the other sites, we currently do not have specific data regarding quality control.

#### Handling from truck to storage area:

In Paris, the handling from the truck to the temporary storage area was carried out by a logistics sub-contractor company dedicated to this task. For the logistic aspects between the temporary storage and the final storage, handling activities were carried out by a sub-contractor.

In Luxembourg, Valencia and Verona, the handling was carried out by the construction site team.

#### 2.2.2.2 Surface area dedicated to logistics

##### Surface area dedicated to logistic (forecast)

On each site, a specific area is dedicated to storage logistics. In Paris and, Luxembourg, there are two delivery areas with a temporary storage area, and additionally a great deal of storage on each level, near the point of use. In Verona, there is one delivery point and additionally, goods are stored wherever there is a free space. In Valencia, the size of the site makes many storage areas available without disturbing the site workers.

##### Total surface area available

The surface area available on site changes during the project. When the construction site develops, more available storage space is created (for example in Luxembourg or Verona), while on the other hand, when walls in the building are created (in Paris), the storage area is diminished.

#### 2.2.2.3 Urban constraints

For all sites, due to traffic jams, it is easiest to receive deliveries in the morning. But sometimes this is not possible (for concrete for example) and in this case deliveries are performed throughout the day. These types of deliveries are not a problem for the Valencia and Verona sites because they have a dedicated entrance without an impact on the public route. For the Paris site, the dedicated space for the deliveries makes it easier, as well as the software used to manage the delivery times. In the case of the Luxembourg site, it is more difficult as in order to unload a truck, it is necessary to stop the traffic in order to allow the truck to carry out its manoeuvre. This activity requires three to four workers in order to secure the perimeter.

For all sites, it is not permitted to park trucks for a long time on public streets near the construction site. In Valencia and Verona, it is possible to park one or two waiting trucks inside the construction site.





For Paris, the software avoids any interaction between two trucks and if one comes earlier or if an unplanned delivery comes, the two zones of deliveries are used, with one truck waiting on a street where there are usually some free parking spots.

For Luxembourg, trucks are sometimes parked temporarily on the street near the construction site, but during the day, many car parking spots are available and this is not a problem for the traffic.

#### 2.2.2.4 Current working practices

##### **Handling practices:**

###### Handling equipment

Except for the Valencia site, the most important piece of equipment is the crane. On each site (except for the Valencia site) there are two cranes. In Luxembourg and Verona, those cranes are dedicated to production and to the site logistics and for the truck unloading at the entrance of the site. In Paris, these cranes are mainly dedicated to the production, and secondarily for logistics. The main piece of equipment in Paris used for unloading trucks is the forklift.

Afterwards, for the movements on the site, forklifts are the most common equipment, but sometimes cranes (if they are available) are used in order to move equipment to another level or to another part of the site.

###### Several times moving

Many types of materials are moved several times, linked to the available space. The first movement was done by the crane, and afterwards, all other movements (except for structural work phase equipment where the crane is the only handling equipment) were done by forklift. During the data collection we can measure the number of times an item was handled.

##### **Identification of logistic areas:**

On each site, there are dedicated spaces for logistics, but not a specific place dedicated to specific materials. Some specific storage areas are used by sub-contractors in order to store their handling material and consumables.

###### Area marking

On all sites, some storage areas are identified, but not dedicated to specific materials. Some “wild” storage places are also used without identification.

###### Schedule of use

Ideally, storage areas can be dedicated to a specific material if the work plan is known and correct. A material can be assigned to an area and afterwards the assignment can be changed after each task.

#### 2.2.2.5 Conclusion

Except for Paris, logistics practices are the same as for handling equipment, or logistics management on site: there is no specific organization; workers are also involved in logistics tasks.





In Paris, a specific form of organization was put in place with a dedicated team for all movements of material. These activities are sub-contracted to a company. This situation permits workers to concentrate on their task and not be disturbed by additional logistics tasks.

During the project, it will be interesting to compare the price and the advantages of the Paris organization with a standard one. It could also be interesting to compare if the most relevant organization can transmit a part of its activities to the CCC and if yes, at what cost.

### 2.2.3 Reverse logistics analysis

At this stage, it is difficult to analyse these types of activities because sites are just at the beginning of the project.

#### 2.2.3.1 Waste management

The type of waste generated by the materials is not currently known, but we can analyse the type and the number of bins after the data collection.

We know that some specific demands of national regulations are managed by the site in order to organize waste management collection and the recycling cycle.

#### 2.2.3.2 Surplus material flows

For material surplus we do not yet know if there is a surplus or not. It's possible to analyse if you have this type of material after the data collection phase.



## Conclusion

The four case studies are all located in urban areas and operate in a high constrained environment. Delivery vehicles suffer from congestion and access restrictions while they generate at the same time congestion and environmental nuisances such as emissions and noise. Considering the limited space on site and the important value of material (material costs represent usually up to 40% of the total construction costs) the construction logistics is critical. However, construction companies get hard to be delivered on a Just In Time basis due to the fragmented nature of the industry and the relative low maturity of the sector on supply chain management: team dedicated to logistics are rare, communication between the numerous stakeholders are mainly email and phone based, use of ICT is limited, low transparency of the delivery price usually included in material price.

With the data collection (task 2.4), the project will go deeper in the AS-IS analysis to better understand the existing processes (e.g. Supplier selection process) and propose solutions for supply chain optimisation.



