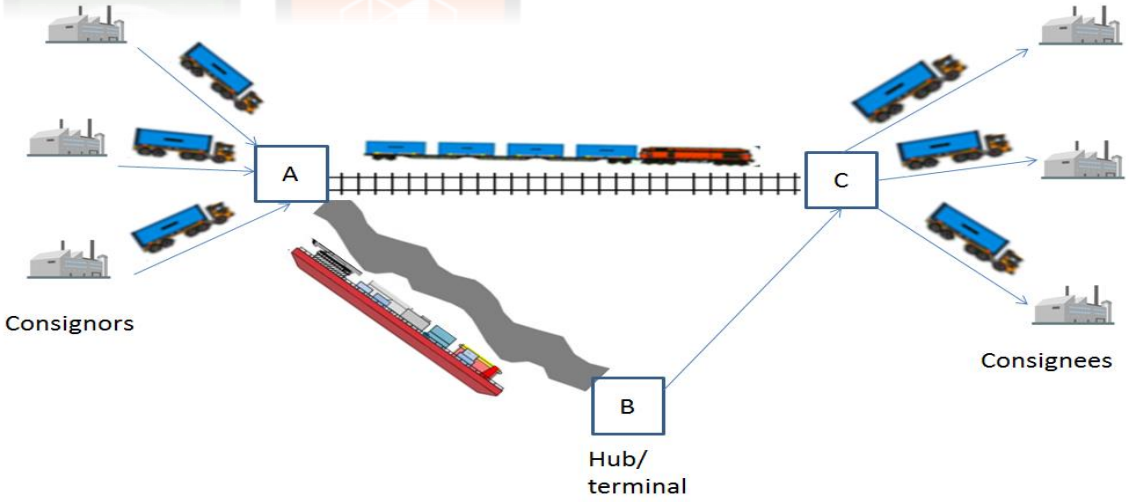
Sustainable transportation for all and beyond

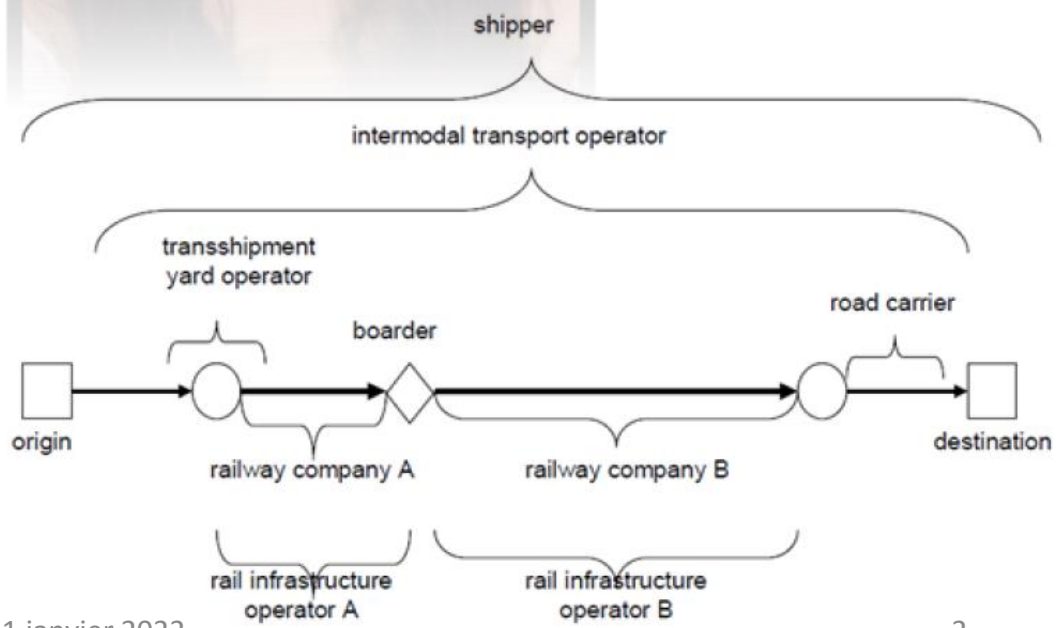
Fatima Ezzahra **Achamrah,** Tanguy **Baiwir,** Elodie **Bebronne,**
Sabine **Limbourg** & Florian **Peters**

