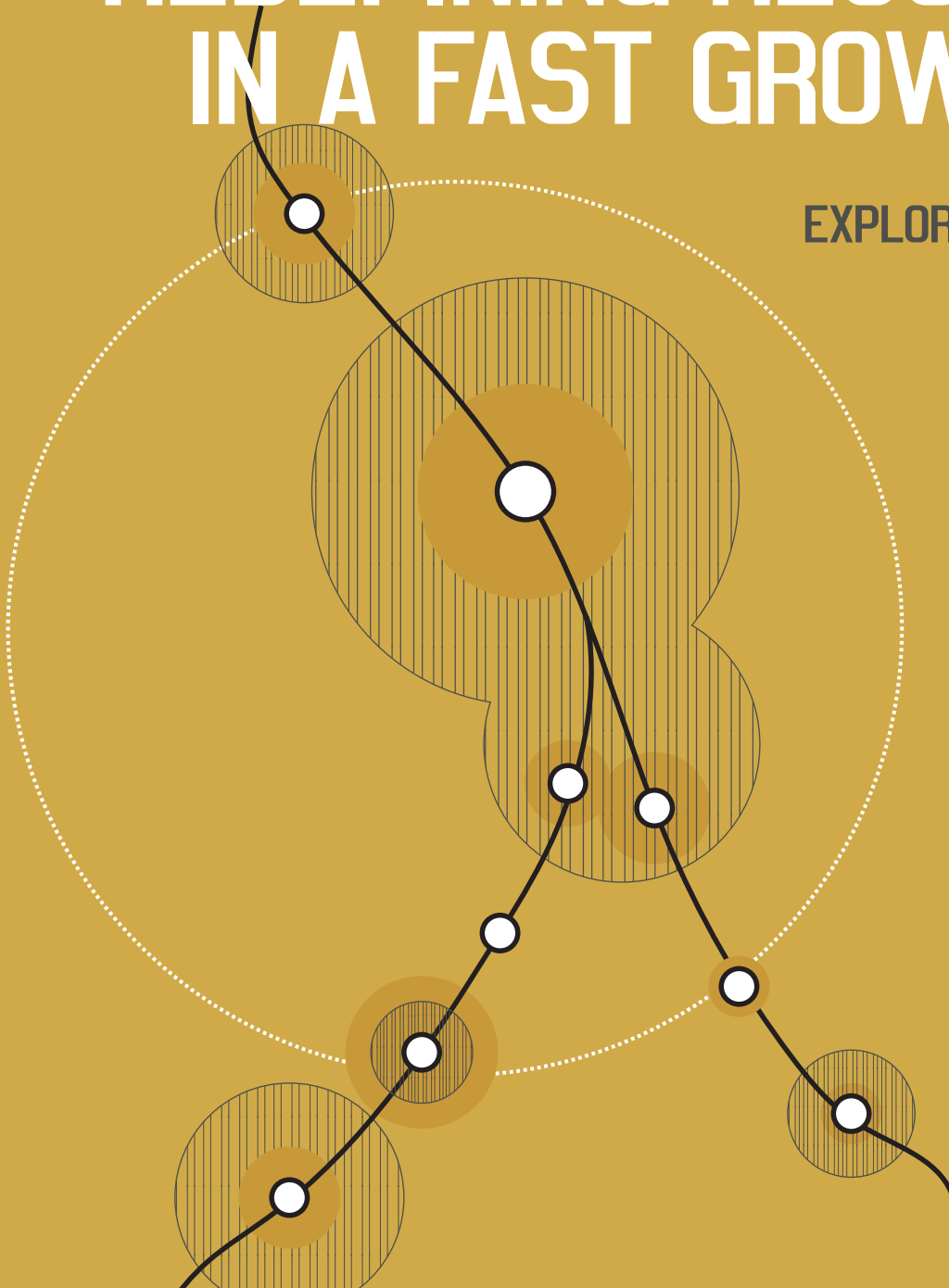
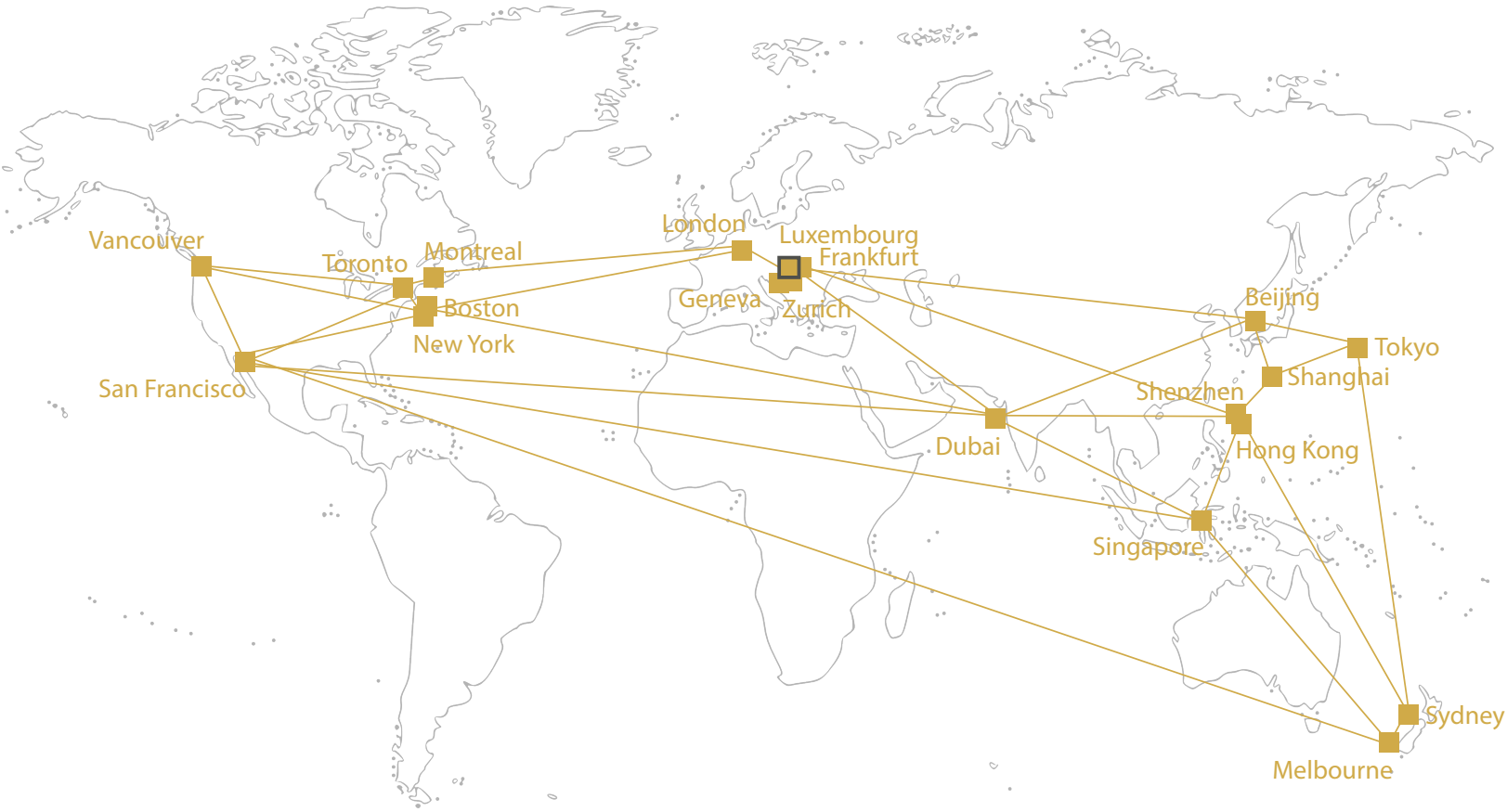


REDEFINING RESOURCE MANAGEMENT IN A FAST GROWING URBAN SETTING

EXPLORATIONS FOR REGIONAL INNOVATION IN LUXEMBOURG



PROBLEM DEFINITION INTRODUCTION



Background image from <http://dokardokarz.net/impressive-world-map-coloring-page/unbelievable-blank-world-map-black-and-white-with-world-map-coloring-page/>


14 th
most powerful financial
centre in the world


2 nd
largest investment fund
centre in the world


1 st
Highest GDP per capita
worldwide in 2016

Low energy price



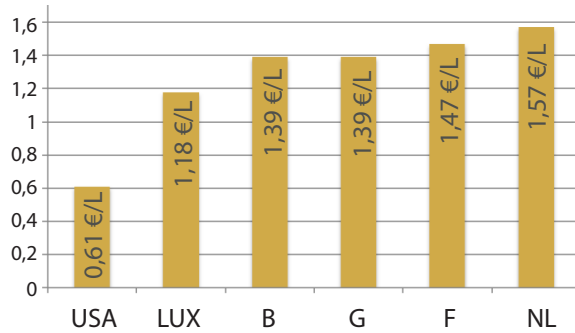
Automobile dependency



Sprawl



Gasoline price
(in € per litre)



Information retrieved from http://www.globalpetrolprices.com/gasoline_prices/

EU average

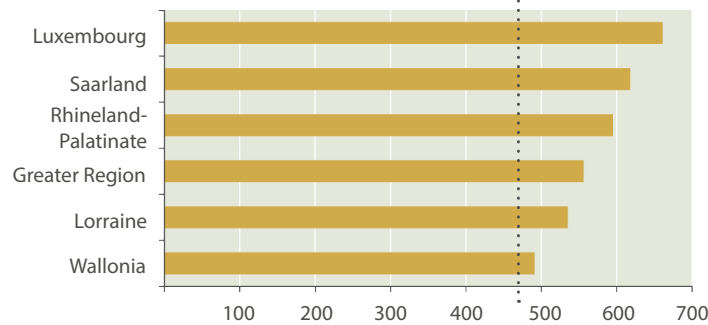
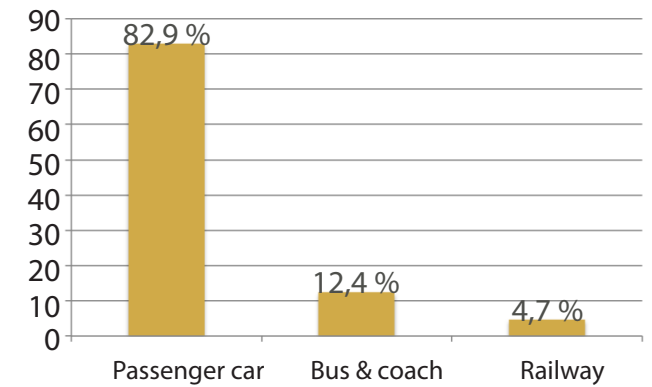


Image from <http://www.grande-region.lu/portal/images/publications/documents/statistiques-en-bref-2016-version-web.pdf>

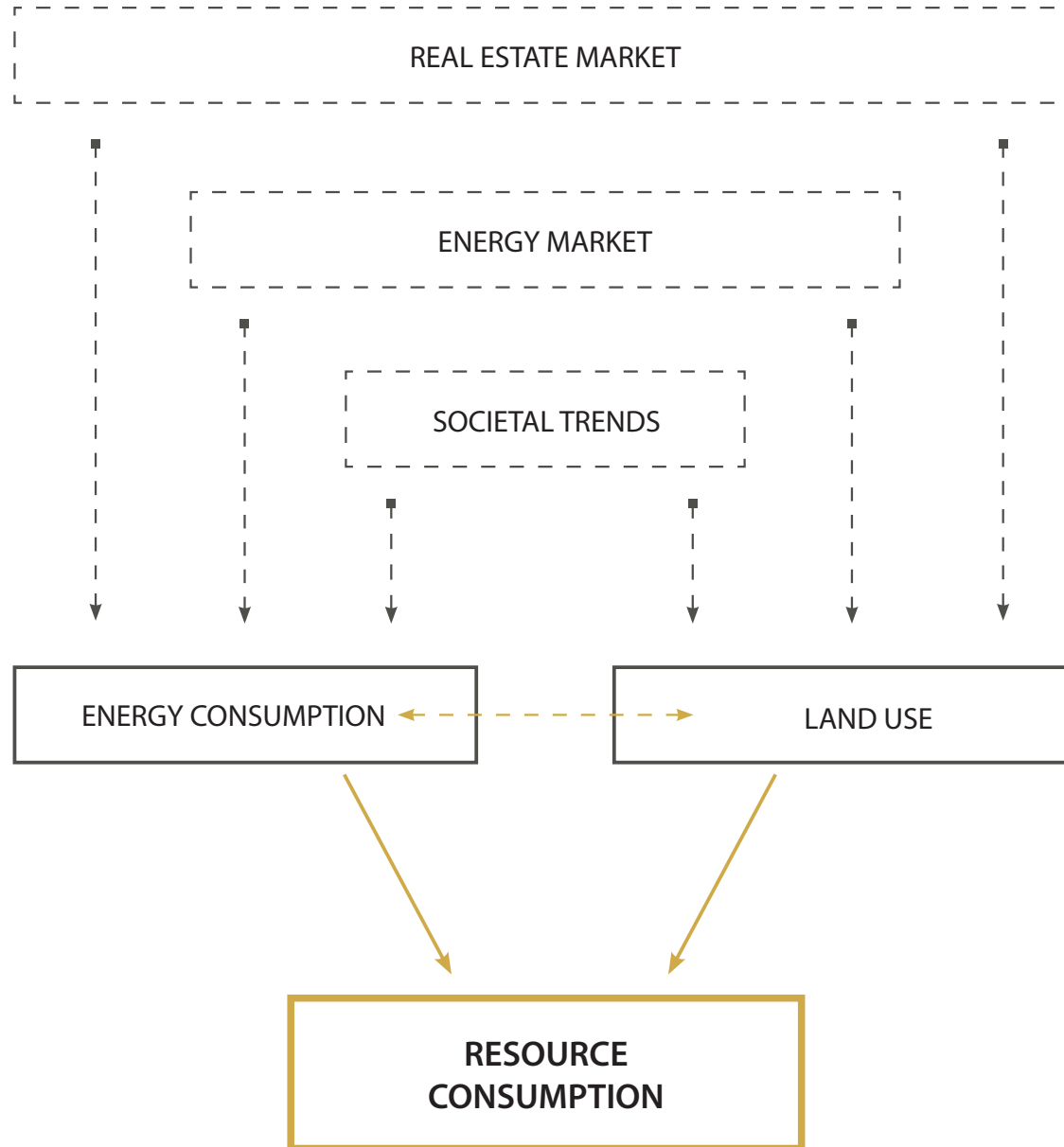
share of passenger-kilometers travelled
(in %)



Information retrieved from http://www.globalpetrolprices.com/gasoline_prices/

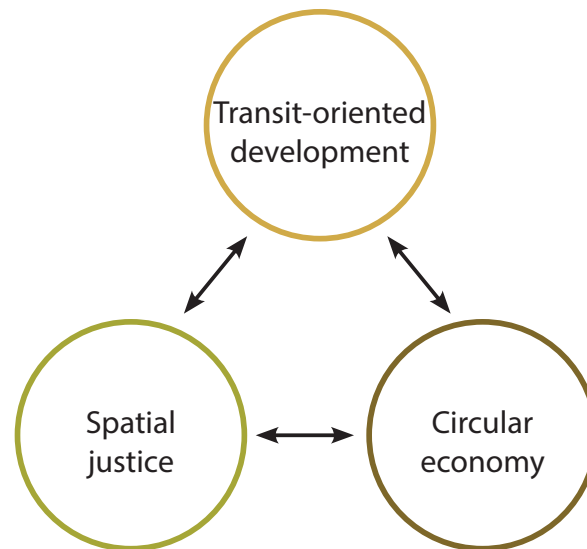


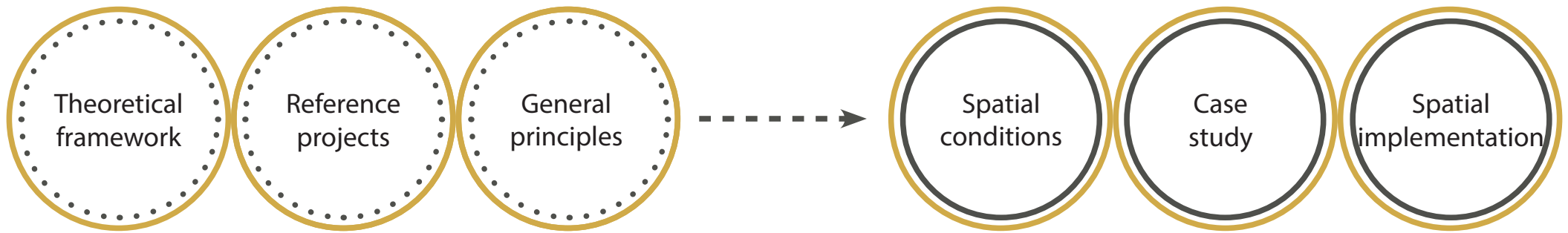
PROBLEM DEFINITION INTRODUCTION



Main research question

How can transit-oriented development practices be integrated in regional planning to enhance resource efficiency and spatial justice in the context of Luxembourg?