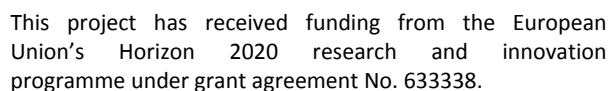


# APPENDIX 1: PILOT SITE DESCRIPTION DATA COLLECTION BOARD





## 1.1 Distribution network

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## 1.2 Construction site

			Planning		General points										Current working practices										Urban constraints			
Project phase	Building component	Material	Estimated starting date	Estimated end date	Material		Persons				Surface area dedicated to logistic				Handling practices		Logistic area identification		Receiving conditions		Delivery hours	Reduced constraints for certain type of trucks	Possibility of use of the public area	number of machines in vehicles allowed for on some roads	number of kilos transported on some roads			
					Unit	Total quantity	Dedicate of persons to all logistics aspects	material reception	quality control	handling from truck to storage area	handling from storage area to point of use	Surface area dedicated to logistic forecast	Logistic area composition	Surface area really used	Total surface area available	handling equipment	Several time moving (Y/N)	Area dedicated to specific materials	Area marking	Schedule of use ?						delivery frequency	Quantities	Quality control ?
General equipments			February 2025	November 2025																								
	Formwork	unit			20	no						600m2	proprietor on site	600m2	600m2	Scramble												
	Mini formwork	unit			25							600m2	proprietor on site	600m2	600m2	Scramble												
	Formwork enhance	unit			25							600m2	proprietor on site	600m2	600m2	Scramble												
	Formwork material	tone			49.8							600m2	proprietor on site	600m2	600m2	Scramble												
	Concrete ballast	unit			65							600m2	proprietor on site	600m2	600m2	Scramble												
	Access gateways	unit			10.5							600m2	proprietor on site	600m2	600m2	Scramble												
	Access gateways	unit			11							600m2	proprietor on site	600m2	600m2	Scramble												
	Steel	unit			972							600m2	proprietor on site	600m2	600m2	Scramble												
	Steel formworking material	unit			954							600m2	proprietor on site	600m2	600m2	Scramble												
	Shuttering panels	unit			113							600m2	proprietor on site	600m2	600m2	Scramble												
	Shuttering panels assembly material	unit			410							600m2	proprietor on site	600m2	600m2	Scramble												
	Personal panels	unit			400							600m2	proprietor on site	600m2	600m2	Scramble												
	Metal tower	unit			100							600m2	proprietor on site	600m2	600m2	Scramble												
	Wood table	unit			121							600m2	proprietor on site	600m2	600m2	Scramble												
Structural works			February 2025	December 2025																								
	Concrete	m3			5130																							
	Structural steel	kg			1122000																							
	Section Steel	kg			2745																							
	Pre-fabricated (balcony, stairs, ...)	kg			425																							
	Anchor	kg			800																							
	Thermal switch	kg			300																							
	Framework	kg			5240																							
	Non-bearing masonry	m2			2025																							
	Parade insulation	m2			1402.5																							
	Basement isolation	m2			4480																							
	Roofs	m2			300																							
	Roof insulation	m2			4030.5																							
Casing			September 2025	September 2026																								
	Parade cladding	m2			2796.5																							
	Aluminum cladding	m2			2380																							
	Aluminum profile	m			1554.5																							
	Aluminum cladding	m2			425																							
	Parade opening	m2			1402.5																							
	Window	pieces			200																							
	Horizontal sliding window	pieces			10																							
	Aluminum window	pieces			10																							
	Aluminum window	pieces			10																							
	Aluminum window	pieces			10																							
	Shutter	pieces			100																							
	Shutter	pieces			100																							
	Shutter	pieces			100																							
External equipments			February 2025	August 2026																								
	Building entry door	pieces			14																							
	Door	pieces			14																							
	Roof insulation	m2			4030.5																							
	Roof insulation	m2			4030.5																							
	Roof insulation	m2			4030.5																							
	Roof insulation	m2			4030.5																							
	Roof insulation	m2			4030.5																							
	Roof insulation	m2			4030.5																							
	Roof insulation	m2			4030.5																							
	Roof insulation	m2			4030.5																							
	Roof insulation	m2			4030.5																							
	Roof insulation	m2			4030.5																							
	Roof insulation	m2			4030.5																							
Technical Trades			February 2025	September 2026																								
	Mechanics	pieces			1																							
	Gas boiler	pieces			1																							
	Water boiler	pieces			1																							
	Hot water tank	pieces			1																							
	Hot water tank	pieces			1																							
	Hot water tank	pieces			1																							
	Hot water tank	pieces			1																							
	Hot water tank	pieces			1																							
	Hot water tank	pieces			1																							
	Hot water tank	pieces			1																							
	Hot water tank	pieces			1																							
	Hot water tank	pieces			1																							
	Hot water tank	pieces			1																							
Sanitary (including down water, down water and waste water)			July 2025	September 2026																								
	Sanitary (including down water, down water and waste water)	pieces			1																							
	Sanitary (including down water, down water and waste water)	pieces			1																							
	Sanitary (including down water, down water and waste water)	pieces			1																							
	Sanitary (including down water, down water and waste water)	pieces			1																							
	Sanitary (including down water, down water and waste water)	pieces			1																							
	Sanitary (including down water, down water and waste water)	pieces			1																							
	Sanitary (including down water, down water and waste water)	pieces			1																							
	Sanitary (including down water, down water and waste water)	pieces			1																							
	Sanitary (including down water, down water and waste water)	pieces			1																							
Fire protection			July 2025	September 2026																								
	Fire protection	pieces			1																							
	Fire protection	pieces			1																							
	Fire protection	pieces			1																							
	Fire protection	pieces			1																							
	Fire protection	pieces			1																							
	Fire protection	pieces			1																							
	Fire protection	pieces			1																							
	Fire protection	pieces			1																							
	Fire protection	pieces			1																							
Finishing			July 2025	September 2026																								
	Finishing	pieces			1																							
	Finishing	pieces			1																							
	Finishing	pieces			1																							
	Finishing	pieces			1																							
	Finishing	pieces			1	</																						



## 1.3 Reverse logistics

			Waste															
Project phase	Building component	Material	Type of waste	Identification		Legislation		Waste sorting				Waste storage on site		Execution			Subcontracting of waste management	
				Yes / No	Precautions	Law in force?	Law identifying	Specific Annex included?	Sorting in the construction site	The reason for sorting	By whom	Area of storage used	Surface area dedicated	Type of vehicle	Dedicated vehicle (VIN)	Handling means	Dedication	Subcontract for waste management
Renovate equipment	Equipment	Formwork																
		Formwork extension																
		Formwork material																
		Concrete ballast																
		Surface waterproofing																
		Shrub																
		Slab formwork material																
		Reinforcing panels																
		Reinforcing panels assembly material																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
Structural works	Structure	Concrete																
		Structural steel																
		Reinforcing panels																
		Reinforcing panels assembly material																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
Cable	Cable cladding	Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
Mechanical	Mechanical	Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																
		Reinforcing panels																





			Material surplus										
Project phase	Building component	Material	Quantity of surplus			Reverse route				Contractual aspects			
			Unit	Quantity	Return frequency	Type of vehicle	Number of vehicles	Destination	Vehicle owner	Financial aspects	Return to supplier (Y/N)	Means of transport owner	Storage
Rental equipments	Equipments	Formwork											
		Ides formwork											
		Formwork enhance											
		Formwork material											
		Concrete ballast											
		Access Gateways											
		Architecton gateways											
		Strut											
		slab formworking material											
		shuttering panels											
		shuttering panels assembly material											
		Plywood panels											
		Metal tower											
		Wood slabs											
Structural works	Structure	Concrete											
		Structural steel											
		Section Steel											
		Prefabricated (balcony, stairs, ...)											
		Anchor											
		Thermal switch											
		Formwork											
		non-bearing masonry											
		Facade insulation											
		Basement isolation											
		Roofs											
		Roof insulation											
		Flat roof											
Casing	Facade cladding	Wood cladding											
		Aluminium cladding											
		Aluminium profile											
		stones cladding											
		Facade coating											
	Facade opening	Windows											
		Tilt-up window											
		Horizontal sliding sash windows											
		Casement window											
		Angle window											
		curtain wall											
		Shutter											
		rock wool insulation											
		Doors											
		Building entry door											
		garage door											
	External equipments	balcony grate											
		grate											
		Rooftop drain for rainwater											
	Roof finishing	well cover											
		Green Roof											
Technical Trades	HVAC	Steel band											
		Mechanism											
		Gas Boiler											
		Panel boiler											
		Hot water tank											
		Dual stream											
	HVAC piping	Ventilation shaft											
		Ventilation shaft											
		Hot water circuit											
		Fire damper											
	Equipment	HVAC air inlet											
		ventilation grid											
	Electricity (including high-voltage, low voltage, ...)	Radiator											
		Mechanism											
		Switchboard											
		Distribution											
		Cable tray											
Sanitary (including drink water, storm water and waste water)	Equipment	Switch											
		Electrical Outlets											
		lamp											
		Towel dryer											
		Rin coil											
	Distribution	Kitchen											
		Pipes											
		Water cutterson											
		WC											
		Washbasin											
		Double washbasin											
		Hand washer											
		Bathtub											
		Shower											
		Water evacuation											
Fire protection	Equipment	Hot water tank											
		Pipes											
	Finishing	Floor											
		Parquet floor											
		baseboard											
		Floor tiles											
		Stair tiles											
		Wall											
		Wall tiles											
		Doors											
		Metal doors											
		External wooden doors											
		Painted doors											
		Glass door											
		Cupboard door											
		Plenum											
Landscaping works	Finishing	Paint											
		Paint											
	Land	Land											
		Arable land											
		Drainage system											
		Drain											
		Water drain hose											
		External tiled floor											
		Pavers											
		Slab											
		Outdoor plants											
		Plants											
		Supplies											
		Seating											
		Turfing											