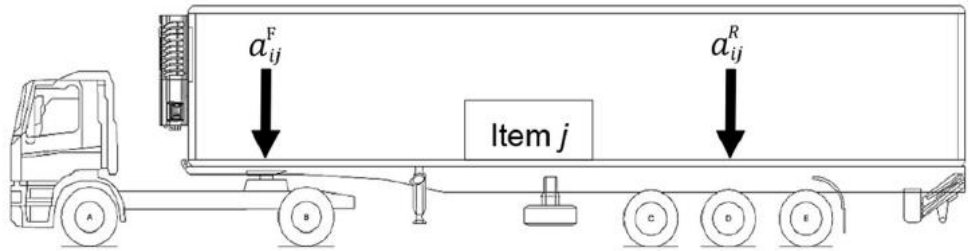


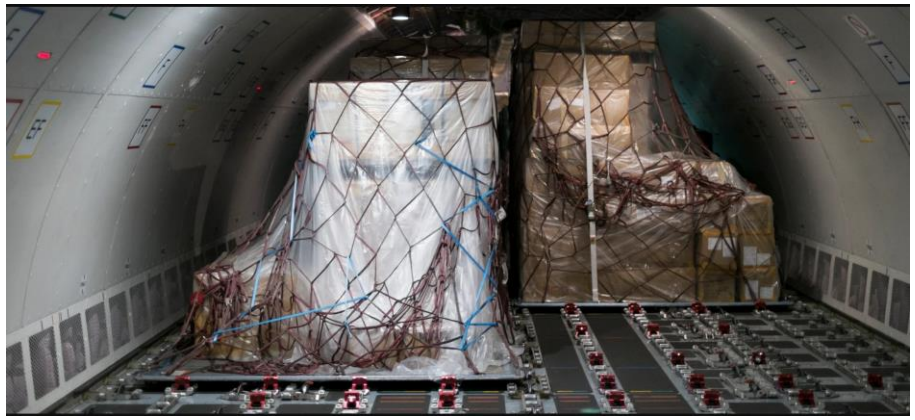
belspo

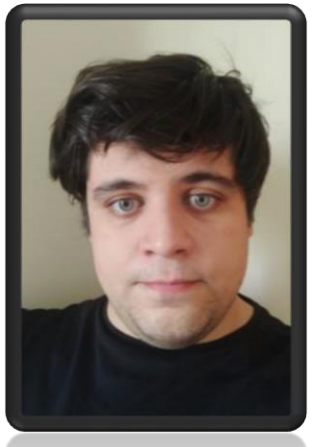
ADEME

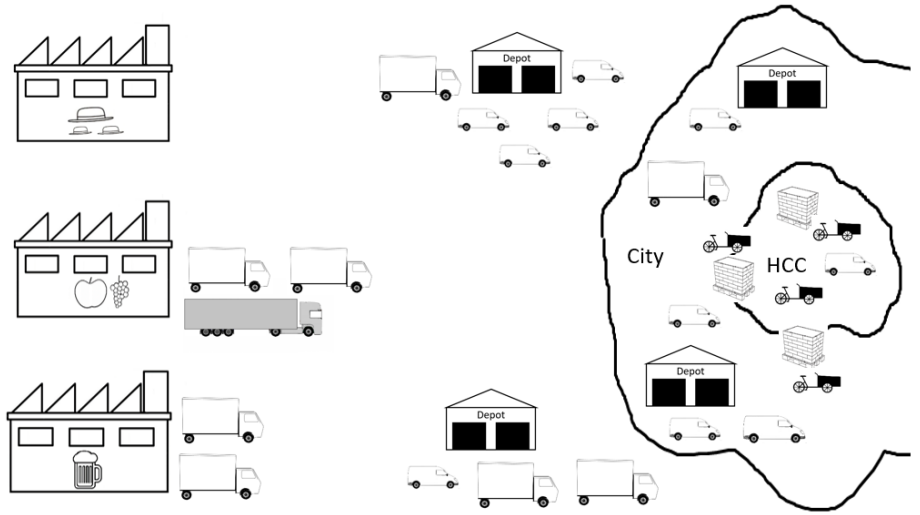
Agence de l'Environnement
et de la Maîtrise de l'Energie











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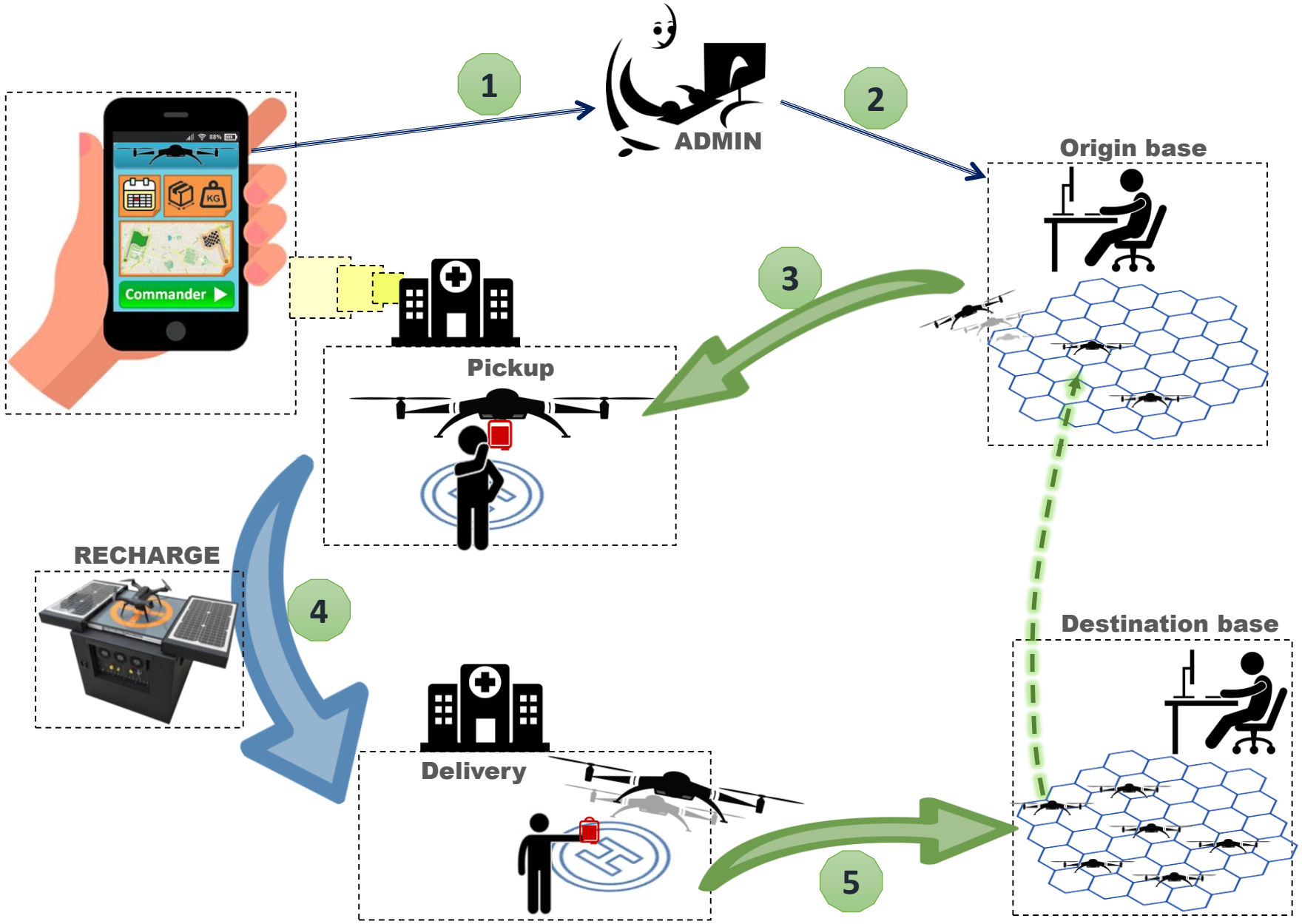
Drone4Care