Location of interest



Image from <http://tripmeter.me/europe-map-outline.html>/free-printable-maps-of-europe-with-map-outline



Own drawing

Specific geography



Own drawing



Own drawing

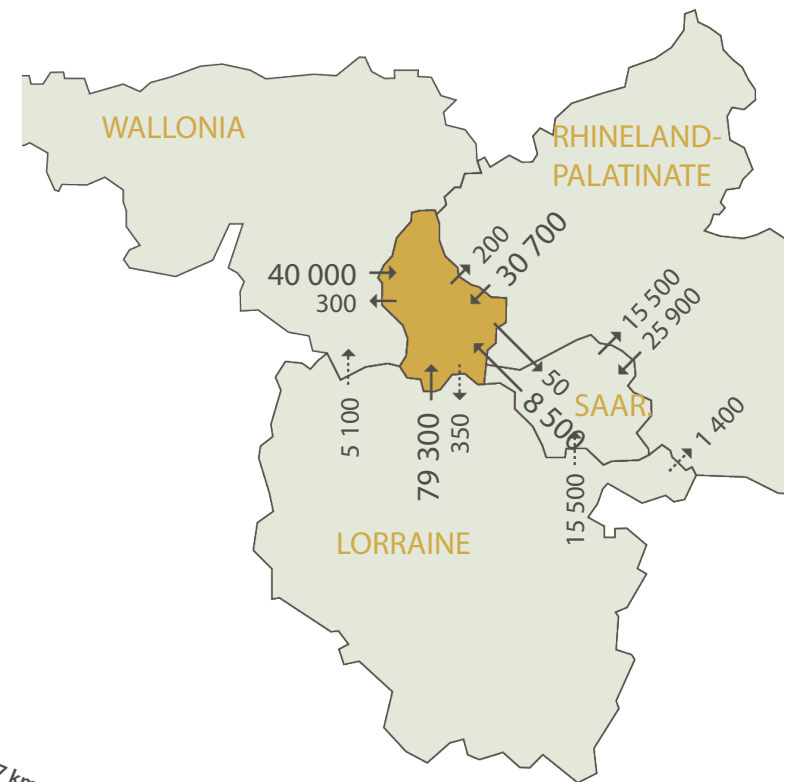
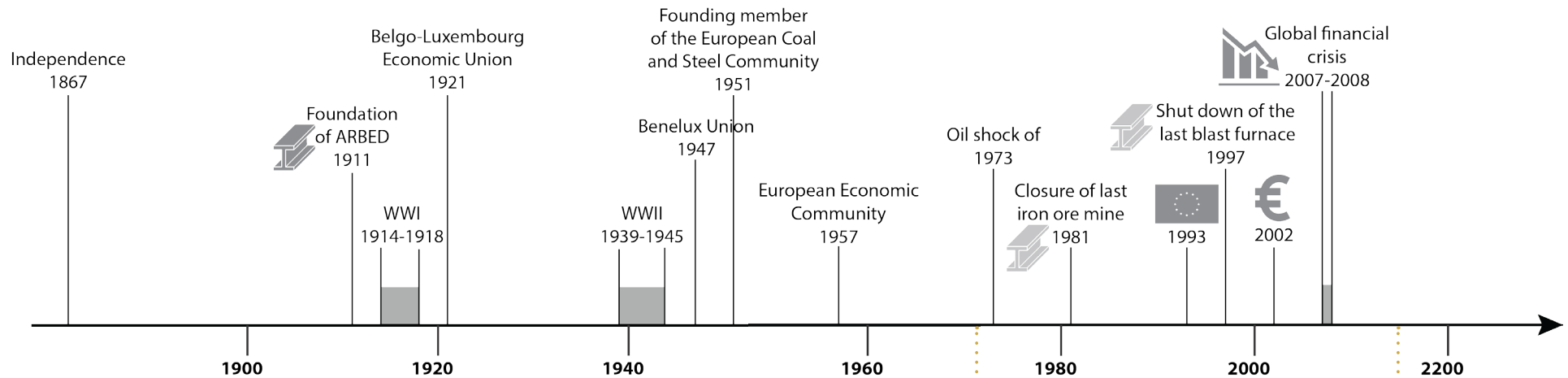


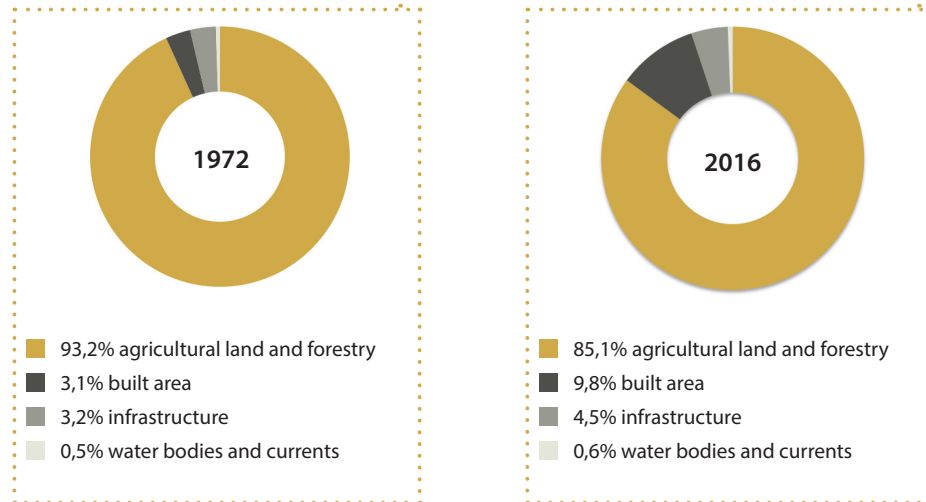
Image from <http://www.grande-region.lu/portal//images/publications/documents/statistiques-en-bref-2016-version-web.pdf>

CONDITIONS **HISTORICAL DEVELOPMENT**

Historical development



Own drawing



CONDITIONS SPATIAL DISTRIBUTION

Spatial conditions - welfare indicator

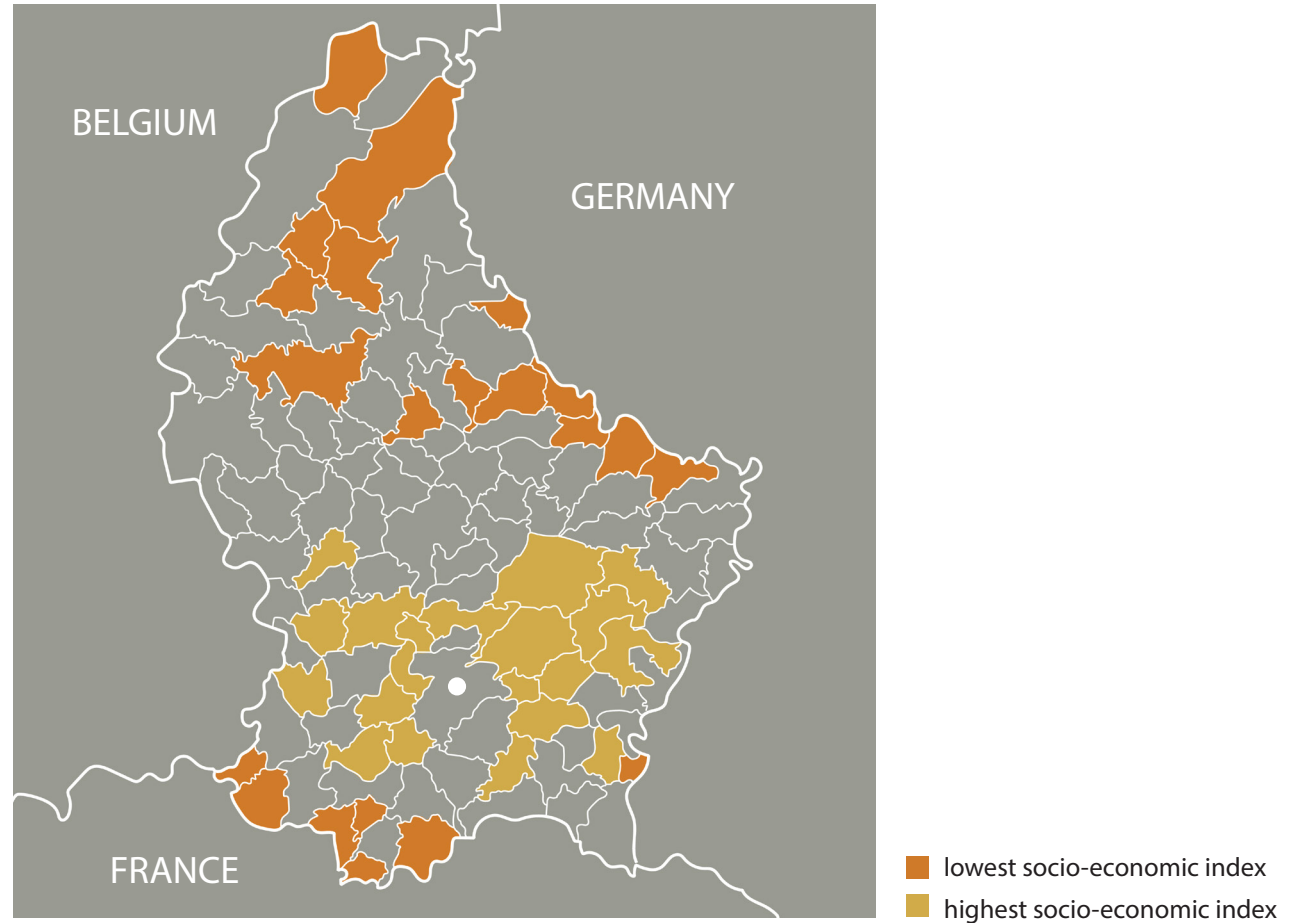


Figure from http://www.chd.lu/wps/PA_RoleDesAffaires/FTSByteServletImpl?path=/export/exped/sexpdata/Mag/0007/077/14777.pdf

CONDITIONS SPATIAL DISTRIBUTION

Spatial conditions - average travel distance home-work

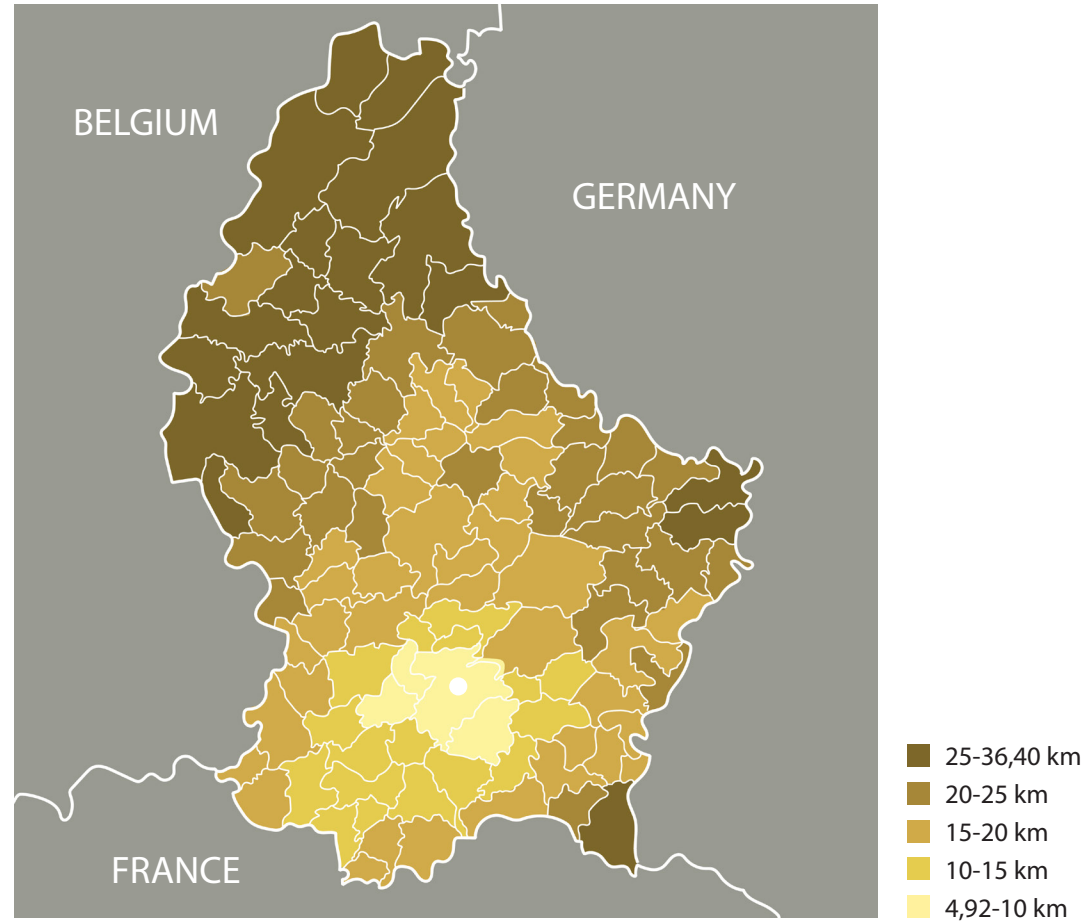


Figure from http://www.chd.lu/wps/PA_RoleDesAffaires/FTSByteServletImpl?path=/export/exped/sexpdata/Mag/0007/077/14777.pdf