			Unsuitable Material										
Project phase	Building component	Material	Quantity of material			Reverse route				Contractual aspects			
			Unit	Quantity	Return frequency	Type of vehicle	Number of vehicles	Destination	Vehicle owner	Financial aspects	Return to supplier (Y/N)	Means of transport owner	Storage
Rental equipments	Equipments	Formwork											
		Ides formwork											
		Formwork enhance											
		Formwork material											
		Concrete ballast											
		Safeex Gateways											
		Archonon gateways											
		Strut											
		slab formworking material											
		shuttering panels											
		shuttering panels assembly material											
		Plywood panels											
		Metal tower											
		Wood slabs											
Structural works	Structure	Concrete											
		Structural steel											
		Section Steel											
		Prefabricated (balcony, stairs, ...)											
		Anchor											
		Thermal switch											
		Formwork											
		non-bearing masonry											
		Facade insulation											
		Basement isolation											
		Roofs											
		Roof insulation											
		Flat roof											
Casing	Facade cladding	Wood cladding											
		Aluminium cladding											
		Aluminium profile											
		stones cladding											
		Facade coating											
	Facade opening	Windows											
		Tilt-up window											
		Horizontal sliding sash windows											
		Casement window											
		Angle window											
		curtain wall											
		Shutter											
		rock wool insulation											
		Doors											
		Building entry door											
		garage door											
	External equipments	balcony grate											
		grate											
		Rooftop drain for rainwater											
Technical Trades	Roof finishing	well cover											
		Green Roof											
		Gravel band											
	HVAC	Mechanism											
		Gas Boiler											
		Panel boiler											
		Hot water tank											
		Dual stream											
		HVAC piping											
		Ventilation shaft											
		Ventilation shaft											
		Hot water circuit											
		Fire damper											
		HVAC air inlet											
		Equipment											
		ventilation grid											
		Radiator											
Electricity (including high-voltage, low voltage, ...)	Mechanism	Switchboard											
		Distribution											
		Cable tray											
		Equipment											
		Switch											
		Electrical Outlets											
		lamp											
		Towel dryer											
		Ran coil											
		Kitchen											
	Sanitary (including drink water, storm water and waste water)	Pipes											
		Equipment											
		Water cutrunner											
		WC											
		Washbasin											
		Double washbasin											
		Hand washer											
		Bathtub											
		Shower											
		Water evacuation											
Fire protection	Hot water tank	Pipes											
		Distribution											
		Pipes											
	Finishing	Floor											
		Parquet floor											
		baseboard											
		Floor tiles											
		Stair tiles											
		Wall											
		Wall tiles											
		Doors											
		Metal doors											
		External wooden doors											
		Painted doors											
		Glass door											
		Cupboard door											
		Plenum											
		Painting											
Landscaping works	Paint	Paint											
		Ceiling											
		Plastering											
		Paint											
	Land	Land											
		Arable land											
		Drainage system											
		Drain											
		Water drain hose											
		External tiled floor											
		Pavers											
		Slab											
		Outdoor plants											
		Plants											
		Supplies											
		Seating											
		Turfing											





## 2.1 Distribution network



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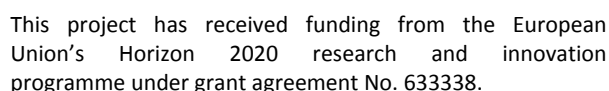




## 2.2 Construction site

				Planning		Material description		Persons in charge of logistic					
Project phase	Building component (Bâtiment)	Sub-contractors (Sous-traitants)	Material (Matériau)	Estimated starting date	Estimated end date	Unit (unité)	Total quantity (quantité totale)	Estimated persons in charge of logistic (Personnes chargées de la logistique estimées)	Material reception (Réception des matériaux)	Quality control (Contrôle qualité)	Handling from storage area to point of use (Manutention du stockage au point d'utilisation)	Handling from storage area to point of use (Manutention du stockage au point d'utilisation)	
Partial demolition (Démolition partielle)	Removing asbestos (Déamiantage)	SRD		mar-14	avr-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
		SERP	carriage waste	mar-14	avr-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
	Coverage (Couverture)	GDR CHERPIN	asbestos waste	mar-14	avr-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
		ASB DÉAMANTEMENT		mar-14	avr-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
		ETIOLÉ DÉMOLITION (ascent)		mar-14	avr-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
	Lead take off (Déplombage)	ATM BTP		mar-14	avr-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
Foundation (Fondation)	Underpinning operations (Renforcement)	GDR CHERPIN		mar-14	avr-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
		ATM BTP		mar-14	avr-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
	Elevating (Surélévation)	LES TERRASSEURS PARISIENS		mar-15	juil-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
		ASB (second-order of LES TERRASSEURS PARISIENS)		mar-15	juil-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
		REINFORCEMENT		mar-15	juil-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
		ASB		mar-15	juil-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
Infrastructure floor work (Travaux d'infrastructure)	Special foundation (Fondation spéciale)	GEOFI	Concrete, micro-pilot, tubes, steel matting	mar-15	juil-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
		BAG ARMATURES	Armature and scrap	mar-15	juil-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
	Flooring (Revêtement)	LA CÉLÈQUE TP		juin-15	oct-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
		AJB ISOLATION	solid coating	juin-15	oct-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
	projector plaster (enduction)	POLIDALLE		mai-15	juil-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
		IPP		avr-15	oct-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
Concrete structure	Concrete masonry (Maçonnerie)	MTS CONSTRUCTION	concrete bloc and sand bag	mar-15	oct-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
		EASYCOM		mar-15	oct-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
	Concrete structure	CBC/BATEG		mar-14	août-17	to define	to define	30 to 40 persons	2 persons	1 person	6 persons		
		Steel structure (Structure métallique)	STT		juil-15	mar-16	define	210 3 persons	1 person	1 person		02 to 3 persons	
			MEVIAH (second-order of STT)		juil-15	mar-16	define	210 3 persons	1 person	1 person		02 to 3 persons	
			MPB (second-order of STT)		juil-15	mar-16	define	210 3 persons	1 person	1 person		02 to 3 persons	
Waterproofing (Étanchéité)	Waterproofing (Étanchéité)		BA TECHNO	waterproof roll, insulating material	juin-15	mar-17	define	210 3 persons	1 person	1 person		02 to 3 persons	
		ETANCHÉITE RATIONNELLE		juin-15	mar-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
	Casing (Revêtement)	ETANCHÉITE RATIONNELLE		juin-15	mar-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		SOB		juin-16	juin-16	define	210 3 persons	1 person	1 person		02 to 3 persons		
	External aluminum joinery (Menuiserie ext. alu)	Facade renovating (Rénovation facade)	LES PERIERS FRANCIS		mar-15	déc-16	define	210 3 persons	1 person	1 person		02 to 3 persons	
			MOON DECOR (second order of LES PERIERS FRANCIS)		mar-15	déc-16	define	210 3 persons	1 person	1 person		02 to 3 persons	
External wood joinery (Menuiserie ext. bois)		ALUMINIUM ALUMINIUM (second-order of LES PERIERS FRANCIS)		mar-15	déc-16	define	210 3 persons	1 person	1 person		02 to 3 persons		
		SERAIL	aluminum chassis	juil-15	juin-16	define	210 3 persons	1 person	1 person		02 to 3 persons		
		THÉRIOT KATZEM (second-order of SERAIL)		juil-15	juin-16	define	210 3 persons	1 person	1 person		02 to 3 persons		
		BANK ADP PERSIENS (second-order of SERAIL)		juil-15	juin-16	define	210 3 persons	1 person	1 person		02 to 3 persons		
Construction	External wood joinery (Menuiserie ext. bois)	KATZEM BISA (second-order of SERAIL)		juil-15	juin-16	define	210 3 persons	1 person	1 person		02 to 3 persons		
		SAN BELLEVUE PARIS (second-order of SERAIL)		juil-15	juin-16	define	210 3 persons	1 person	1 person		02 to 3 persons		
	Facade occlusion (Occlusion facade)	BILLET	Wood chassis	juil-15	dec-15	define	210 3 persons	1 person	1 person		02 to 3 persons		
		ATS		juil-15	mai-16	define	210 3 persons	1 person	1 person		02 to 3 persons		
	Furniture and putting (meublement et pose)	CYBETONE		12-06	mar-16	define	210 3 persons	1 person	1 person		02 to 3 persons		
		OPS TR TECHNOLOGIES		12-06	mar-16	define	210 3 persons	1 person	1 person		02 to 3 persons		
INTERLU France		Wood and wallboard	sept-15	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons			
INTERLU France			sept-15	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons			
Furniture and putting (meublement et pose)	Interior wall (Mur int.)	ISOLATION 2000	wallboard	mar-15	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		GOVANS SERVICES		avr-16	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
	Production and putting of metal grid (Production et pose de grille métallique)	PORTATEU		avr-16	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		FERM BATTI		avr-16	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		ETIOLÉ		avr-16	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		CESELEC		avr-16	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
Plumbing (Plomberie)	Water supply (Approvisionnement en eau)	DECOOR BARRAL	tiles	avr-15	mar-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		BMP	carpet slab	avr-15	mar-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
	Heating, ventilation and air-conditioning (CVC)	RESCLOUP		mar-15	dec-16	define	210 3 persons	1 person	1 person		02 to 3 persons		
		GROUPEMENT LACROIXE		avr-15	juin-16	define	210 3 persons	1 person	1 person		02 to 3 persons		
		CESELEC	ductwork, cell, tube, box	juin-15	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		POPANICA (second-order of CESELEC)		juin-15	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
Electricity (Électricité)	Lighting (Éclairage)	GOULAM (second-order of CESELEC)		juin-15	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		SPRIS (second-order of CESELEC)		juin-15	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
	Electrical joinery (Menuiserie électrique)	EPHON	cell	juin-15	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		GENELUX (second-order of EPHON)		juin-15	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		POUTY SERVICES (second-order of EPHON)		juin-15	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		CLIMAT (second-order of EPHON)		juin-15	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
Finishing (Finition)	Blower (B)	RESEAU (second-order of EPHON)		juin-15	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		OPS		avr-15	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
	Decoration in synthetic resin (Décoration en résine synthétique)	CREADEFUSION		avr-15	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		CAN AGENCEMENT		avr-15	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		DEL BOCA		avr-17	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		ALGUEUX		avr-17	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
Joining (Jointage)	Stair restoration (Restauration des escaliers)	LA FERRONNERIE DE BINE		avr-16	mar-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		BASTIMOD		avr-16	mar-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
	Restoration and creating of stone ground (Restauration et création de sol en pierre)	COBA		avr-15	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		BONNET THROUX		juin-16	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
	Restoration of permanent floor, library and office (Restauration du plancher, bibliothèque et bureau)	EUROPARQUET		juin-17	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		Covering wall (Revêtement de mur)	ADOLP		juin-16	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons	
Painting (Peinture)	Painting (Peinture de la)	SENECHAL		mar-16	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		SCOUTERIE MARQUE		mar-16	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
	Painting (Peinture de la)	PPS PERIER		juin-16	juin-16	define	210 3 persons	1 person	1 person		02 to 3 persons		
		SEA TECH		sept-16	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		PRESTIMETAL		juin-17	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		ASTRAL		juin-16	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
Joining (Jointage)	Joining (Jointage)	BRANC ROUVIERES		juin-16	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		SOB		avr-15	avr-16	define	210 3 persons	1 person	1 person		02 to 3 persons		
	Cleaning mosaic (Nettoyage de mosaïque)	SOB (second-order of SOB)		juin-16	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		COTTEEM		juin-16	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons		
		Power generator (Générateur électrique)	AEN	fuel oil tank	juin-16	juin-17	define	210 3 persons	1 person	1 person		02 to 3 persons	