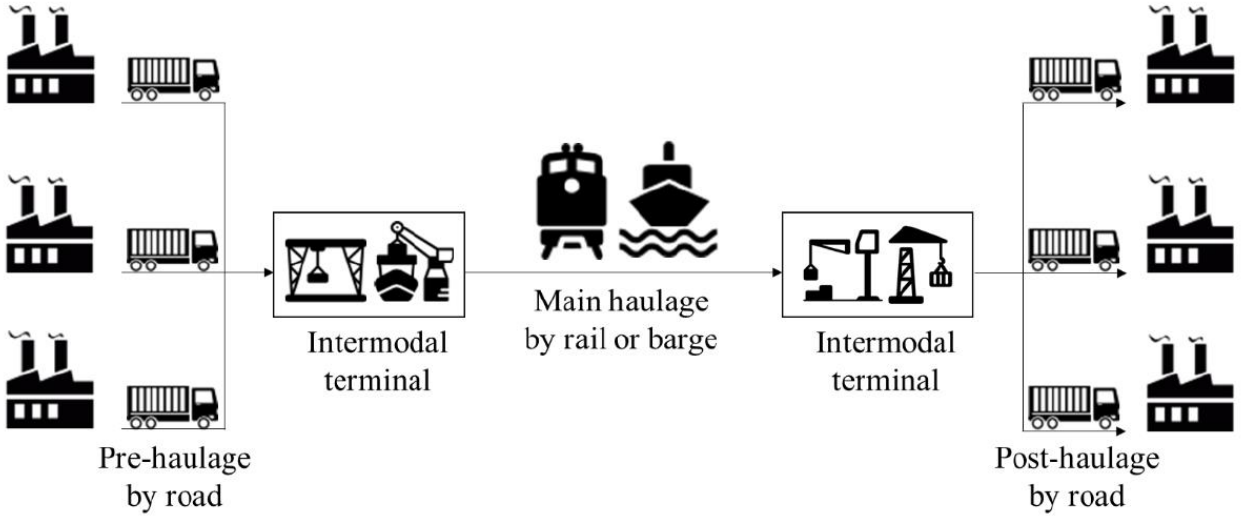

13
CLIMATE ACTION

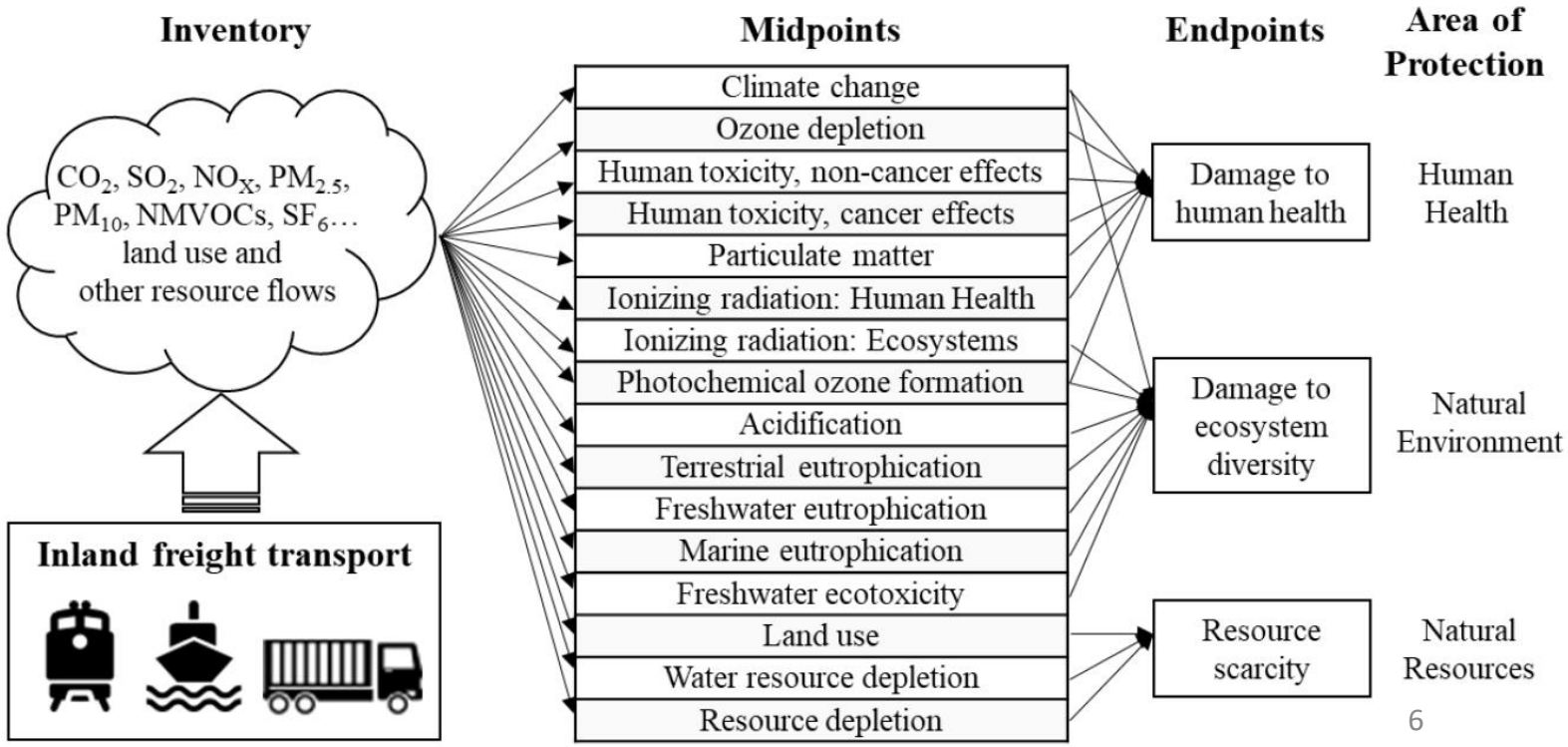

3
GOOD HEALTH AND WELL-BEING


1
ADMIN
2
Origin base
Commander
3
Pickup
RECHARGE
4
Destination base
Delivery
5

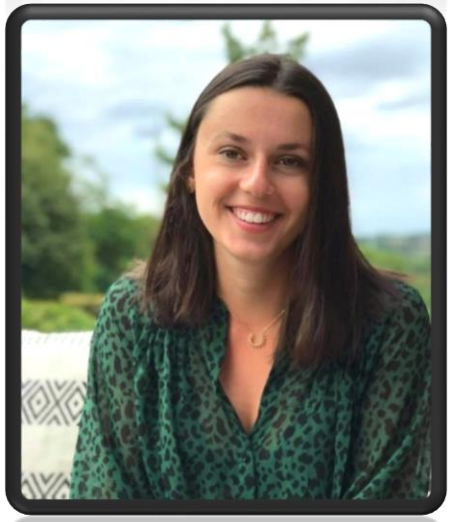
Eclosio

ARES



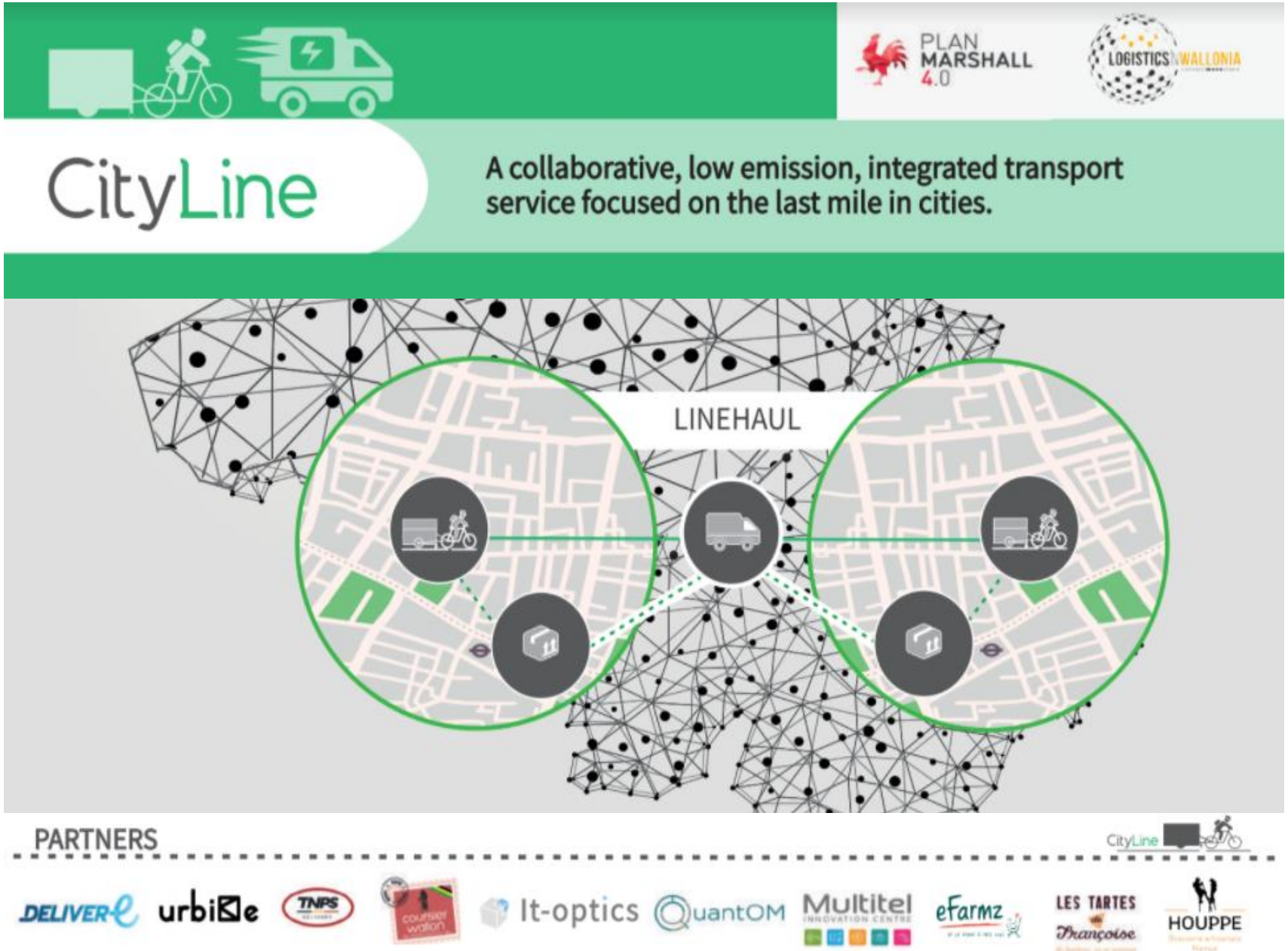


- Cost & CO_2 emissions
- Cost & external costs
- Cost & air pollution



CO2 eq	300	Emissions
2	Cargo bike	0,0446
1	Electric van	0,1814
1	Thermal van	0,3360
1	Light truck	0,4816

NOx eq	300	Emissions
2	Cargo bike	0,00012
1	Electric van	0,00060
1	Thermal van	0,00151
1	Light truck	0,00070