CONDITIONS SPATIAL DISTRIBUTION

Spatial conditions - communal commercial tax

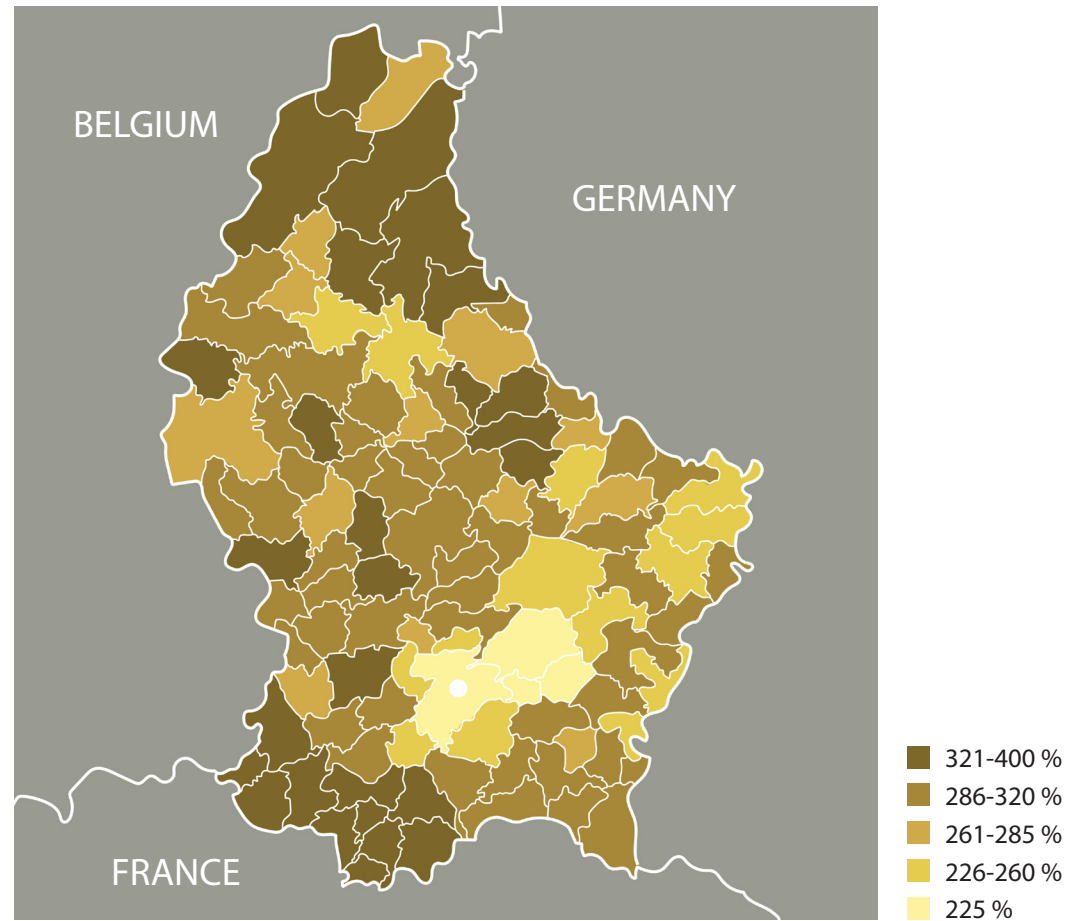


Figure from http://www.chd.lu/wps/PA_RoleDesAffaires/FTSByteServletImpl?path=/export/exped/sexpdata/Mag/0007/077/14777.pdf

CONDITIONS SPATIAL DISTRIBUTION

Spatial conditions - ratio between jobs and residents

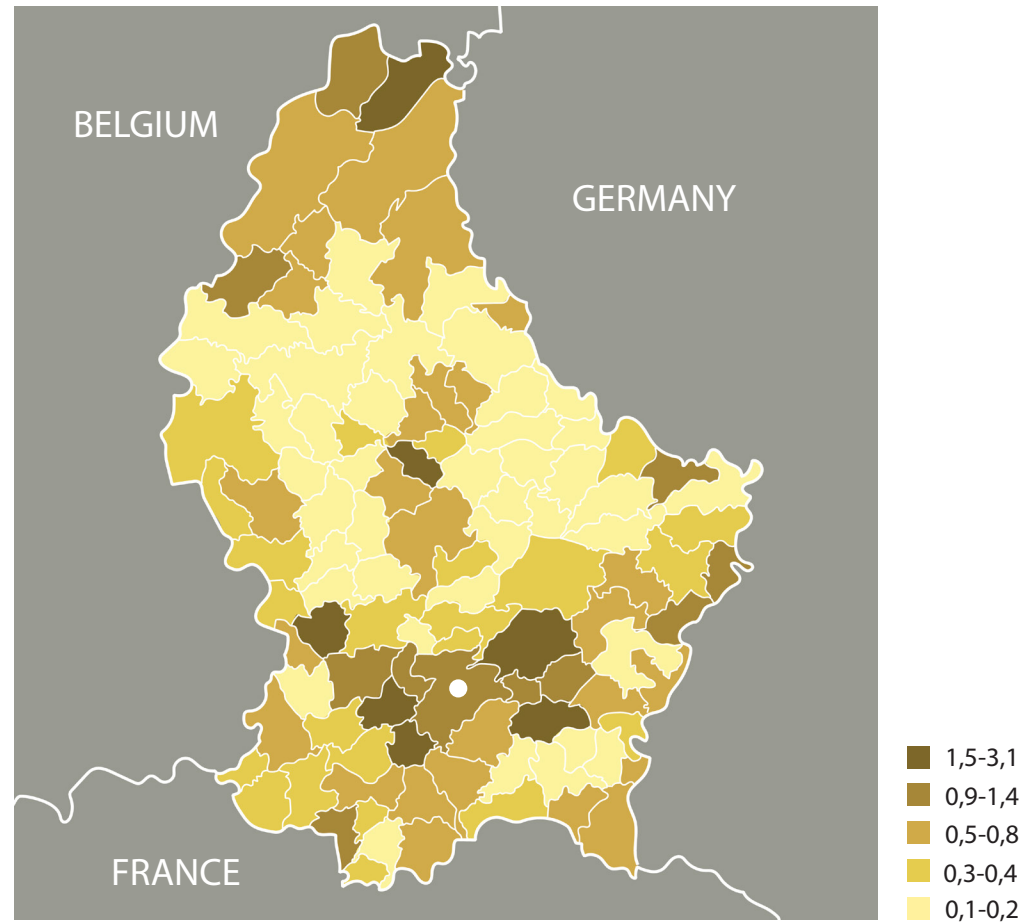


Figure from http://www.chd.lu/wps/PA_RoleDesAffaires/FTSByteServletImpl?path=/export/exped/sexpdata/Mag/0007/077/14777.pdf

CONDITIONS SPATIAL DISTRIBUTION

Spatial conditions - general accessibility

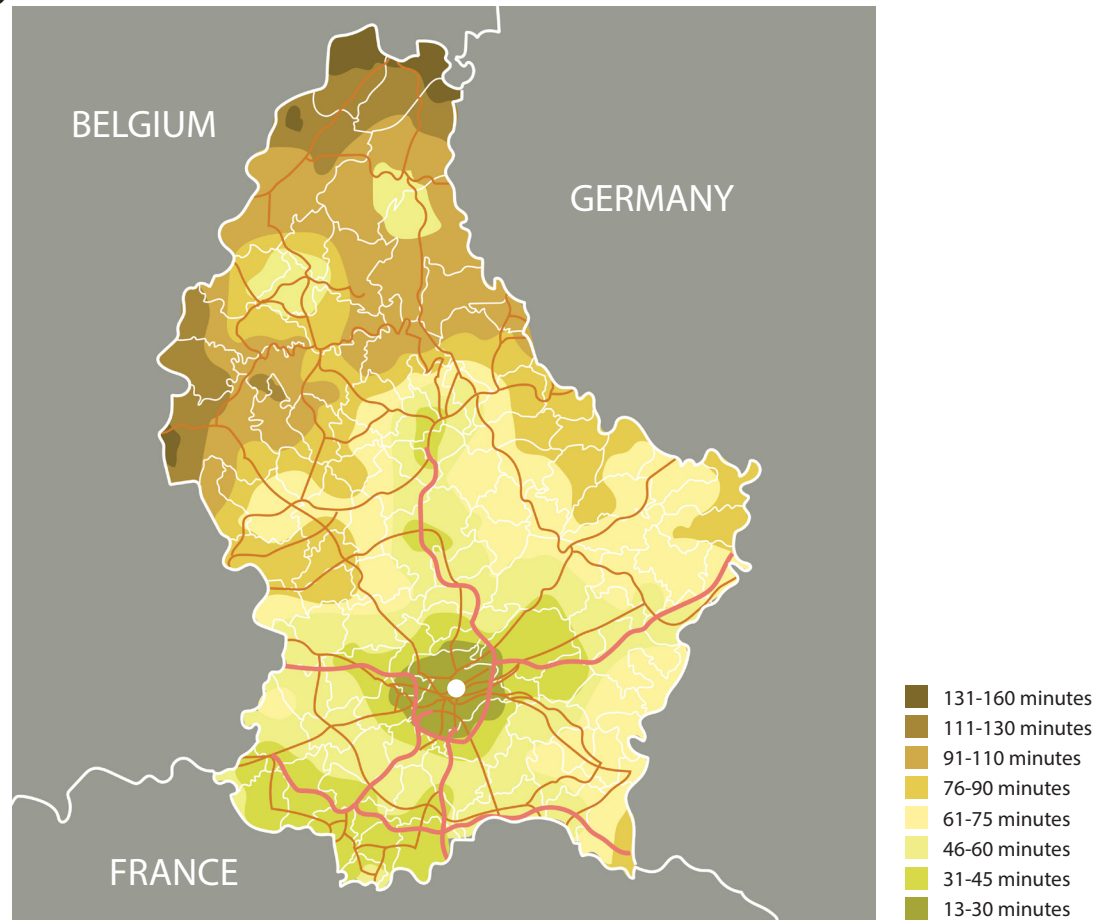


Figure from http://www.chd.lu/wps/PA_RoleDesAffaires/FTSByteServletImpl?path=/export/exped/sexpdata/Mag/0007/077/14777.pdf

CONDITIONS SPATIAL DISTRIBUTION

Spatial conditions - traffic development

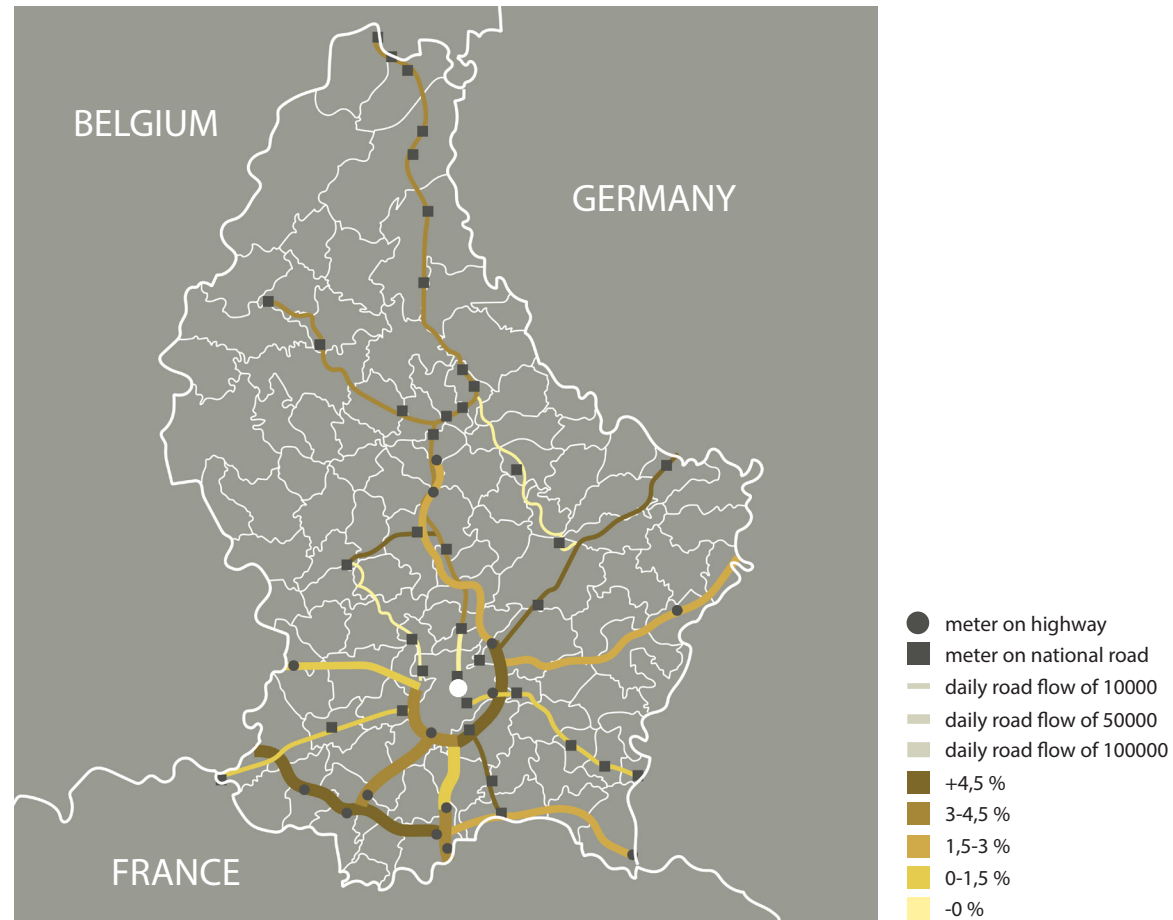
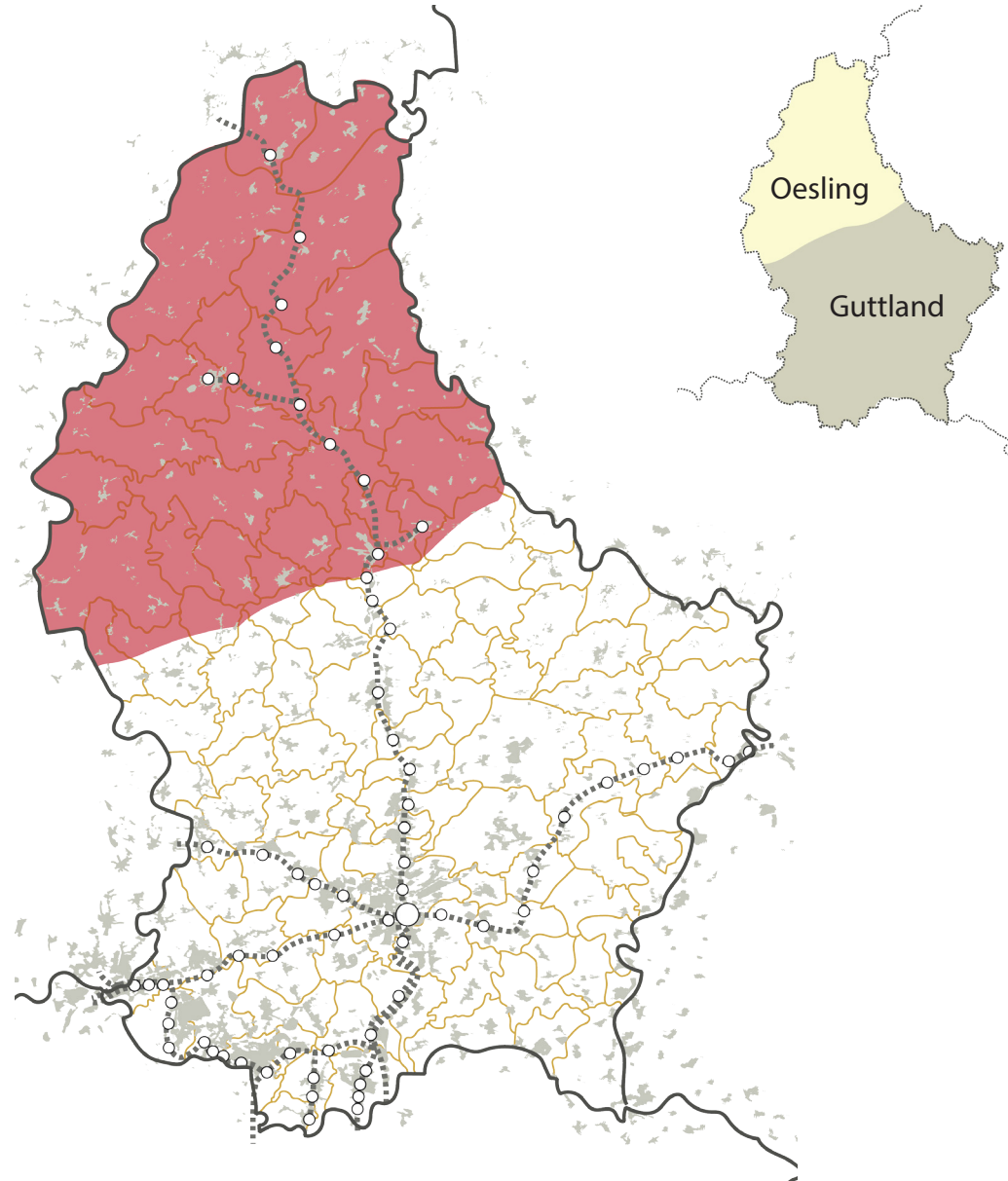