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					Planning						
Project phase (phase)	Building component (composant)	Sub-contractors (sous-traitants)	Material (matériaux)	Estimated starting date	Estimated end date	Delivery hours (heures de livraison)	Reduced constraints for certain type of trucks (contraintes réduites pour certains types de camions)	Possibility of use of the public area (possibilité d'utilisation)	(contractor to be selected according to the market call)	(contract manager and client)	
Partial demolition (Démolition partielle)	Removing asbestos (Déamiantage)	SRDI		mars-14	avr-15	yes	No	No			
		SERPIS	cartridge waste	mars-14	avr-15	yes	No	No			
		GDR CHERPIN	asbestos waste	mars-14	avr-15	yes	No	No			
		ADS DEMANTELLEMENT		mars-14	avr-15	yes	No	No			
		ETOILE DEMOLITION (second order of STT)		mars-14	avr-15	yes	No	No			
	Curtage (Curage)	ATM BTP		mars-14	avr-15	yes	No	No			
		GDR CHERPIN		mars-14	avr-15	yes	No	No			
	Lead take off (dépotage)	ATM BTP		mars-15	juil-15	yes	No	No			
		GDR CHERPIN		mars-15	juil-15	yes	No	No			
	Foundation (Fondation de base)	Demolition	LES TERRASSIERS PARISIENS		mars-15	juil-15	yes	No	No		
AGB (second order of LES TERRASSIERS PARISIENS)				mars-15	juil-15	yes	No	No			
Earth - moving (déblaiement)		AGE		mars-15	juil-15	yes	No	No			
		GEOP	Concrete, micro-picket, tubes, steel matting	mars-15	juil-15	yes	No	No			
Special foundation		BAG ARMATURES	Armature and scrap	mars-15	juil-15	yes	No	No			
		LA CELLULE 1P		juin-15	oct-15	yes	No	No			
FURNITURE and putting blinds (production de blinds)		AJB ISOLATION	cast coating	juin-15	juil-16	yes	No	No			
		POLDALIE		mai-15	juil-16	yes	No	No			
paving and floor (couverture)			OPF		avr-15	juil-15	yes	No	No		
		Concrete masonry (maçonnerie en béton)	MTS CONSTRUCTION	concrete bloc and sand bag	mars-15	juil-15	yes	No	No		
Infrastructure floor work (Infrastructure sol)	Rubbing (réparation de sol)	EASYCOM		mars-15	oct-15	yes	No	No			
	Concrete structure	CBC/BATEG		mars-14	août-17	yes	Yes	Yes			
Construction	Steel structure (structure métallique)	STT		juil-15	mars-16	yes	No	Yes			
		MEWARI (second order of STT)		juil-15	mars-16	yes	No	No			
		MTB (second order of STT)		juil-15	mars-16	yes	No	No			
	Waterproofing (étanchéité)	BATEMO	waterproof roll, insulating material	juin-15	mars-17	yes	No	No			
		BEUCING		juin-15	mars-17	yes	No	No			
	Casing (revêtement)	ETANCHÉITE RATIONNELLE		juin-15	mars-17	yes	No	No			
	Steel cladding (bardage)	OCER		janv-16	juin-16	yes	No	No			
		LES PIERREUX FRANCOIS		mars-15	juil-16	yes	No	No			
	Facade renovating (renovation facade)	MEWA DECOR (second order of LES PIERREUX FRANCOIS)		mars-15	juil-16	yes	No	No			
		REH (second order of LES PIERREUX FRANCOIS)		mars-15	juil-16	yes	No	No			
		External aluminium joinery (menuiserie ext alu)	SERALLI	aluminium chassis	juil-15	janv-16	yes	No	No		
			THERRY KAISER (second order of SERALLI)		juil-15	janv-16	yes	No	No		
			SARL OF FENETURES (second order of SERALLI)		juil-15	janv-16	yes	No	No		
	KALITER BYBA (second order of SERALLI)			juil-15	janv-16	yes	No	No			
	SAS BELLEVUE PARIS (second order of SERALLI)			juil-15	janv-16	yes	No	No			
	External wood joinery (menuiserie ext bois)	BILLET	Wood chassis	juil-15	juil-15	yes	No	No			
		ATB		juil-15	juil-15	yes	No	No			
	External aluminium joinery (menuiserie ext alu)	CYBISTORE		12-06	mai-16	yes	No	No			
		OFB TR TECHNOLOGIES		12-06	mai-16	yes	No	No			
	Furniture and putting blind (production de blindés)	INTERALLI France	Wood and wallboard	sept-15	juin-17	yes	No	No			
		INAC BATHUBENT (second order of INTERALLI France)		sept-15	juin-17	yes	No	No			
	Furniture and putting metallic ceiling (production de plafonds métalliques)	ALPHA GANIE (second order of INTERALLI France)		sept-15	juin-17	yes	No	No			
		CALORFUGE PARISIEN (second order of INTERALLI France)		sept-15	juin-17	yes	No	No			
		INTERVCON (second order of INTERALLI France)		sept-15	juin-17	yes	No	No			
		CLIXEUF (second order of INTERALLI France)		sept-15	juin-17	yes	No	No			
		TUVAUTERIE SUPPORT BATI INDUSTRIES (second order of INTERALLI France)		sept-15	juin-17	yes	No	No			
		CROCI France (second order of INTERALLI France)		sept-15	juin-17	yes	No	No			
		INTERALLI France		sept-15	juin-17	yes	No	No			
		INTERVCON (second order of INTERALLI France)		sept-15	juin-17	yes	No	No			
		INTERVCON (second order of INTERALLI France)		sept-15	juin-17	yes	No	No			
		INTERVCON (second order of INTERALLI France)		sept-15	juin-17	yes	No	No			
		INTERVCON (second order of INTERALLI France)		sept-15	juin-17	yes	No	No			
		INTERVCON (second order of INTERALLI France)		sept-15	juin-17	yes	No	No			
		INTERVCON (second order of INTERALLI France)		sept-15	juin-17	yes	No	No			
		INTERVCON (second order of INTERALLI France)		sept-15	juin-17	yes	No	No			
		INTERVCON (second order of INTERALLI France)		sept-15	juin-17	yes	No	No			
		INTERVCON (second order of INTERALLI France)		sept-15	juin-17	yes	No	No			
		INTERVCON (second order of INTERALLI France)		sept-15	juin-17	yes	No	No			
		Partition wall (mur de cloisonnement)	ISOLATION 2000	wallboard	mai-15	mars-17	yes	No	No		
			GOVANS SERVICES		mars-16	juin-17	yes	No	No		
			False ceiling (plafond faux)	SOLPL		juil-15	juin-17	yes	No	No	
	PORTAFEU				juil-15	juin-17	yes	No	No		
	Production and putting of metallic doors (Portes métalliques)		FERMI BAT 1		juil-15	juin-17	yes	No	No		
			FERMI BAT 1		juil-15	juin-17	yes	No	No		
	Hard ground (revêtement dur)		DECOR BARAL	tiles	juil-15	mars-17	yes	No	No		
			SMP	carpet slab	juil-15	juin-17	yes	No	No		
	Structural work (travaux structuraux)		REDUCOUP		mars-15	juil-15	yes	No	No		
			GROUPEMENT LASCOURE		juil-15	juin-16	yes	No	No		
	Painting and sculpture (peinture des façades extérieures)	CEGELEC	sheath, rail, tube, box	juin-15	juin-17	yes	No	No			
		SAGA	box, PVC	juin-15	juin-17	yes	No	No			
Heating, ventilation and air conditioning (CVC)	POP MOPIS (second order of SAGA)		juin-15	juin-17	yes	No	No				
	ISOLALM (second order of SAGA)		juin-15	juin-17	yes	No	No				
Plumbing (plomberie)	SERIS (second order of SAGA)		juin-15	juin-17	yes	No	No				
	PHIBOX	cable	juin-15	juin-17	yes	No	No				
Electricity (électricité)	GENELEC (second order of PHIBOX)		juin-15	juin-17	yes	No	No				
	POUTET SERVICES (second order of PHIBOX)		juin-15	juin-17	yes	No	No				
Elevator lift (ascenseur)	CLIMAT (second order of PHIBOX)		juin-15	juin-17	yes	No	No				
	RESEAUX PARTNER (second order of PHIBOX)		juin-15	juin-17	yes	No	No				
Elevator lift (ascenseur)	OTIS		oct-15	mars-17	yes	No	No				
	CREADIFFUSION		juil-15	juin-17	yes	No	No				
Arrangement (aménagement)	CAIA AMEUBLEMENT		juil-15	juin-17	yes	No	No				
	DEL BOCA		juil-15	juin-17	yes	No	No				
Facade restoration (restauration des façades)	ALGAPLEX		janv-17	juin-17	yes	No	No				
	LA FERRONIÈRE DE BIRE		juil-15	mars-17	yes	No	No				
Staircase restoration (restauration des escaliers)	BASTARDIZ		juil-15	juin-17	yes	No	No				
	COBA		juil-15	juin-17	yes	No	No				
Restoration and creating of stone ground (revêtement de sol)	BONNET TOROQUE		juin-16	juin-17	yes	No	No				
	EUROPARQUET		janv-17	juin-17	yes	No	No				
Grounding (nivellement)	ALDUP		janv-16	juin-17	yes	No	No				
	SENECOL		juil-15	juin-17	yes	No	No				
Painting (peinture)	SIGNATURE MURALE		janv-16	juin-17	yes	No	No				
	PPB PENTEC		juil-15	juin-16	yes	No	No				
Painting (peinture)	SER. TECH		sept-15	juin-17	yes	No	No				
	PRESTAMETAL		janv-17	juin-17	yes	No	No				
Ironwork (serrurerie)	BRAND INDUSTRIES		juil-15	juin-17	yes	No	No				
	BOB		juil-15	juin-16	yes	No	No				
Scallding (lissage de sol)	ECS (second order of SOBI)		juil-15	juin-16	yes	No	No				
	COTIDEM		janv-16	juin-17	yes	No	No				
Cleaning (nettoyage)	AEEN		janv-16	juin-17	yes	No	No				