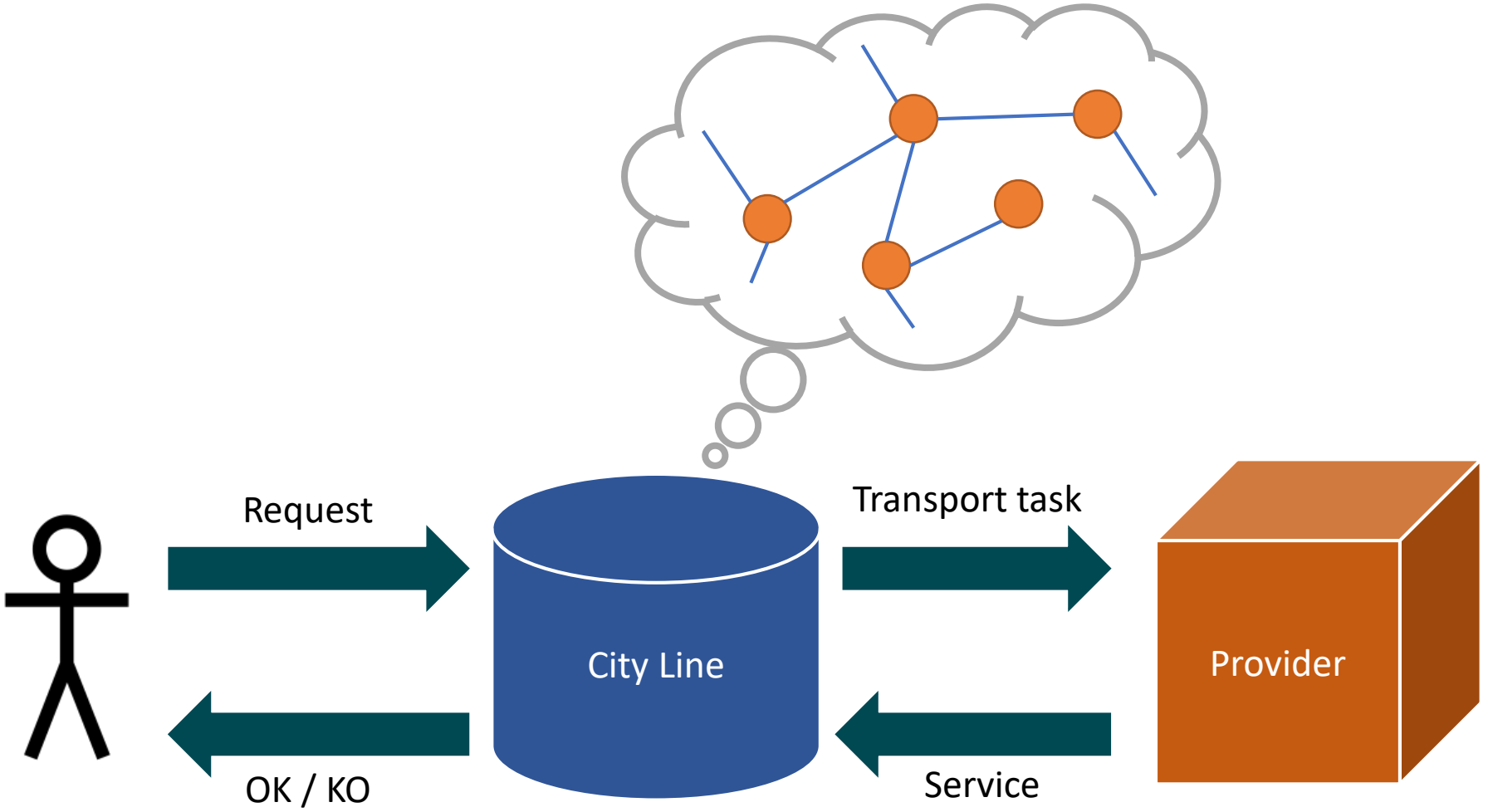

CityLine
A collaborative, low emission, integrated transport service focused on the last mile in cities.
PLAN MARSHALL 4.0
LOGISTICS WALLONIA
LINEHAUL
PARTNERS
CityLine
DELIVER
urbike
TNPS
courser wallon
It-optics
QuantOM
Multitel
eFarmz
LES TARTES Françoise
HOUPPE

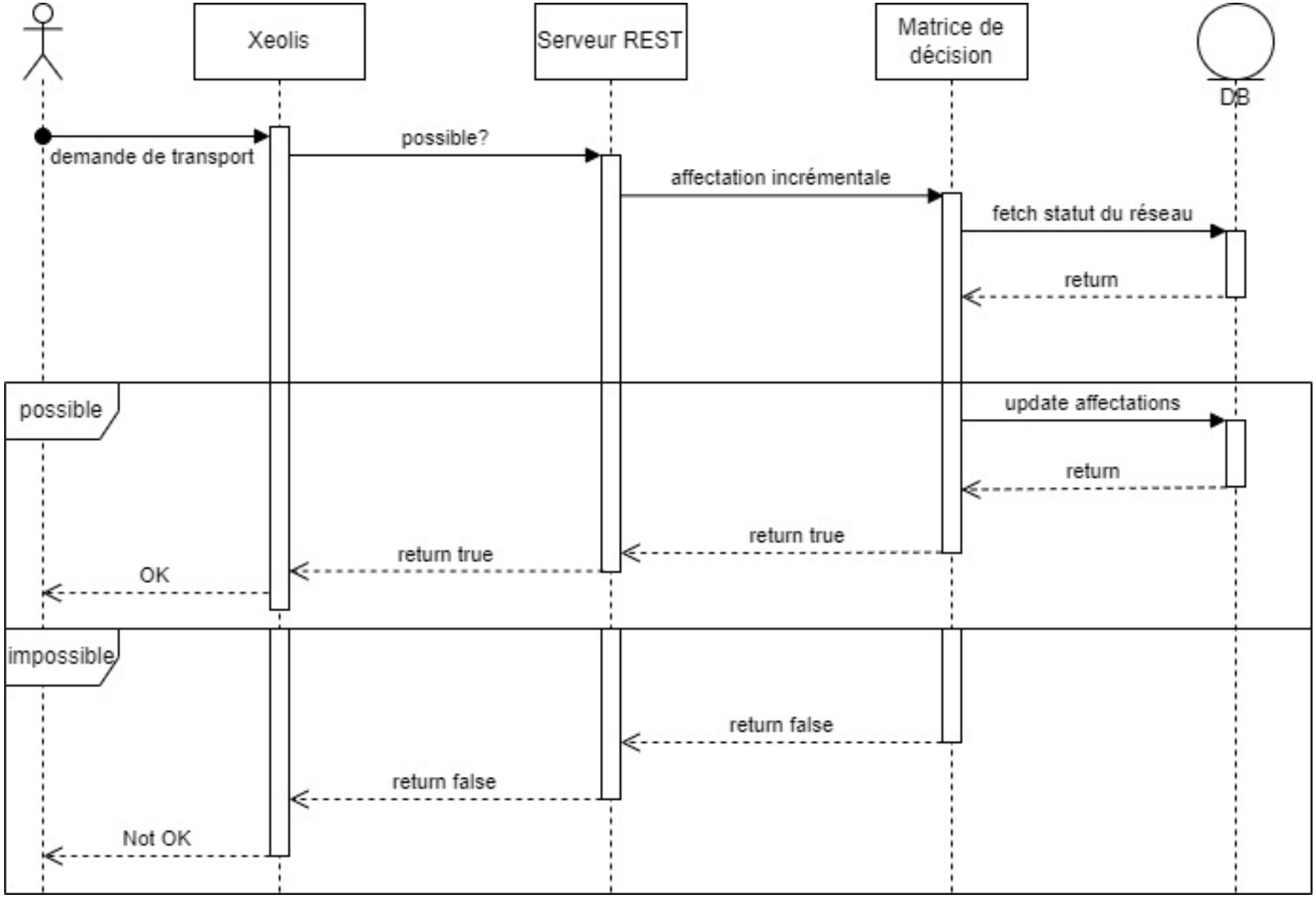
- Digitalization of freight transport
- Making bike transportation more viable

- Decrease harmful emissions within cities
- Limit total CO_2 emissions

- Resources pooling
- Collaborative logistics
- Consolidation of packages
- Higher market coverage