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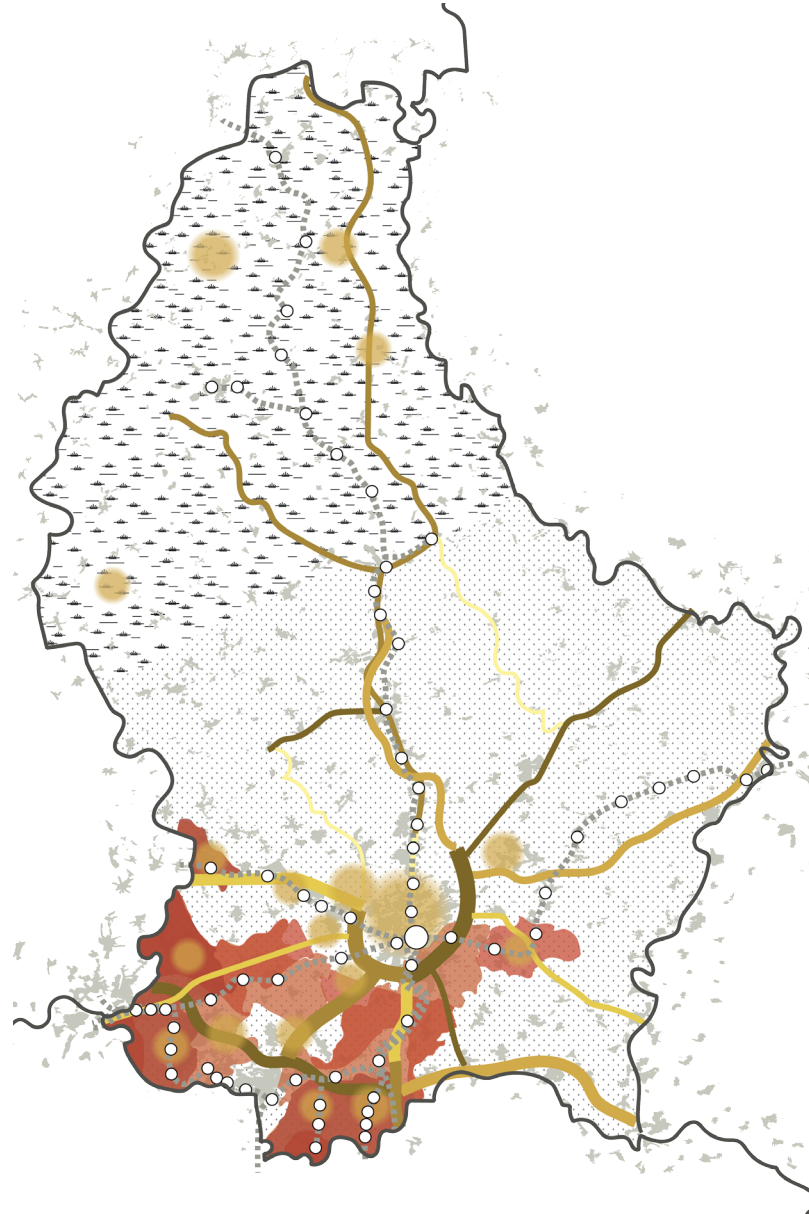
CONDITIONS SPATIAL DISTRIBUTION

Spatial conditions - regional differences

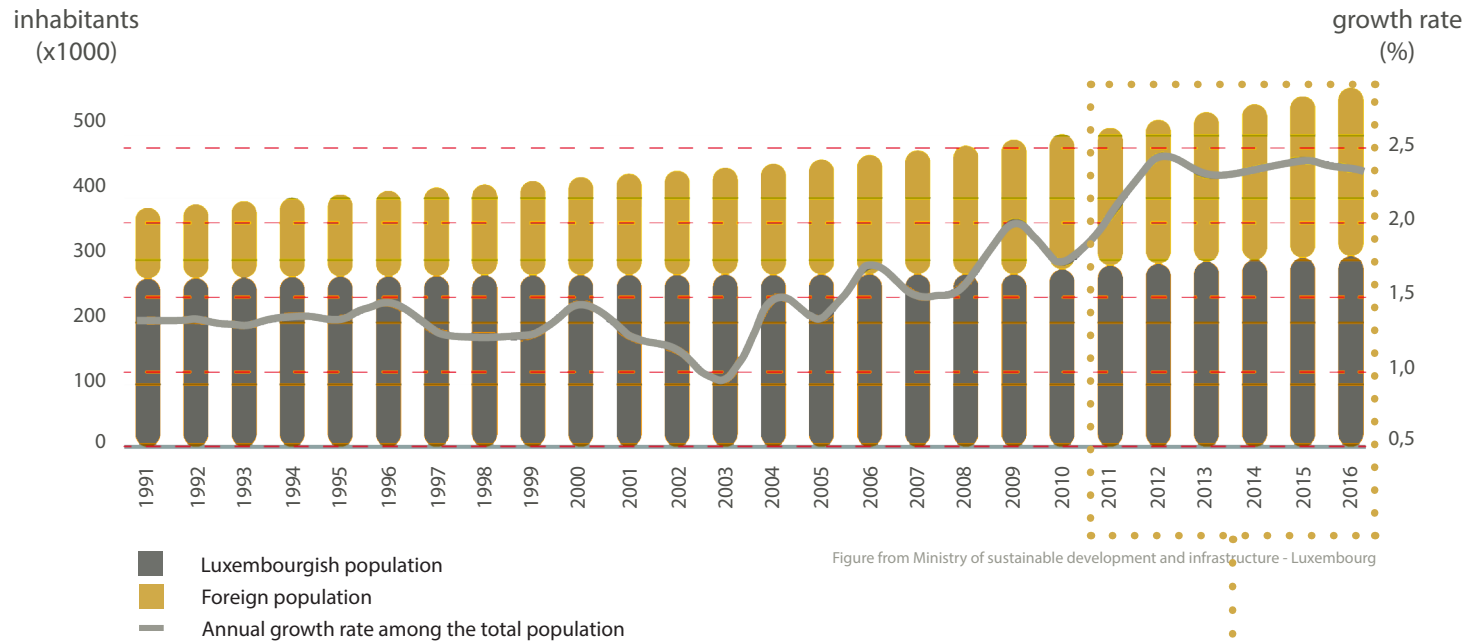


CONDITIONS SPATIAL DISTRIBUTION

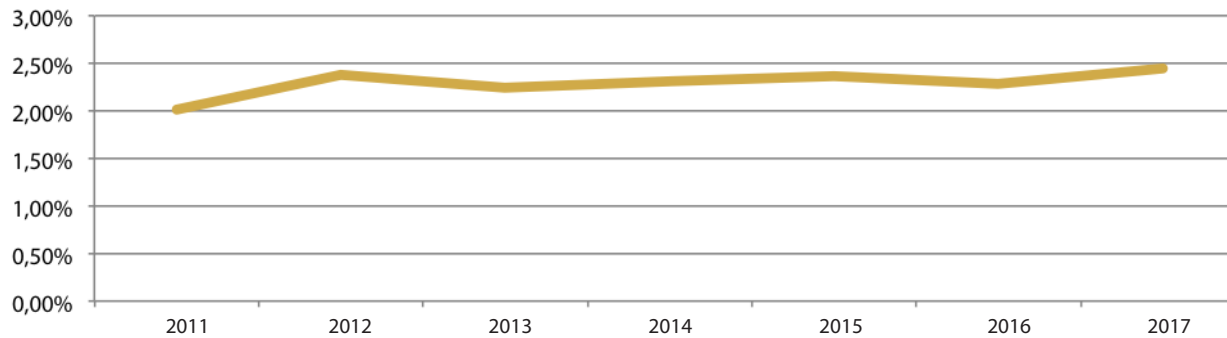
Spatial conditions - regional focus



Previous population growth

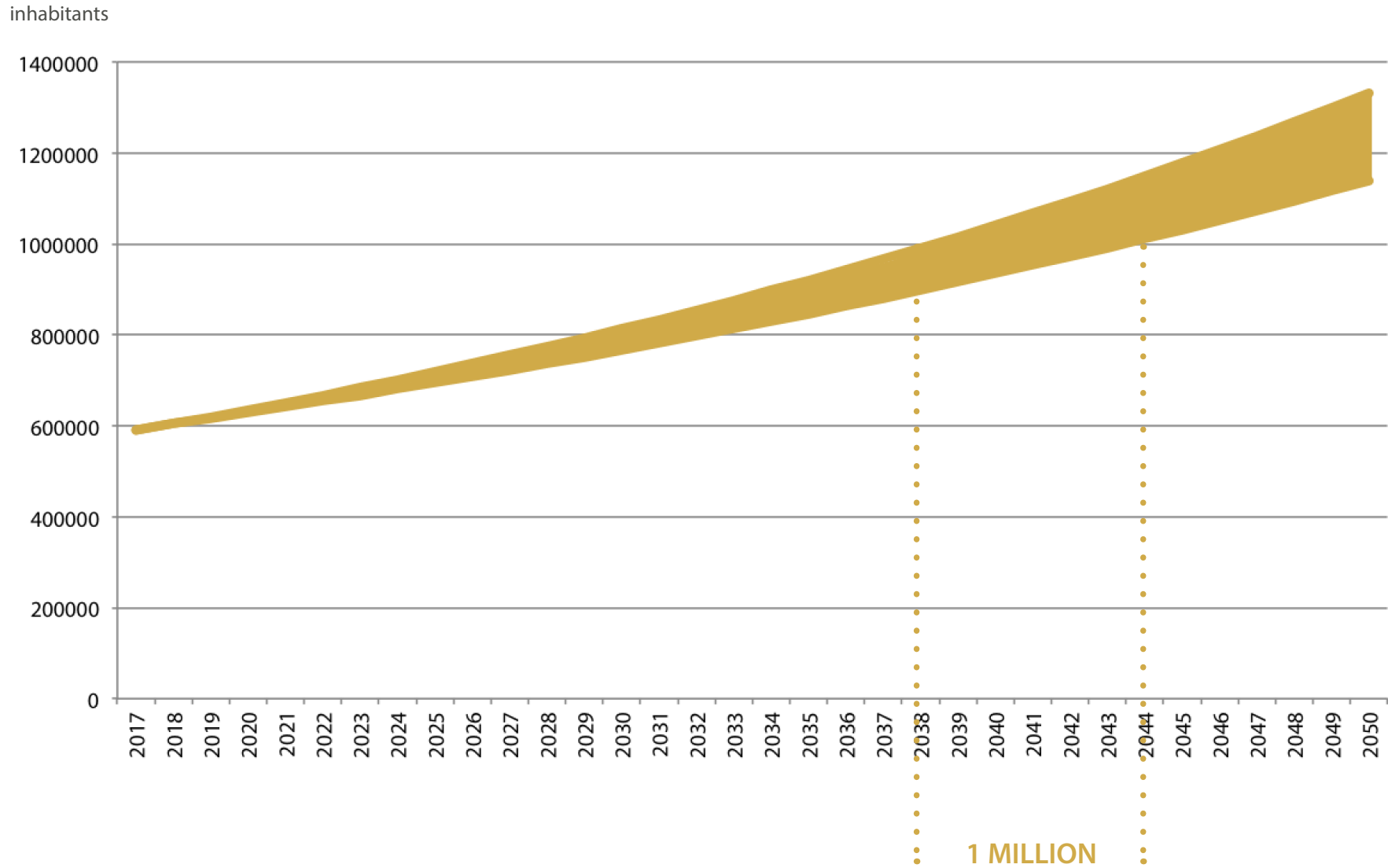


annual population growth in %



Data from http://www.statistiques.public.lu/stat/ReportFolders/ReportFolder.aspx?IF_Language=fra&MainTheme=2&FldrName=1

Projected population growth



Resource consumption

LUXEMBOURG TIMES by Luxemburger Wort

HOME ECONOMICS LUXEMBOURG COMMUNITY EUROPEAN UNION WORLD CULTURE & LIFE

LUXEMBOURG

Luxembourg needs 8,000 new homes per year



Image from <https://luxtimes.lu/archives/2764-luxembourg-needs-8-000-new-homes-per-year>