## 2.3 Reverse logistics

	Data available	Waste															Subcontracting of waste management
		Type of waste (type de déchet)	Identification (identification)		Legislation		Waste sorting (tri des déchets)			Waste storage on site (stockage des déchets sur le chantier)		Evacuation					
			Yes/No	Photo/Video	Law in force? (loi en vigueur?)	Are identifying documents required? (documents d'identification requis?)	Sorting in the construction site (tri sur le chantier)	The reason for sorting (raison du tri)	By whom (par qui)	Means of storage used (moyens de stockage utilisés)	Surface area dedicated (surface dédiée)	Type of vehicle	Dedicated vehicle (V/N)	Handling means (moyens de manutention)	Destination		
Project phase (phase du projet)	Sub-contractors (sous-traitants)																
Partial demolition (Démolition partielle)	ATM BTP	Industrial wastes (Déchets industriels liquides)	No	No	Yes	Arrêté consulté du 9 septembre 2007	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck and Angewalt truck (Camion à benne et camion à benne)	Yes	Yes	LUXO BENNES OUEST 44 km de Charente-le-Mar 86100 - LES SAINTS-BOIS	Yes	LUXO BENNES OUEST
		Industrial wastes (Déchets industriels liquides)	No	No	Yes	Arrêté consulté du 9 septembre 2007	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck	Yes	Yes	PARISC 44 km de la Seine 91100 - Evry-Courcouronnes	Yes	PARISC
		Wood (Bois)	No	No	Yes	Arrêté consulté du 9 septembre 2007	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck and Angewalt truck (Camion à benne et camion à benne)	Yes	Yes	LUXO BENNES OUEST 44 km de Charente-le-Mar 86100 - LES SAINTS-BOIS	Yes	LUXO BENNES OUEST
		Wood (Bois)	No	No	Yes	Arrêté consulté du 9 septembre 2007	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck	Yes	Yes	PARISC 44 km de la Seine 91100 - Evry-Courcouronnes	Yes	PARISC
		Metal and scrap iron (MÉTALL - FERRAILLAGE)	No	No	Yes	Arrêté consulté du 9 septembre 2007	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck	Yes	Yes	PARISC 44 km de la Seine 91100 - Evry-Courcouronnes	Yes	PARISC (et ANDRÉ)
		Metal and scrap iron (MÉTALL - FERRAILLAGE)	No	No	Yes	Arrêté consulté du 9 septembre 2007	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck	Yes	Yes	PARISC 44 km de la Seine 91100 - Evry-Courcouronnes	Yes	PARISC (et ANDRÉ)
		Short rubble mixed and plaster (Gravats mélangés mortier - Plâtre)	No	No	Yes	Arrêté consulté du 9 septembre 2007	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck and Angewalt truck (Camion à benne et camion à benne)	Yes	Yes	LUXO BENNES OUEST 44 km de Charente-le-Mar 86100 - LES SAINTS-BOIS	Yes	LUXO BENNES OUEST
		Clean rubble - concrete (GRAVATS PROPRES - BÉTON)	No	No	Yes	Arrêté du 12 décembre 2004	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck	Yes	Yes	PARISC 44 km de la Seine 91100 - Evry-Courcouronnes	Yes	PARISC - Gravel Dan
		Short rubble mixed (GRAVATS MÉLÉS EN MÉLANGE)	No	No	Yes	Arrêté du 12 décembre 2004	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck and Angewalt truck (Camion à benne et camion à benne)	Yes	Yes	LUXO BENNES OUEST 44 km de Charente-le-Mar 86100 - LES SAINTS-BOIS	Yes	LUXO BENNES OUEST
		Industrial wastes (Déchets industriels liquides)	No	No	Yes	Arrêté consulté du 9 septembre 2007	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck	Yes	Yes	PARISC 44 km de la Seine 91100 - Evry-Courcouronnes	Yes	POISSON TERRASSEMENT
	AGS	Industrial wastes (Déchets industriels liquides)	No	No	Yes	Arrêté consulté du 9 septembre 2007	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck	Yes	Yes	COURTAGE NEGOCES INTERNATIONAL 44 Route de la République 86100 - MANTOUILLON	Yes	COURTAGE NEGOCES INTERNA
		Industrial wastes (Déchets industriels liquides)	No	No	Yes	Arrêté consulté du 9 septembre 2007	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck	Yes	Yes	COURTAGE NEGOCES INTERNATIONAL 44 Route de la République 86100 - MANTOUILLON	Yes	AGS
		Industrial wastes (Déchets industriels liquides)	No	No	Yes	Arrêté consulté du 9 septembre 2007	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck	Yes	Yes	COURTAGE NEGOCES INTERNATIONAL 44 Route de la République 86100 - MANTOUILLON	Yes	AGS
		Industrial wastes (Déchets industriels liquides)	No	No	Yes	Arrêté consulté du 9 septembre 2007	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck	Yes	Yes	COURTAGE NEGOCES INTERNATIONAL 44 Route de la République 86100 - MANTOUILLON	Yes	AGS
		Industrial wastes (Déchets industriels liquides)	No	No	Yes	Arrêté consulté du 9 septembre 2007	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck	Yes	Yes	COURTAGE NEGOCES INTERNATIONAL 44 Route de la République 86100 - MANTOUILLON	Yes	AGS
Others project phases	CBC B&T/G	Short rubble mixed (GRAVATS MÉLÉS EN MÉLANGE)	No	No	Yes	Arrêté du 12 décembre 2004	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck	Yes	Yes	COURTAGE NEGOCES INTERNATIONAL 44 Route de la République 86100 - MANTOUILLON	Yes	COURTAGE NEGOCES INTERNA
		Short rubble mixed (GRAVATS MÉLÉS EN MÉLANGE)	No	No	Yes	Arrêté du 12 décembre 2004	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck	Yes	Yes	COURTAGE NEGOCES INTERNATIONAL 44 Route de la République 86100 - MANTOUILLON	Yes	AGS
		Clean rubble (GRAVATS PROPRES)	No	No	Yes	Arrêté du 12 décembre 2004	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck	Yes	Yes	POISSON TERRASSEMENT 11 route de la République 86100 - MANTOUILLON	Yes	POISSON TERRASSEMENT
		Clean rubble (GRAVATS PROPRES)	No	No	Yes	Arrêté du 12 décembre 2004	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck	Yes	Yes	POISSON TERRASSEMENT 11 route de la République 86100 - MANTOUILLON	Yes	AGS
		Sanitary wastes, electrical and electronic equipment wastes, and liquid and gaseous waste (Déchets divers)	No	No	Yes	Arrêté du 2004-1228 du 10 décembre 2004	Arrêté Préfectoral du 05.05.2007 et AP du 12.12.2008	Yes	Imposed by the clients for the HGE certification	AGS	waste containers (bacs à déchets)	Dumper truck	Yes	Yes	POISSON TERRASSEMENT 11 route de la République 86100 - MANTOUILLON	Yes	POISSON TERRASSEMENT