City Line – Modus Operandi

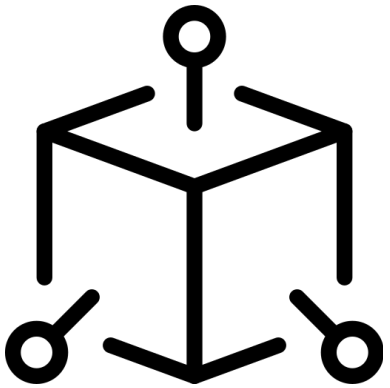



Xeolis
Serveur REST
Matrice de décision
DB
demande de transport
possible?
affectation incrémentale
fetch statut du réseau
return
possible
update affectations
return
return true
return true
OK
impossible
return false
return false
Not OK

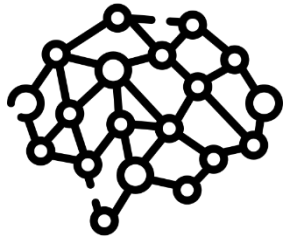
Provider reality

- Opening & closing hours
- Accessible pick-up zones
- Dynamic pricing
- Fragility and temperature constraints

Model reality



- Time-windows
- Geofencing data (e.g. GeoJSON)
- Custom pricing functions
- Tags matching



Optimization technique

Incremental optimization :

- For each delivery request:
  - Generate all paths from origin to destination
  - For each path:
    - Compute CO_2 eq.
    - Compute economic costs
    - Compute final score as weighted sum
  - Select path with lowest score

Additional techniques → *GAP model, Bi-objective graph search, …*

HEC LIÈGE
Management School - Liège Université

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DECISION TOOL

Build resilient infrastructure, promote sustainable industrialization and *foster innovation*

- Electric vans
- eBikes + Trailers
- Double deck trailers

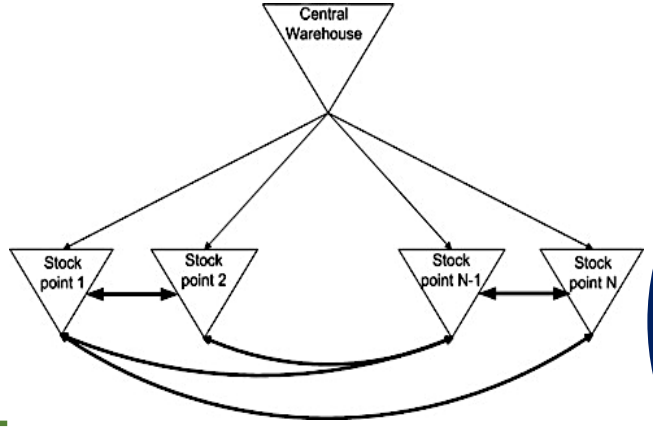
Make cities inclusive, safe, resilient and sustainable

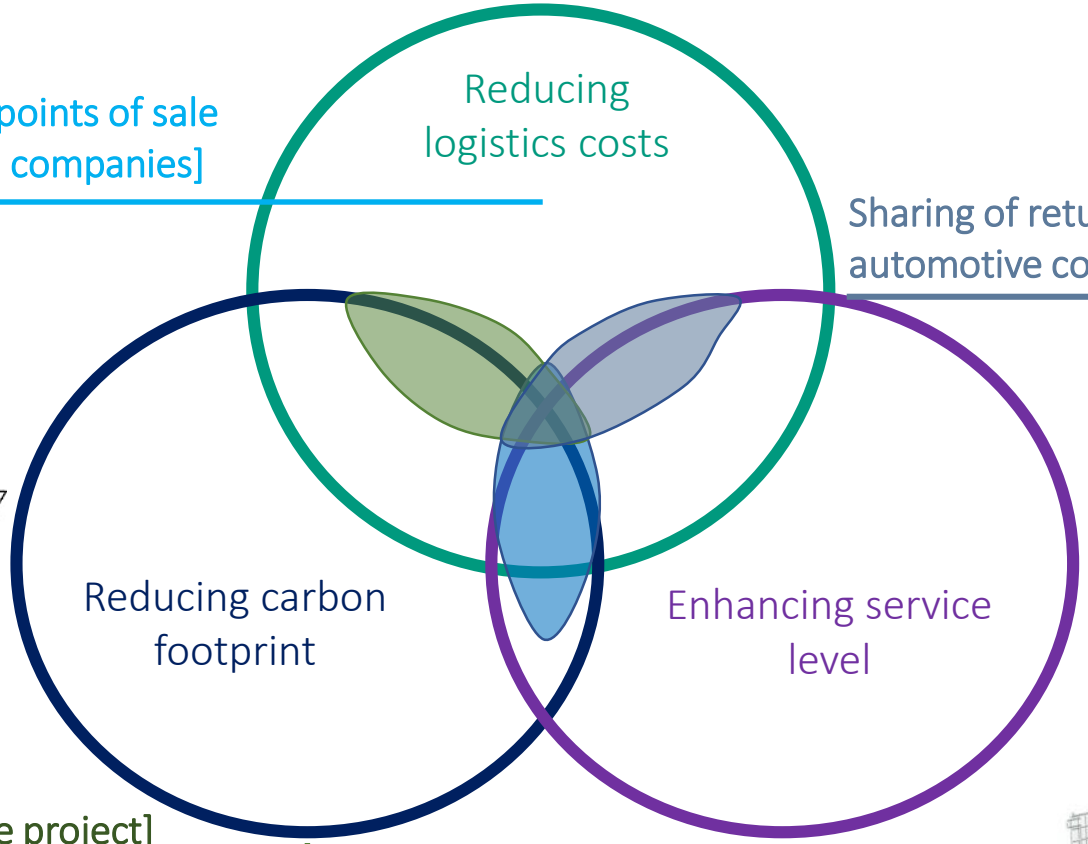
- Air quality
- Noise pollution
- Congestion
- Safety
- Shared logistics infrastructures

Take urgent action to combat climate change and its impacts

Resource sharing refers to **the sharing and pooling of physical assets between partners** on the basis of the principle of logistic collaboration. This is can be applicable in sharing of vehicles/trucks, consumable resources (product inventory) and RTI.