Average housing density:
32,2 housing units per
hectare

+



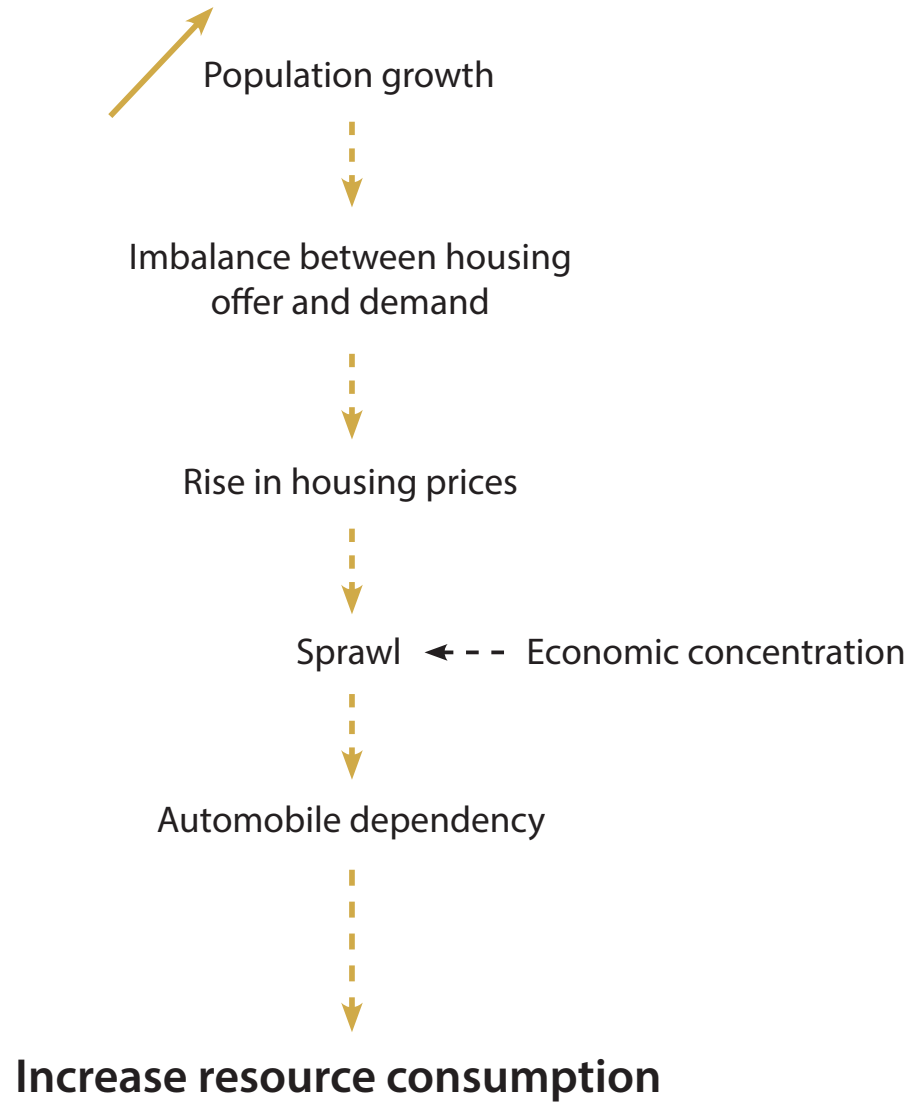
Average household type:
2,41 people per household

=

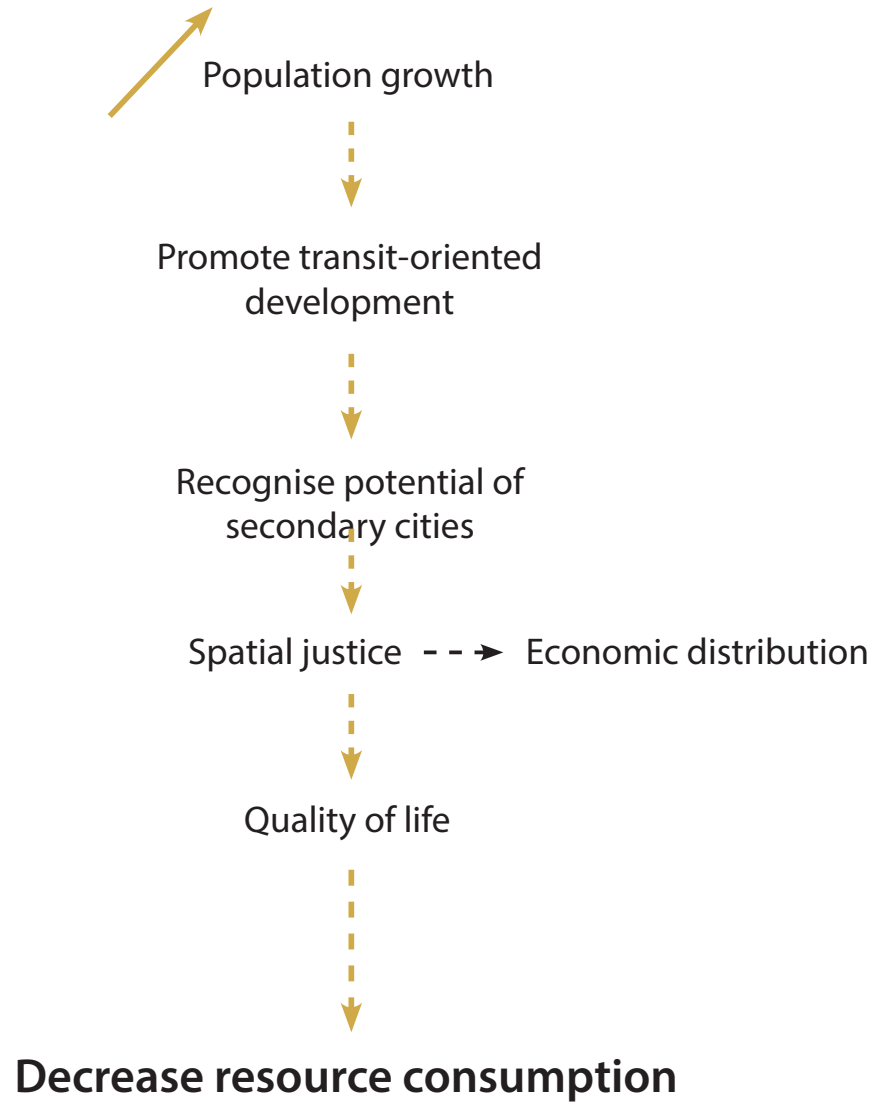
2030

CONDITIONS FORECAST

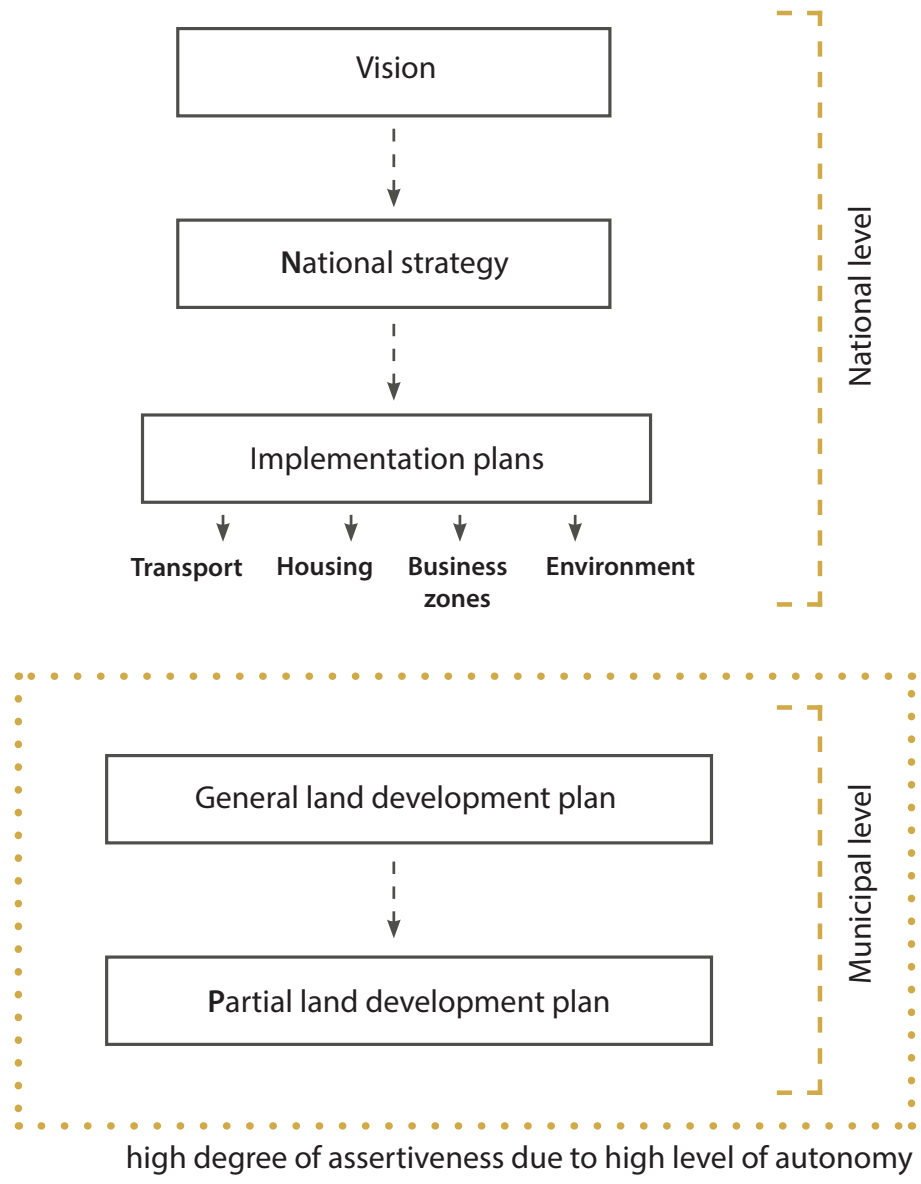
Existing situation



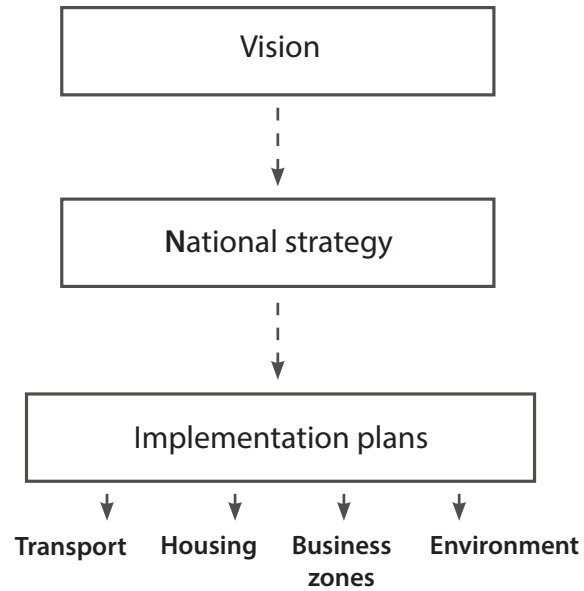
Intended situation



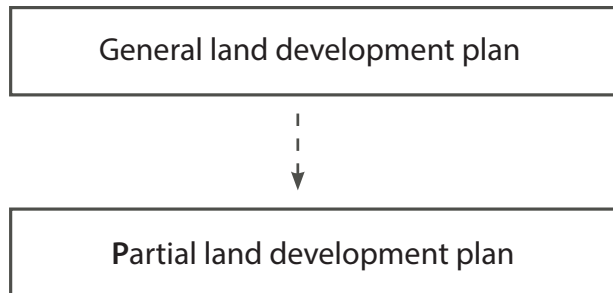
Power distribution and planning tools



Power distribution and planning tools



National level



Municipal level

high degree of assertiveness due to high level of autonomy

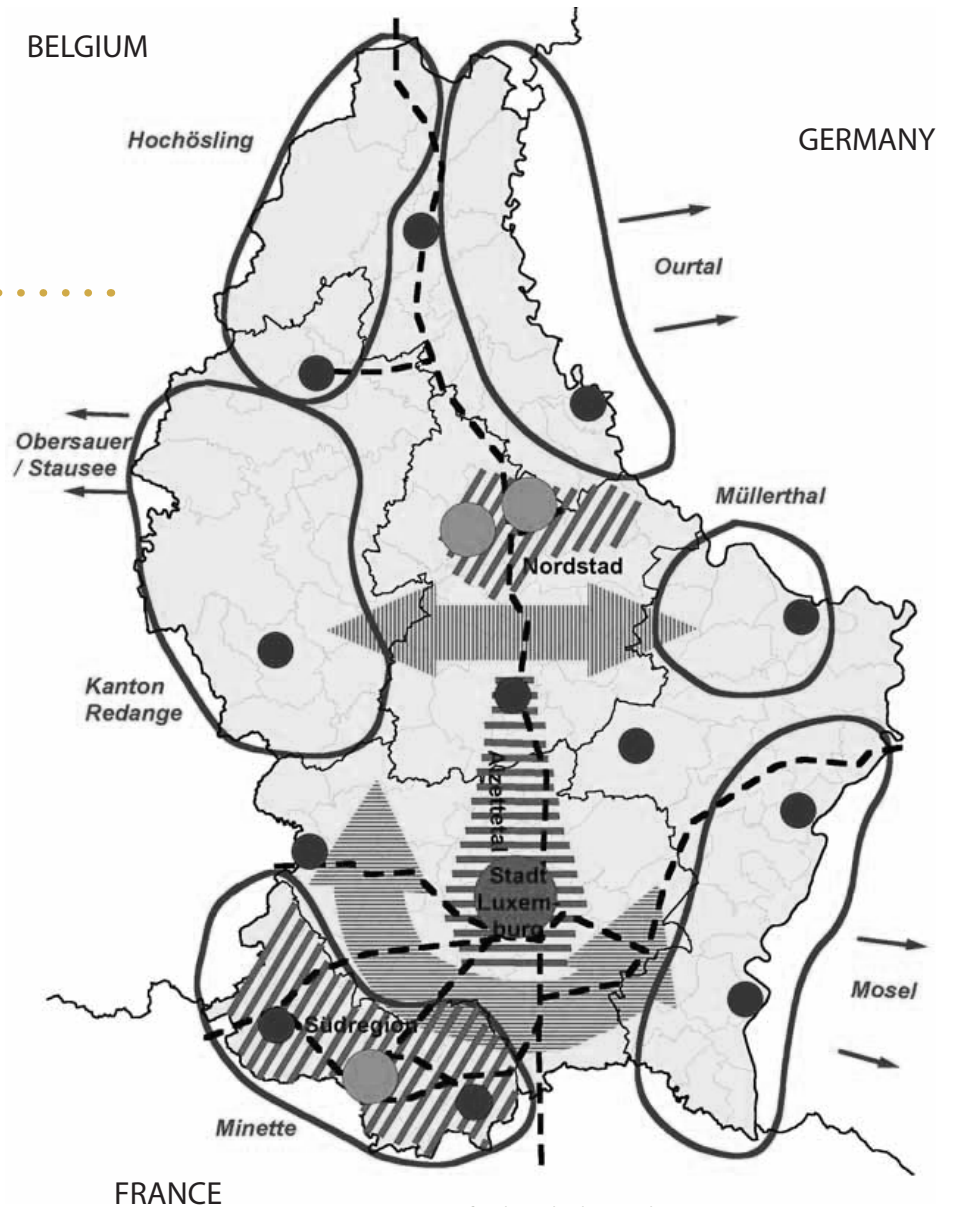
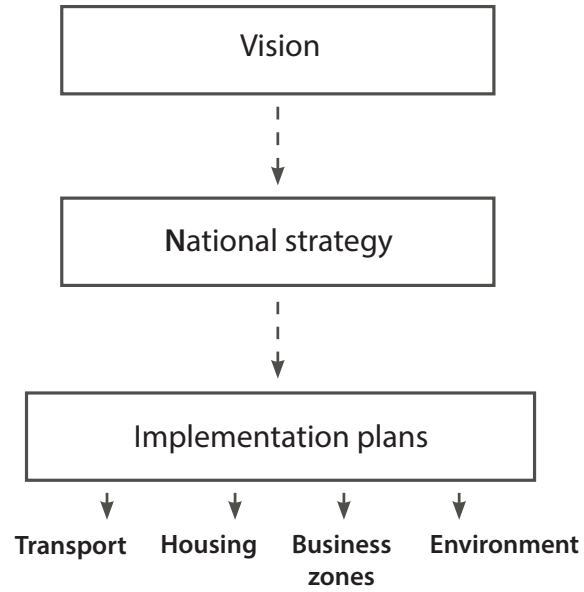