## 3.2 Construction site

								General points									Current working practices					Urban constraints												
				Planning		Material description		Persons in charge of logistic				Surface area dedicated to logistic				Handling practices		Logistic area identification			Receiving conditions													
Project phase	Building component	Material	Estimated starting date	Estimated end date	Unit	Total quantity	Dedicated person to all logistics aspects	material reception	quality control	handling from truck to storage area	handling from storage area to point of use	Surface area dedicated to logistic	Logistic area composition (floor, etc)	Surface area really used	Total surface area available	handling equipment	Several time moving (Y/N)	Area dedicated to specific materials (Y/N)	Area marking (Y/N)	Schedule of use (Y/N)	delivery frequency (number of total trips per day)	Quantities per delivery	Quality control (Y/N)	Delivery hours	Reduced constraints for certain type of trucks	Possibility of use of the public area	number of maximum vehicles allowed for on some roads	number of kilos transported on some roads						
GROUND WORKS	Fillings from own soils, embankment	Soil	11-mar-15	9-avr-15	m3	28 443,00	Same person for all logistics aspects: PROJECT MANAGER or PRODUCTION MANAGER and FOREMAN	Same person for all logistics aspects: PROJECT MANAGER or PRODUCTION MANAGER and FOREMAN	NA	NA	NA	na	Internal logistic storage areas are located at the ground level of the construction site	na	78470,4 m2	Face shovel, dump truck, tank-truck, motor grader, vibrating roller	Y	Y	Y	Y	120	12		There is no time restriction for trucks related to construction deliveries	No restrictions for construction trucks	Permission to use the public area under special authorisation by the City Hall. In the case studied, the storage will be located inside the site area.	No restrictions regarding the number of vehicles	Load condition regulation by special permissions for vehicles delivering material for construction site. No upper weight limit						
	Fillings from own soils, walls	Soil	7-ago-15	28-ago-15	m3	5 412,36						na		na	Backhoe, dump truck, tank-truck, motor grader, vibrating roller	Y	Y	Y	Y	32	12													
FOUNDINGS, STRUCTURES AND WALLS	Green Walls	Concrete	8-jul-15	14-ago-15	m2	1 844,00						2500m2				Mixer truck, Hydraulic crane	N	Y	Y	Y	7	60												
	Precast concrete panels	Concrete	4-may-15	11-jun-15	m2	2 743,67										Mixer truck, Hydraulic crane	N	Y	Y	Y	3	40												
GARDENING	Trees	Trees	4-avr-16	19-ago-15	ud	1099						500 m2				Backhoe, dump truck, tank-truck, crane	N	Y	Y	Y	4	40												
	Plants	Plants	15-mar-16	19-ago-16	ud	52025										Backhoe, dump truck, tank-truck, crane	N	Y	Y	Y	4	150												
FLOORS, BLOCKS AND KERBS	Fillings of selected material	Soil	29-sep-15	14-oct-15	m3	3 830,71										NA	NA	NA	2500 m2			Backhoe, tank-truck, dump truck, motor grader, vibrating roller	Y						Y	Y	Y	32	12	
	Paving Stone recovered from "artes" basalt	Paving Stone	26-feb-16	27-avr-16	m2	4 060,00														Cement mixer, forklift	N	Y	Y						Y	Y	4	110		
	Exterior pavement (Calatrava Stone)	Paving Stone	18-dic-15	28-avr-16	m2	13 102,00														Cement mixer, forklift	N	Y	Y						Y	Y	4	110		
	Concrete slab pavement for sidewalks	Concrete	28-dic-15	25-feb-16	m2	6 100,00														Cement mixer, forklift	N	Y	Y						Y	Y	4	110		
	Concrete slab pavement for roundabout	Concrete			m2	180,00														Cement mixer, forklift	N	Y	Y						Y	Y	4	110		
	Exterior pavement slabs (Kids amphora)	Pavement	26-ene-16	11-mar-16	m2	2 350,00														Cement mixer, forklift	N	Y	Y						Y	Y	4	110		
	Hydraulic tile pavement	Pavement			m2	2 120,00														Cement mixer, forklift	N	Y	Y						Y	Y	4	110		
	Pavement type "albino arpaq"	Pavement	18-avr-16	28-avr-16	m2	11 931,00														Cement mixer, forklift	N	Y	Y						Y	Y	16	110		
	Wooden platform for kids	Wood	14-mar-16	28-mar-16	m2	142,00															Cement mixer, forklift, grinding machine	N	Y						Y	Y	Y	4	110	
	Wooden kerb	Wood	29-mar-16	19-avr-16	m	598,00															Cement mixer, forklift, grinding machine	N	Y						Y	Y	Y	5	200	
	Concrete kerbs and ditches	Concrete	9-nov-15	2-dic-15	m	8 268,00															Cement mixer, forklift	N	Y						Y	Y	Y	5	300	
	Precast concrete block	Concrete	11-nov-15	11-dic-15	m	660,00															Cement mixer, forklift	N	Y						Y	Y	Y	5	60	
	Natural Stone Block	Stone	14-dic-15	18-ene-16	m	4 787,59															Cement mixer, forklift	N	Y						Y	Y	Y	8	40	