Inventory sharing between retailers, points of sale [fashion and spare parts distribution companies]





Sharing of returnable transport items (RTI) [food and automotive companies]

Sharing of transportation means [City Line project]


12
RESPONSIBLE CONSUMPTION AND PRODUCTION


TARGET 12.5
SUBSTANTIALLY REDUCE WASTE GENERATION


11
SUSTAINABLE CITIES AND COMMUNITIES


TARGET 11.A
STRONG NATIONAL AND REGIONAL DEVELOPMENT PLANNING

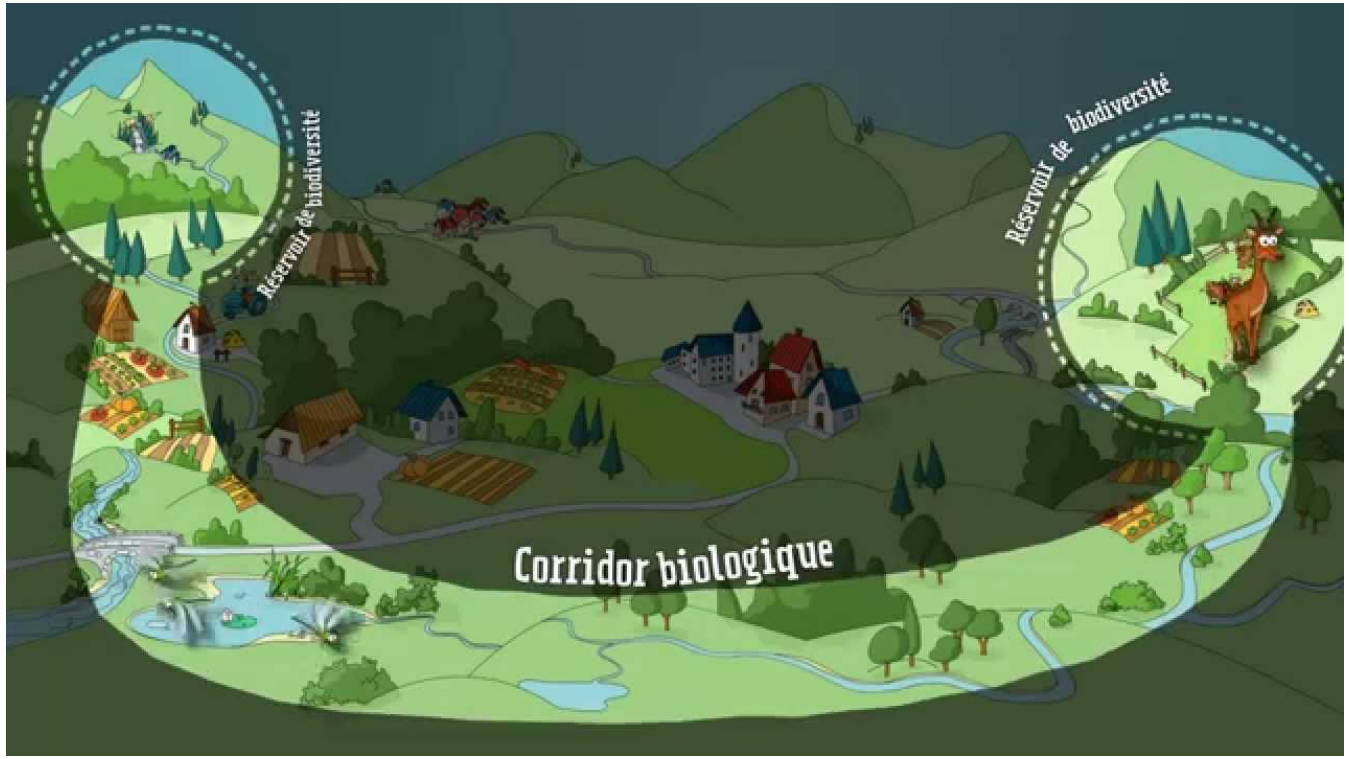
Case studies are considered to foster sharing of physical assets mainly finished product and RTI. Different configurations are studied to highlight the benefits/limits of promoting sharing.

Solving the different models help to assess and quantify the impact of promoting sharing on the overall performance of the supply chains: reducing costs to about **56%** and increasing service level to about **40%**.

Sharing transportation means (City Line Project): generating of routes considering time windows, logistic costs, CO_2 emissions

Sharing transportation means (City Line Project): developing models for cost/profit allocation between involved parties

"Wildlife movement corridors, also called dispersal corridors or landscape linkages as opposed to linear habitats, are linear features whose primary wildlife function is to connect at least two significant habitat areas" (Beier and Loe, 1992 *in* Bond, 2003, p.1)



Connection corridors to alleviate biodiversity loss: conception through mathematical optimisation

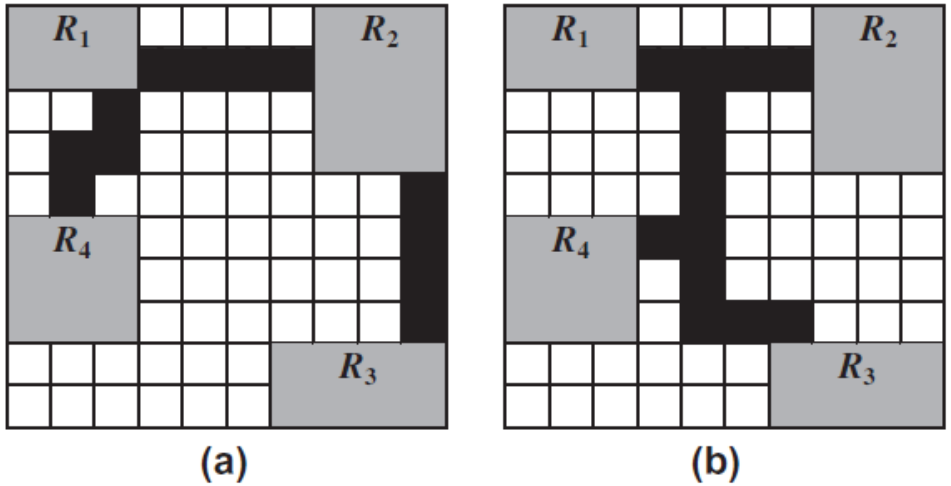
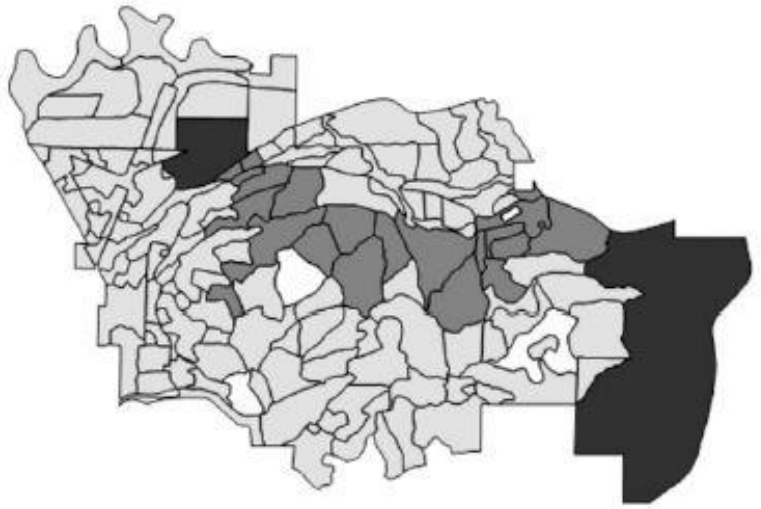


Fig. 4. (a) The restoration of 12 parcels connect the four reserves R_1, R_2, R_3, R_4. The length of the corridor connecting R_3–R_4 is 18. (b) The restoration of 13 parcels connect the four reserves. The length of the corridor connecting R_3–R_4 is equal to 6.