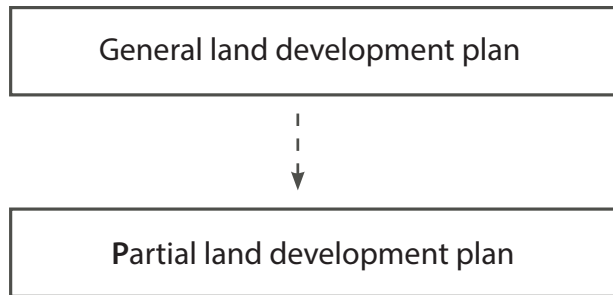
Image from <http://docplayer.org/docs-images/56/38865341/images/82-0.jpg>

CONDITIONS **CURRENT APPROACH**

Power distribution and planning tools



National level



Municipal level

high degree of assertiveness due to high level of autonomy

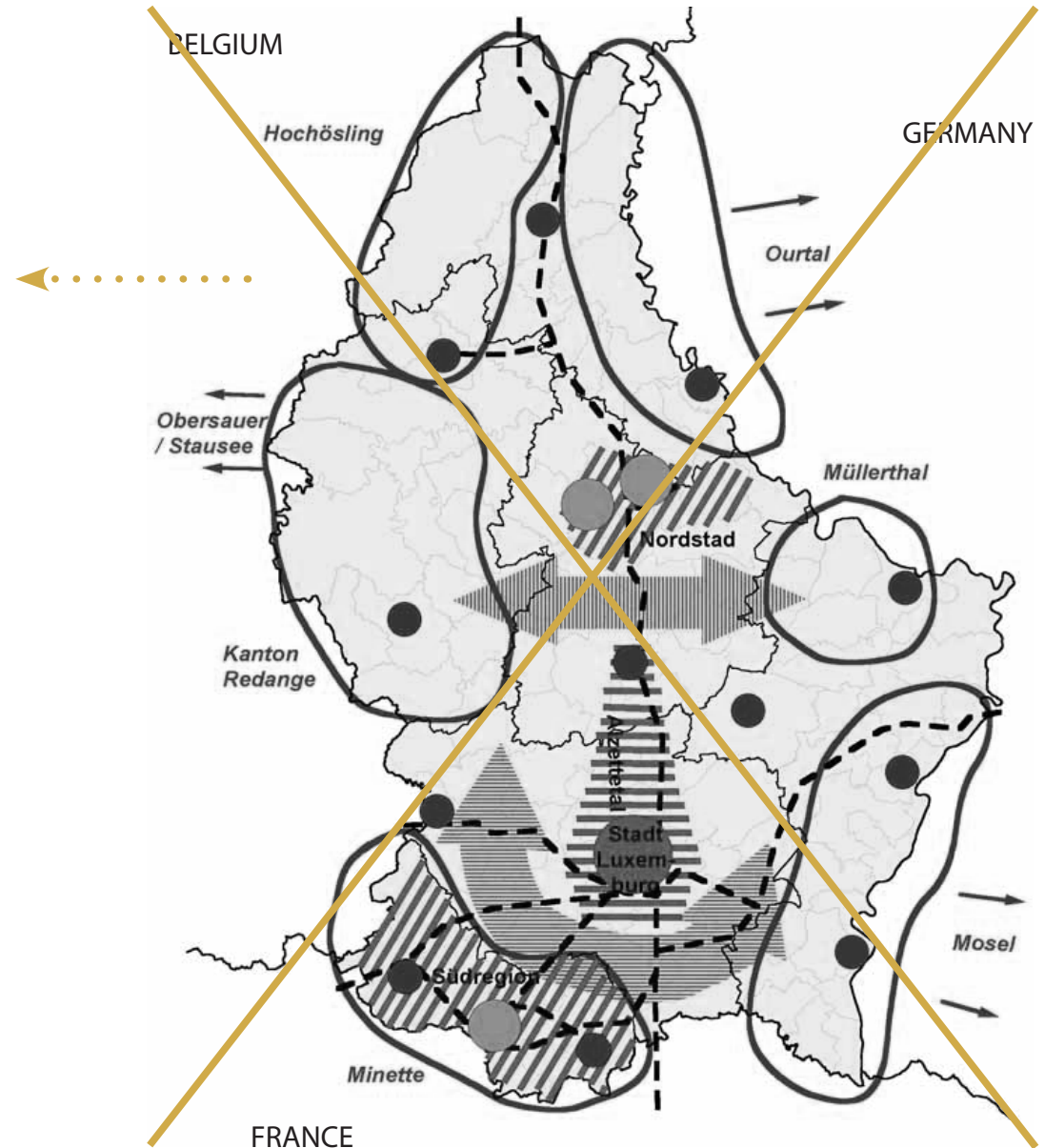
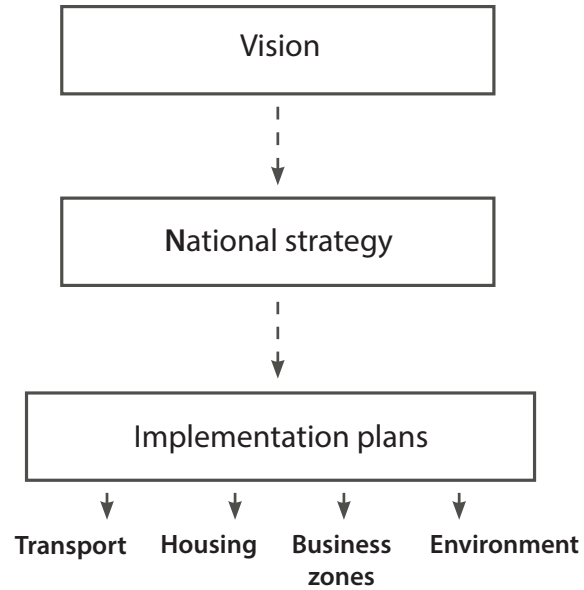
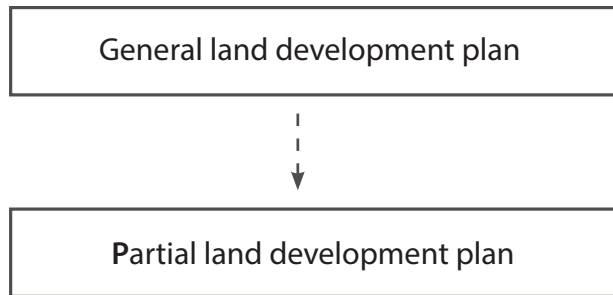


Image from <http://docplayer.org/docs-images/56/38865341/images/82-0.jpg>

Power distribution and planning tools



National level

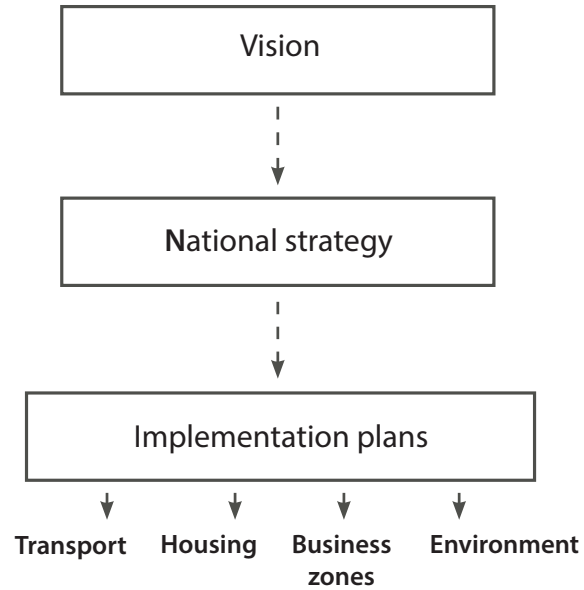


Municipal level

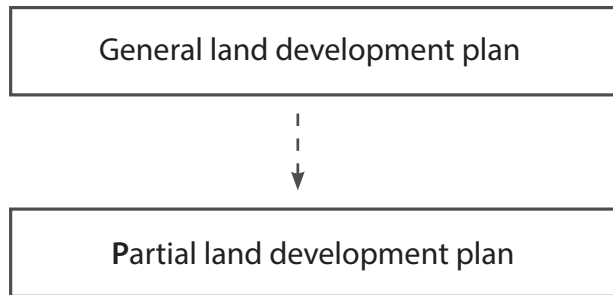
high degree of assertiveness due to high level of autonomy

Type d'équipement	Présence / absence							Source / remarques
	Boevange	Brouch	Buschdorf	Grevenknapp	Openthalt	Bill	Finsterthal	
Commerces								
1 Boulangers	0	1	0	0	0	0	0	GWS17
2 Supermarchés inférieurs à 500 m² et/ou magasins d'alimentation générale	0	0	0	0	0	0	0	GWS17
3 Stations-services	0	0	0	0	0	0	0	GWS17
4 Magasins de vêtements et de chaussures	0	0	0	0	0	0	0	GWS17
5 Supermarchés (supérieurs à 500 m²)	0	0	0	0	0	0	0	GWS17
6 Grandes surfaces spécialisées	0	0	0	0	0	0	0	GWS17
7 Commerces spécialisés	0	0	0	0	0	0	0	GWS17
8 Garagistes	0	0	0	0	0	0	0	GWS17
Coliffeurs	0	1	0	0	0	0	0	GWS17
Boucheries	0	0	0	0	0	0	0	GWS17
Services								
9 Services à la personne, banques, assurances	1	1	1	1	0	0	0	GWS17
10 Distributeurs automatiques de billets	0	0	0	0	0	0	0	Sites internet banques
11 Bureaux de poste	0	0	0	0	0	0	0	GWS17
12 Notaires	0	0	0	0	0	0	0	GWS17
Services publiques								
13 Mairie	1	0	0	0	0	0	0	site internet commune
14 Commissariat de proximité	0	0	0	0	0	0	0	
15 Offices sociaux	0	0	0	0	0	0	0	
16 Agences de la Caisse nationale de santé	0	0	0	0	0	0	0	
17 Agences pour l'emploi	0	0	0	0	0	0	0	
18 Centres de secours	0	0	0	0	0	0	0	
Education								
19 Ecoles fondamentales (publiques, privées, européennes et internationales)	1	1	1	0	0	0	0	Buschd. C2; Boev. C3; Brouch C4. C1 in den 3 Ortschaften. Source: Site internet commune.
20 Lycées (publics, privés, européens et internationaux)	0	0	0	0	0	0	0	
21 Facultés	0	0	0	0	0	0	0	
Social								
22 Crèches	0	1	0	0	0	0	0	GWS17
23 Maisons relais	0	0	1	0	0	0	0	Site internet commune
CIPA (Centres intégrés pour personnes âgées)	0	0	0	0	0	0	0	
Maisons de jeunes	0	0	0	0	0	0	0	
Santé et domaine paramédical								
24 Médecins généralistes	0	0	0	0	0	0	0	
25 Dentistes	0	0	0	0	0	0	0	
26 Kinésithérapeutes	0	1	0	0	0	0	0	
27 Laboratoires de prise de sang	0	0	0	0	0	0	0	
28 Pharmacies	0	0	0	0	0	0	0	
29 Vétérinaires	0	0	0	0	0	0	0	
30 Médecins spécialistes	0	0	0	0	0	0	0	
31 Maisons médicales	0	0	0	0	0	0	0	
32 Hôpitaux	0	0	0	0	0	0	0	
Restaurants, cafés								
33 Cafés, bars	1	1	0	0	0	0	0	GWS17
34 Restaurants	0	1	0	0	0	0	0	GWS17
Culture, sport et loisirs								
35 Centres sportifs	1	0	0	0	0	0	0	Centre sportif & culturel Site internet commune
36 Piscines	0	0	0	0	0	0	0	
37 Musées, galeries d'art	0	0	0	0	0	0	0	
38 Bibliothèques	0	0	0	0	0	0	0	
39 Théâtres, salles de spectacle	0	0	0	0	0	0	0	
40 Cinémas	0	0	0	0	0	0	0	
Total	5	8	3	1	0	0	0	coiffeurs auch mitgezählt