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## 4 Verona

### 4.1 Distribution network

										Distribution network detailed description					
										Material origin and route					
										Planning		Production location		Last storage location	
Project phase	Building component	Material	ITALIAN	Brand	Subcontractor	Estimated starting date	Estimated end date	Name	Address	Name	Address				
Rental equipments			Attrezzature noleggio												
	Crain		Gru edile	POTAIN	CMB	01-Jun-14	01-Mar-17			CMB	Via Carlo Marx, 101, 41012 Carpi (MO)				
	Fork lift		Muletto telescopico sollevatore	MANITOU - MERLO	BACCARANI - CMB	01-Jun-14	01-Mar-17			CMB	Via Carlo Marx, 101, 41012 Carpi (MO)				
	Walkway		Ponteggi	FRACASSO	CMB	01-Nov-14	01-Dec-16			CMB	Via Carlo Marx, 101, 41012 Carpi (MO)				
	Shoring material		Sistemi di puntellazione	PERI - DOKA	CONSORZIO EDILVENETO	01-Nov-14	01-Oct-15	Doka	Strada Provinciale Cerca 23, 20060 Colturano (MI)	Consorzio Edilveneto	Via Luigi Carozzani, 15, 30027 San Donà di Piave (VE)				
	Formwork		Casseforme da getto	PERI SKYDECK	CONSORZIO EDILVENETO	01-Nov-14	01-Oct-15	Peri	Via Giovanni Pascoli 4, 20060 Basiglio (MI)	Consorzio Edilveneto	Via Luigi Carozzani, 15, 30027 San Donà di Piave (VE)				
Structural works			Lavori strutturali												
		Reinforced Concrete		BETONROSSI-ALFA ACCIAI	CONSORZIO EDILVENETO	01-Nov-14	01-Mar-15	(A) Cementirossi (cement). (B) Inerti S. Valentino (aggregate). (C) Mapei (additive). (D) Alfa Acciai (steel)	(A) Via San Giacomo 18, 31040, Pederobba (TV). (B) Località Cà Nova Tacconi 37012, Bussolengo (VR). (C) Strada Provinciale 159 Bettola Sordio 1, 20060, Mediglia (MI). (D) Via S. Polo, 152, 25134 Brescia (BS).	(A) Betonrossi (B) Ferroberica	(A) Via Filisoline, 37026 Pescantina (VR) (B) Via dell'Edilizia, 22, 36100 Vicenza (VI)				
	Foundation laying		Realizzazione delle strutture d												
		Reinforced Concrete		BETONROSSI-ALFA ACCIAI	CONSORZIO EDILVENETO	01-Jan-15	01-Oct-15	(A) Cementirossi (cement). (B) Inerti S. Valentino (aggregate). (C) Mapei (additive). (D) Alfa Acciai (steel)	(A) Via San Giacomo 18, 31040, Pederobba (TV). (B) Località Cà Nova Tacconi 37012, Bussolengo (VR). (C) Strada Provinciale 159 Bettola Sordio 1, 20060, Mediglia (MI). (D) Via S. Polo, 152, 25134 Brescia (BS).	(A) Betonrossi (B) Ferroberica	(A) Via Filisoline, 37026 Pescantina (VR) (B) Via dell'Edilizia, 22, 36100 Vicenza (VI)				
	Reinforced concrete walls and pillars		Realizzazione di setti e pilastri												
		Reinforced Concrete		BETONROSSI-ALFA ACCIAI	CONSORZIO EDILVENETO	01-Feb-15	01-Oct-15	(A) Cementirossi (cement). (B) Inerti S. Valentino (aggregate). (C) Mapei (additive). (D) Alfa Acciai (steel)	(A) Via San Giacomo 18, 31040, Pederobba (TV). (B) Località Cà Nova Tacconi 37012, Bussolengo (VR). (C) Strada Provinciale 159 Bettola Sordio 1, 20060, Mediglia (MI). (D) Via S. Polo, 152, 25134 Brescia (BS).	(A) Betonrossi (B) Ferroberica	(A) Via Filisoline, 37026 Pescantina (VR) (B) Via dell'Edilizia, 22, 36100 Vicenza (VI)				
	hollow-core concrete floors		realizzazione di solai in cemento armato pieno sp 30 cm												
	Metal carpentry realization		Realizzazione di carpenterie metalliche		COSTRUZIONI METALLICHE MULTIN	01-Jan-16	01-Dec-16								
				BETONROSSI-ALFA ACCIAI	CONSORZIO EDILVENETO	01-Oct-15	01-Oct-15	(A) Cementirossi (cement). (B) Inerti S. Valentino (aggregate). (C) Mapei (additive). (D) Alfa Acciai (steel)	(A) Via San Giacomo 18, 31040, Pederobba (TV). (B) Località Cà Nova Tacconi 37012, Bussolengo (VR). (C) Strada Provinciale 159 Bettola Sordio 1, 20060, Mediglia (MI). (D) Via S. Polo, 152, 25134 Brescia (BS).	(A) Betonrossi (B) Ferroberica	(A) Via Filisoline, 37026 Pescantina (VR) (B) Via dell'Edilizia, 22, 36100 Vicenza (VI)				
	roof cladding		Solaio di copertura (uguale agli												
Casing			Involucro												
	Facade cladding	Aluminium + stone	Rivestimento facciata	SCHUCO	BASE SPA	01-Oct-15	01-Feb-16	Schuco	Via del Progresso, 42, 35127 Padova (PD)	Base s.p.a.	Via Mattarella Piersanti, 32/34, 36061, Bassano del Grappa (VI)				
	Windows		Finestre	SCHUCO	BASE SPA	01-Aug-15	01-Feb-16	Schuco	Via del Progresso, 42, 35127 Padova (PD)	Base s.p.a.	Via Mattarella Piersanti, 32/34, 36061, Bassano del Grappa (VI)				
	Windows installation	Aluminium	Montaggio infissi	SCHUCO	BASE SPA	01-Aug-15	01-Feb-16	Schuco	Via del Progresso, 42, 35127 Padova (PD)	Base s.p.a.	Via Mattarella Piersanti, 32/34, 36061, Bassano del Grappa (VI)				
	Glass installation		Montaggio vetri multistrato per abbattimento acustico e tenuta termica	SCHUCO	BASE SPA	01-Aug-15	01-Feb-16	Guardian Europe	19, rue de Puits Romain - 8070 Bertrange Luxembourg	Base s.p.a.	Via Mattarella Piersanti, 32/34, 36061, Bassano del Grappa (VI)				