Figure 1. A Landscape with a Corridor



(St John, Toth, Zabinsky, 2018)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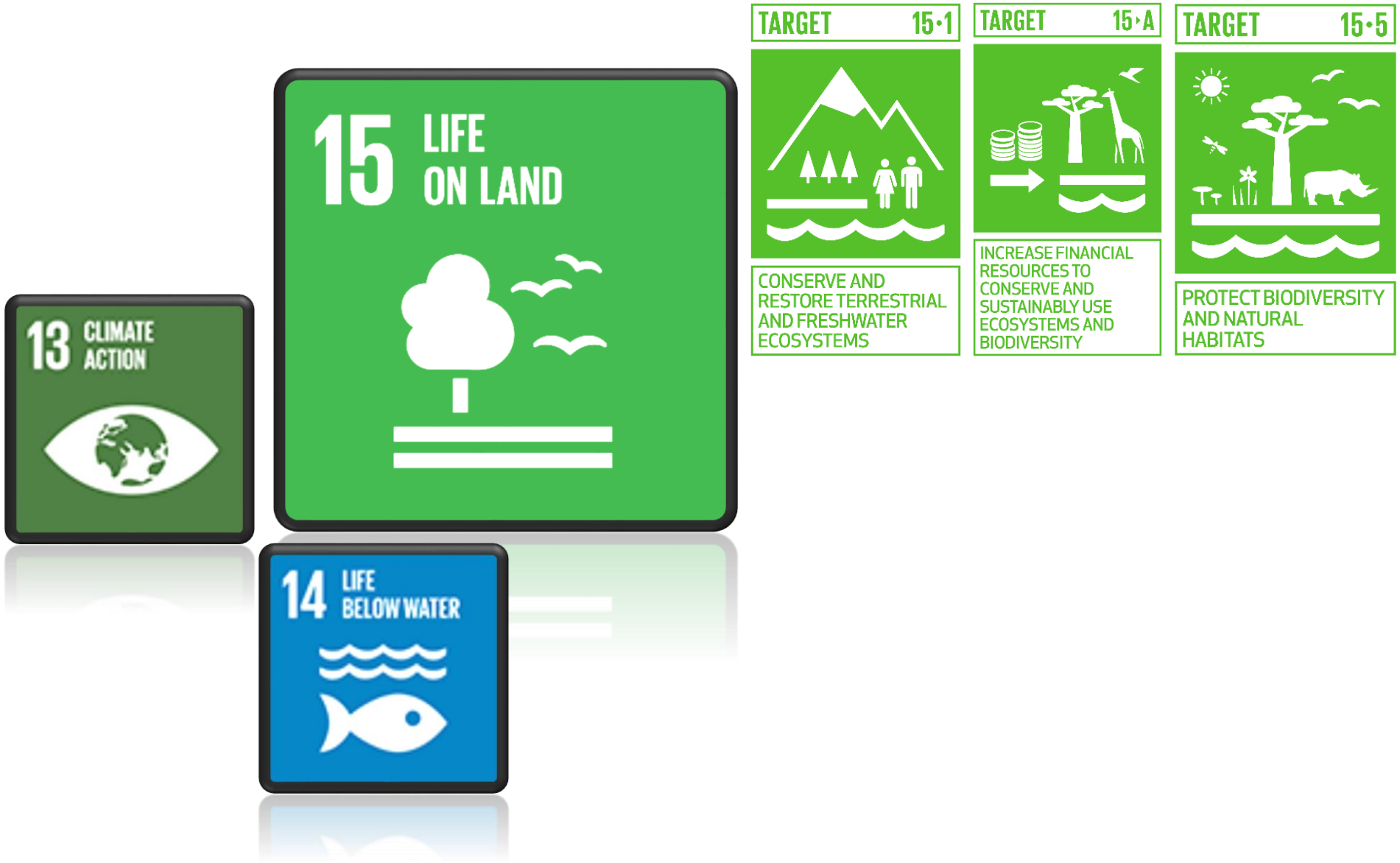

13 CLIMATE ACTION
15 LIFE ON LAND
14 LIFE BELOW WATER
TARGET 15·1
CONSERVE AND RESTORE TERRESTRIAL AND FRESHWATER ECOSYSTEMS
TARGET 15·A
INCREASE FINANCIAL RESOURCES TO CONSERVE AND SUSTAINABLY USE ECOSYSTEMS AND BIODIVERSITY
TARGET 15·5
PROTECT BIODIVERSITY AND NATURAL HABITATS

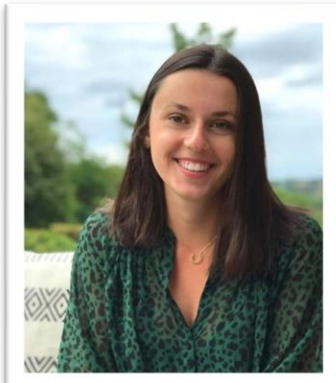


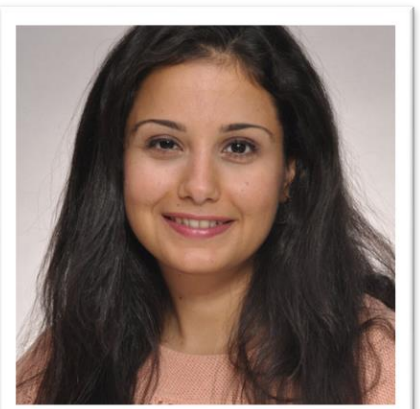
4 QUALITY EDUCATION

12 RESPONSIBLE CONSUMPTION AND PRODUCTION



3 GOOD HEALTH AND WELL-BEING






7 AFFORDABLE AND CLEAN ENERGY