Power distribution and planning tools



National level



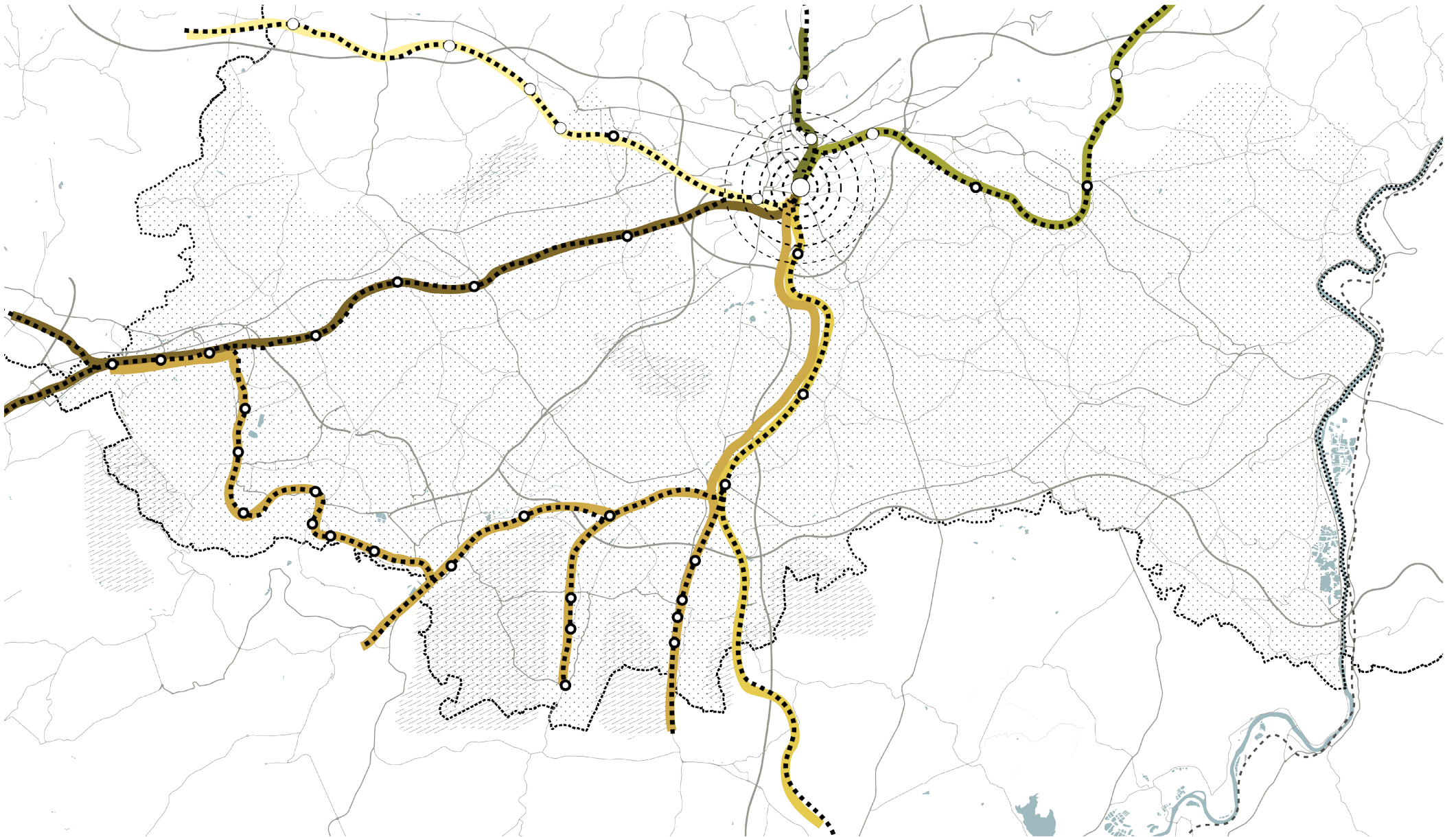
Municipal level

high degree of assertiveness due to high level of autonomy

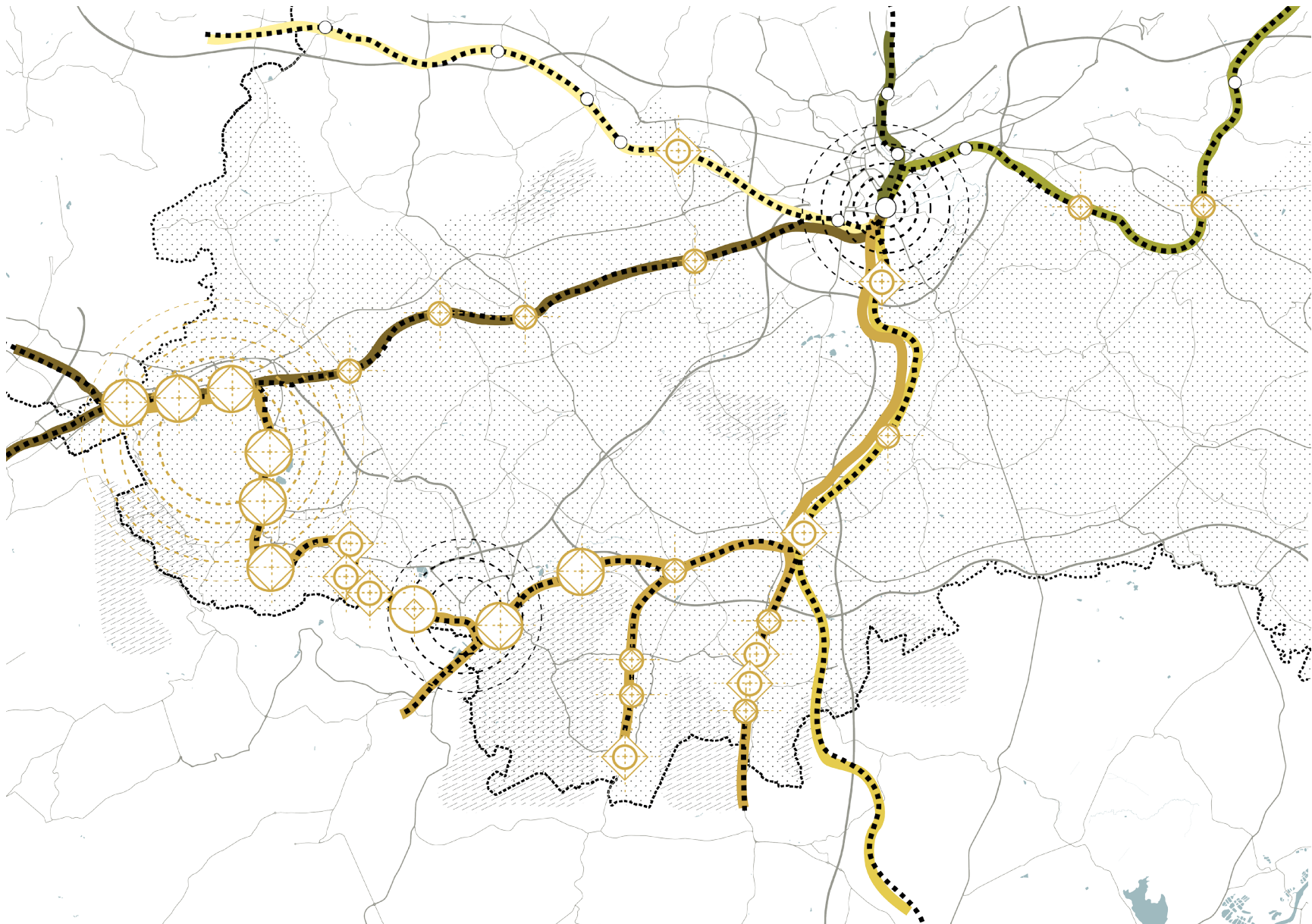
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3 Stations-services	0	0	0	0	0	0	0	GWS17
4 Magasins de vêtements et de chaussures	0	0	0	0	0	0	0	GWS17
5 Supermarchés (supérieurs à 500 m²)	0	0	0	0	0	0	0	GWS17
6 Grandes surfaces spécialisées	0	0	0	0	0	0	0	GWS17
7 Commerces spécialisés	0	0	0	0	0	0	0	GWS17
8 Garagistes	0	0	0	0	0	0	0	GWS17
9 Coiffeurs	0	1	0	0	0	0	0	GWS17
10 Boucheries	0	0	0	0	0	0	0	GWS17
Services								
9 Services à la personne, banques, assurances	1	1	1	1	0	0	0	GWS17
10 Distributeurs automatiques de billets	0	0	0	0	0	0	0	Sites internet banques
11 Bureaux de poste	0	0	0	0	0	0	0	GWS17
12 Notaires	0	0	0	0	0	0	0	GWS17
Services publiques								
13 Mairie	0	0	0	0	0	0	0	site internet commune
14 Commissariat de proximité	0	0	0	0	0	0	0	
15 Offices sociaux	0	0	0	0	0	0	0	
16 Agences de la Caisse nationale de santé	0	0	0	0	0	0	0	
17 Agences pour l'emploi	0	0	0	0	0	0	0	
18 Centres de secours	0	0	0	0	0	0	0	
Education								
19 Ecoles fondamentales (publiques, privées, européennes et internationales)	1	1	1	0	0	0	0	Buschd. C2; Boev. C3; Brouch C4, C1 in den 3 Ortschaften. Source: Site internet commune.
20 Lycées (publics, privés, européens et internationaux)	0	0	0	0	0	0	0	
21 Facultés	0	0	0	0	0	0	0	
Social								
22 Crèches	0	1	0	0	0	0	0	GWS17
23 Maisons relais	0	0	1	0	0	0	0	Site internet commune
24 CIPA (Centres intégrés pour personnes âgées)	0	0	0	0	0	0	0	
25 Maisons de jeunes	0	0	0	0	0	0	0	
Santé et domaine paramédical								
24 Médecins généralistes	0	0	0	0	0	0	0	
25 Dentistes	0	0	0	0	0	0	0	
26 Kinésithérapeutes	0	1	0	0	0	0	0	
27 Laboratoires de prise de sang	0	0	0	0	0	0	0	
28 Pharmacies	0	0	0	0	0	0	0	
29 Vétérinaires	0	0	0	0	0	0	0	
30 Médecins spécialistes	0	0	0	0	0	0	0	
31 Maisons médicales	0	0	0	0	0	0	0	
32 Hôpitaux	0	0	0	0	0	0	0	
Restaurants, cafés								
33 Cafés, bars	1	1	0	0	0	0	0	GWS17
34 Restaurants	0	1	0	0	0	0	0	GWS17
Culture, sport et loisirs								
35 Centres sportifs	1	0	0	0	0	0	0	Centre sportif & culturel Site internet commune
36 Pêche	0	0	0	0	0	0	0	
37 Musées, galeries d'art	0	0	0	0	0	0	0	
38 Bibliothèques	0	0	0	0	0	0	0	
39 Théâtres, salles de spectacle	0	0	0	0	0	0	0	
40 Cinémas	0	0	0	0	0	0	0	
Total	5	8	3	1	0	0	0	coiffeurs auch mitgezählt

**Transportation is not recognised
as a decisive criteria!**

STRATEGY FINDINGS OF CASE STUDY

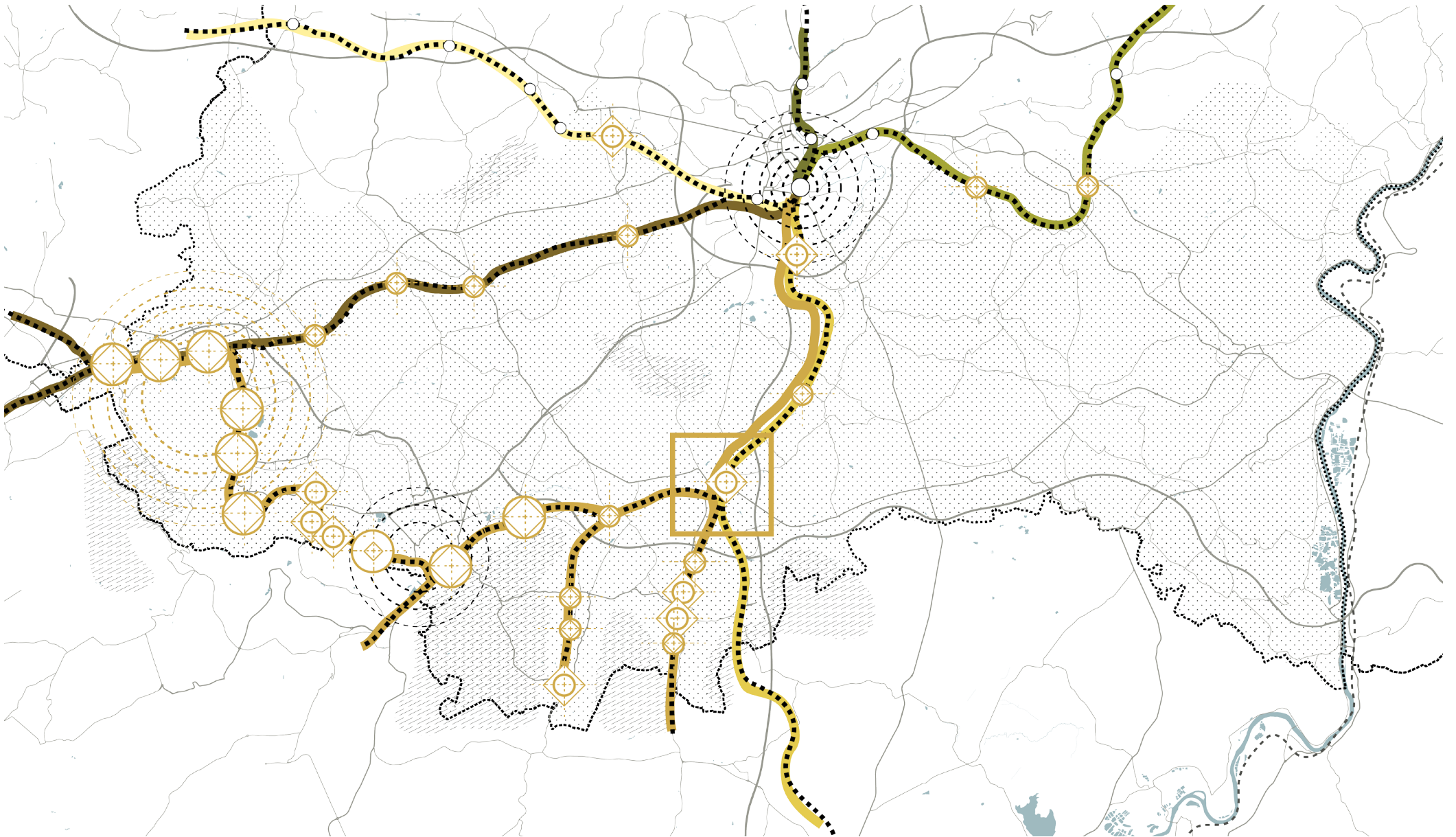



STRATEGY FINDINGS OF CASE STUDY

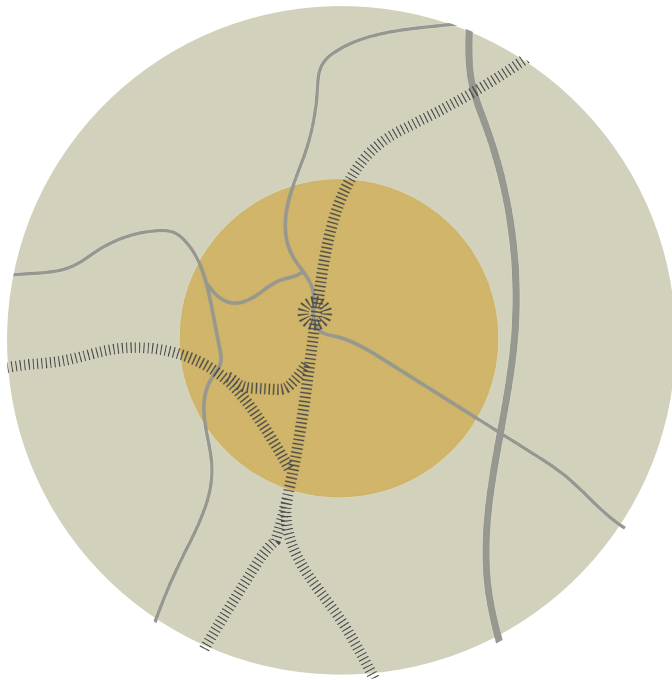


- 
Category 1
high population density /
high level of urbanity
- 
Category 2
high population density /
low level of urbanity
- 
Category 3
low population density /
high level of urbanity
- 
Category 4
low population density /
low level of urbanity