	Doors		Porte esterne	SCHUCO	BASE SPA	01-Aug-15	01-Feb-16	Schuco	Via del Progresso, 42, 35127 Padova (PD)	Base s.p.a.	Via Mattarella Piersanti, 32/34, 36061, Bassano del Grappa (VI)				
	Roof finishing		Finitura del tetto												
	Roof soil sealing	Tar paper with polyester	Impermeabilizzazione con guai	GRACE	IMPERNOVO	01-May-15	01-Nov-15	Edilteco spa	Via dell'Industria 710, 41028 San Felice Sul Via Giuseppe di Vittorio, 1, 50053 Empoli (FI)	Impernovo	Via A. A. Mari, 21, 41034 Finale Emilia (MO)				
	thermal-acoustic insulation		Posa di materiali fonoassorbent	LAPE	IMPERNOVO	01-May-15	01-Nov-15	Lape HD srl		Impernovo	Via A. A. Mari, 21, 41034 Finale Emilia (MO)				
Finishing			Finiture												
		sand +cement			PENTA SERVICES	01-Jun-15	01-Nov-15	(A) Cave di Pilcante sas (sand) (B) Materiali Edili F.lli Donà (cement)	(A) Strada Provinciale 90 km 12, 38061, Pilcante di Ala (TN). (B) Via Fossalta, 2, 35025, Cartura PD	Penta Services	Via Valentino Bernardi, 25, 31039 Riese Pio X (TV)				
	screed		Massetto grezzo												
	thermal-acoustic insulation mater	Polystyrene	Posa dei materiali fonoisolanti e fonoassorbenti	LAPE	IMPERNOVO	01-May-15	01-Nov-15	Lape HD srl	Via Giuseppe di Vittorio, 1, 50053 Empoli (FI)	Impernovo	Via A. A. Mari, 21, 41034 Finale Emilia (MO)				
		sand +cement			PENTA SERVICES	01-Jun-15	01-Nov-15	(A) Cave di Pilcante sas (sand) (B) Materiali Edili F.lli Donà (cement)	(A) Strada Provinciale 90 km 12, 38061, Pilcante di Ala (TN). (B) Via Fossalta, 2, 35025, Cartura PD	Penta Services	Via Valentino Bernardi, 25, 31039 Riese Pio X (TV)				
	Screed		Massetto di allestimento												
	Resin floor		Posa del pavimento resilianti	TARKETT	RIVESTYLE SAS	01-Apr-16	01-Oct-16	Tarketti Italia	Via Sant'Anna, 6, 05035 Narni (TR)	Rivestyle sas	Via Fieschi, 3, 16121 Genova (GE)				
	Plaster	Slaved Aerated Concrete	Pareti in cartongesso	GYPRO	COVER CONTRACT	01-Jun-15	01-Dec-16	(A) Gyproc Saint Gobain (lastre) (B) Isover Saint Gobain (lana)	(A) Gyproc Saint Gobain (lastre) (B) Isover Saint Gobain (lana)	Coiver	Via Bizzozzero, 93, 20032 Cornano (MI)				
				LECA SISTEM	MAROSO IVO ENZO	01-Mar-15	01-Sep-15	Lecasytem	Via Vittorio Veneto, 57, 43045 Fomovo di Taro (PR)	Lecasytem	Via Vittorio Veneto, 57, 43045 Fomovo di Taro (PR)				
	Fire door		Pareti in leca												
			Porte REI (resistenza al fuoco e con controllo remoto per sezionare i reparti in caso di incendio)	SCHIEVANO	NOVOFERM	01-Nov-15	01-Nov-16	Novoferm	Via Alessandro Volta, 1, 35012 Camposampiero (PD)	Novoferm	Via Alessandro Volta, 1, 35012 Camposampiero (PD)				
			Porte interne		IALC SERRAMENTI	01-Mar-16	01-Nov-16	Ialc	Via Spin, 134, 36060 Romano D'ezzelino (VI)	Ialc	Via Spin, 134, 36060 Romano D'ezzelino (VI)				
	Painting		Tinteggiatura		COVER SIGN & COLOR	01-Mar-16	01-Nov-16			Coiver	Via Bizzozzero, 93, 20032 Cornano (MI)				
	false ceiling		Controsoffittatura	BPB	COVER CONTRACT	01-Mar-16	01-Nov-16	Bpb	Strada Provinciale Traversa della Termolese Z.I. Pantano Basso, 86039 Termoli (CB).	Coiver	Via Bizzozzero, 93, 20032 Cornano (MI)				
	Painting		Pittura		COVER SIGN & COLOR	01-Mar-16	01-Nov-16	IVAS Industria Vernici	Via Bellaria, 40, 47030 San Mauro Pascoli (FC)	Coiver	Via Bizzozzero, 93, 20032 Cornano (MI)				



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				Works																				
				Planning		Requirements			Integration			System testing			Works design in site			Release				Subcontracting of works management		
				Type of work	Yes	No	Procedures	Is it built?	Is it in testing	Is it in use?	Testing in the last 30 days	The date for testing	By whom		Material design card	Material (contract) card	Type of work	Contracted work (Y/N)	Handling issues	Dedication	Subcontracted for works management	Subcontractor name		
Project phase	Building components	Material	Issues	Estimated starting date	Estimated end date																			
Initial requirements	Foundation		Architectural drawings																					
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
Design	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
Construction works	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
Testing	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
Release	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
Subcontracting	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
Subcontractor	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
Subcontractor	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
Subcontractor	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
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	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
Subcontractor	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
	Foundation		Architectural drawings	2019-01-01	2019-01-01																			
Subcontractor	Foundation		Architectural drawings																					



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