STRATEGY CASE STUDY EXAMPLE

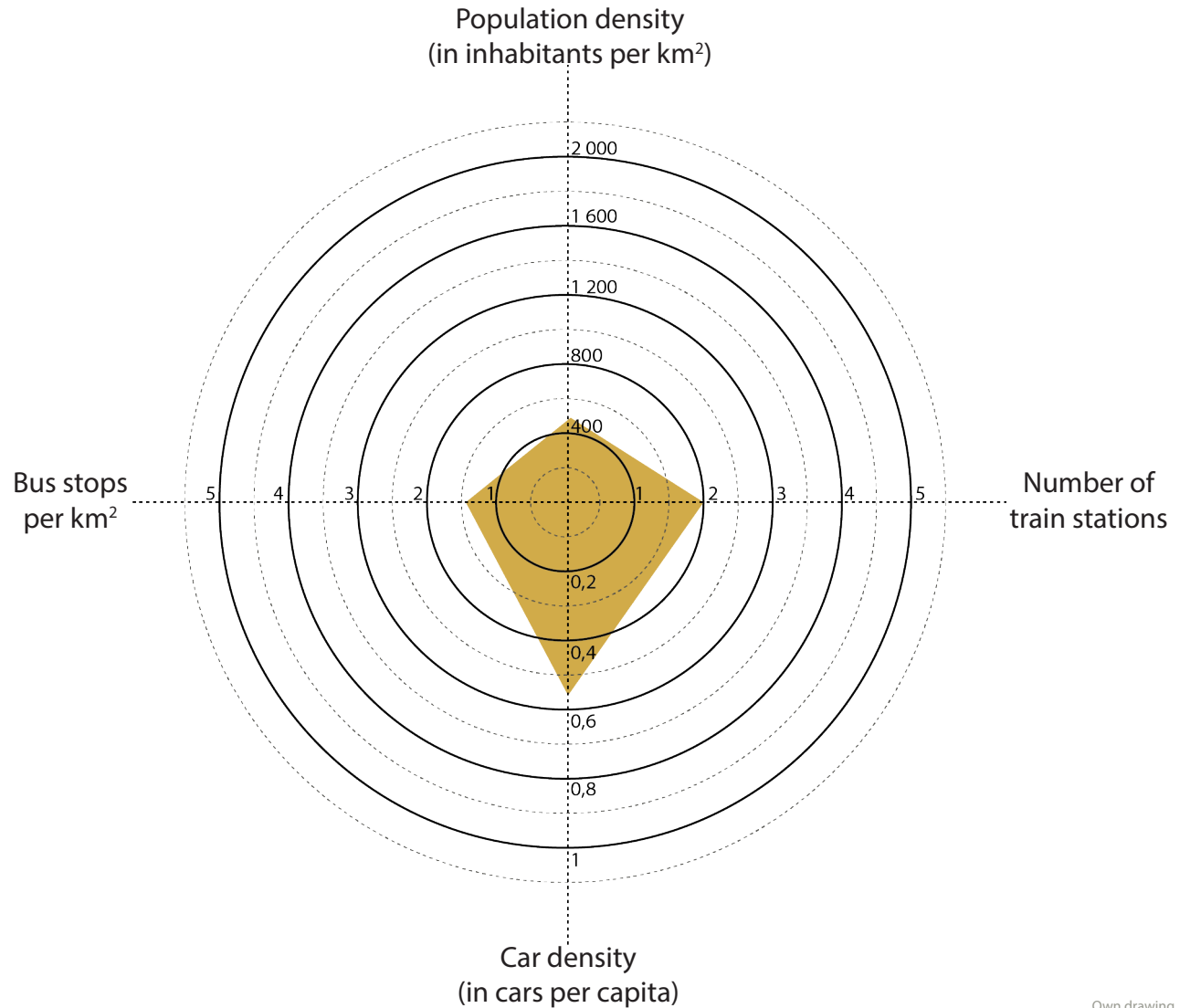


 **Train station Bettembourg Gare**
Relation between built environment
and infrastructure network




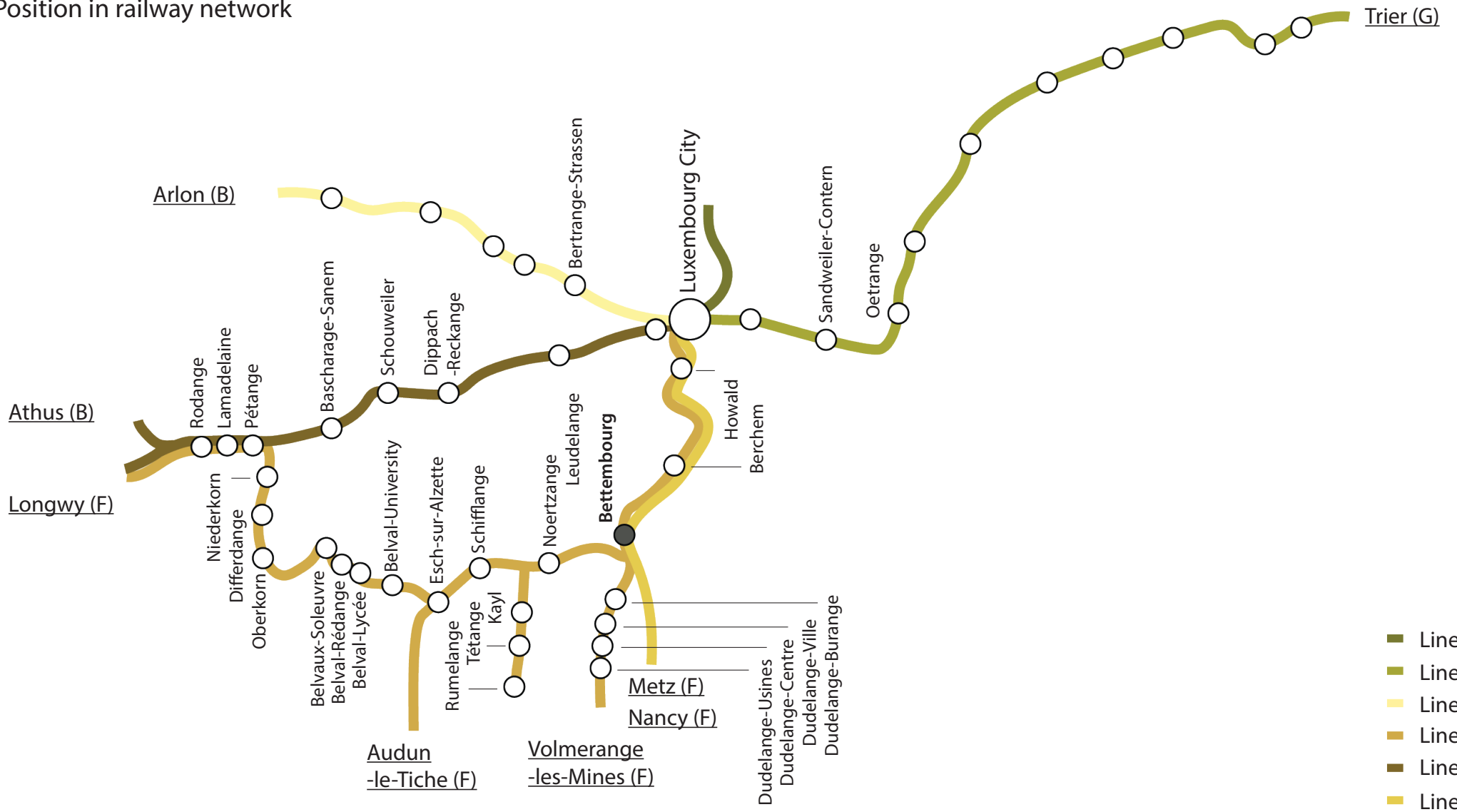
Own drawing

Relation between density and accessibility



Own drawing

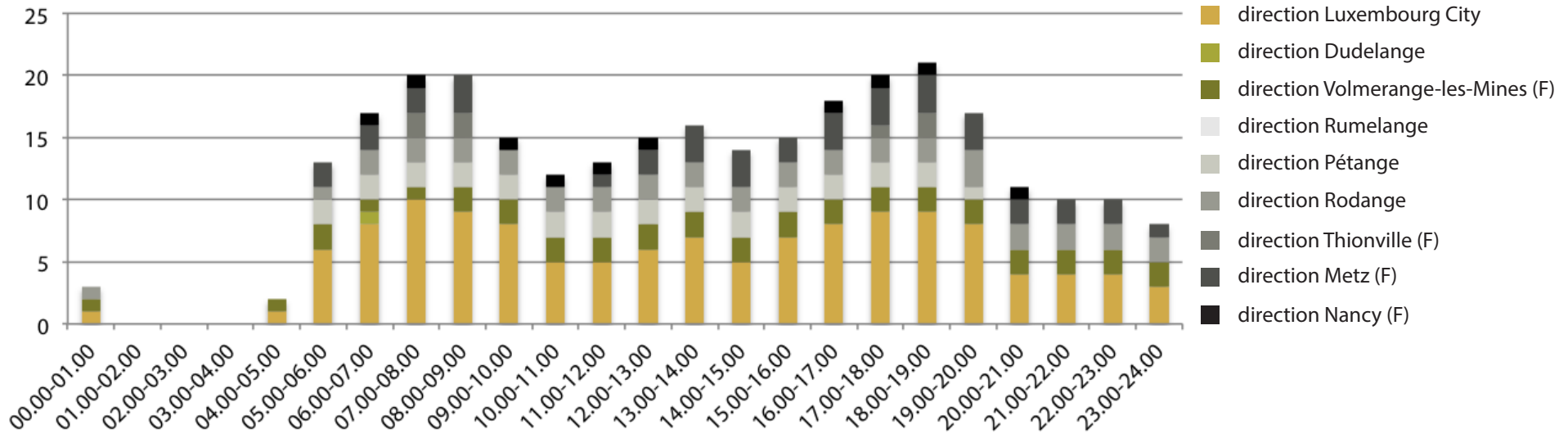
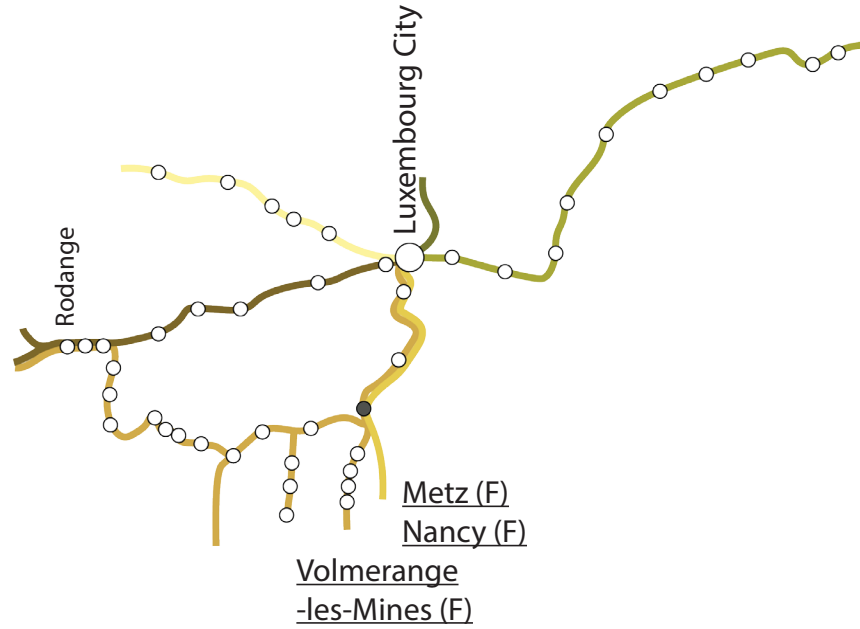
 Train station **Bettembourg Gare**
Position in railway network



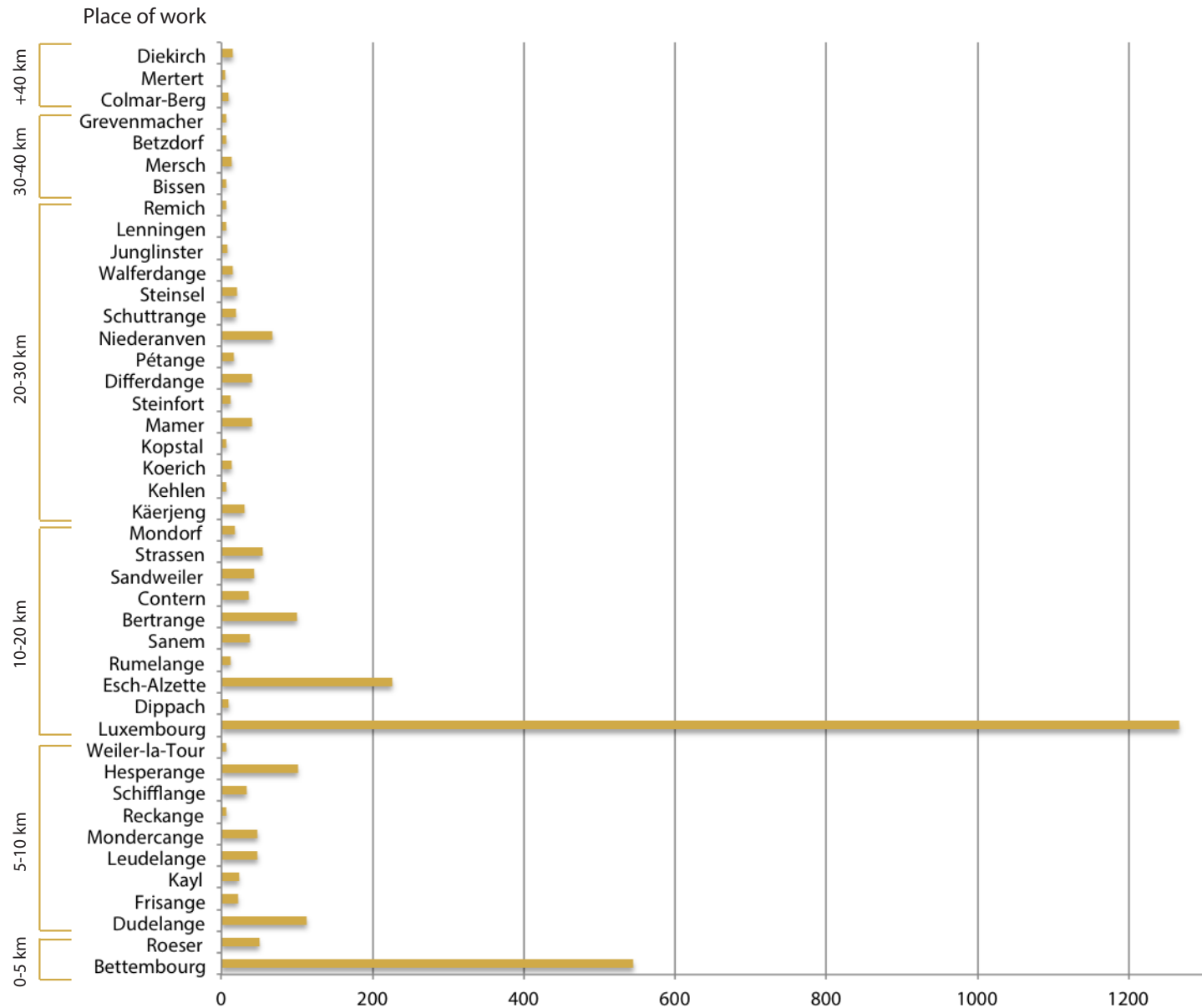
Own drawing

STRATEGY CASE STUDY EXAMPLE

 Train station Bettembourg Gare
 Frequency



Commuting distance



Data from year 2011. Information retrieved from <http://www.statistiques.public.lu>

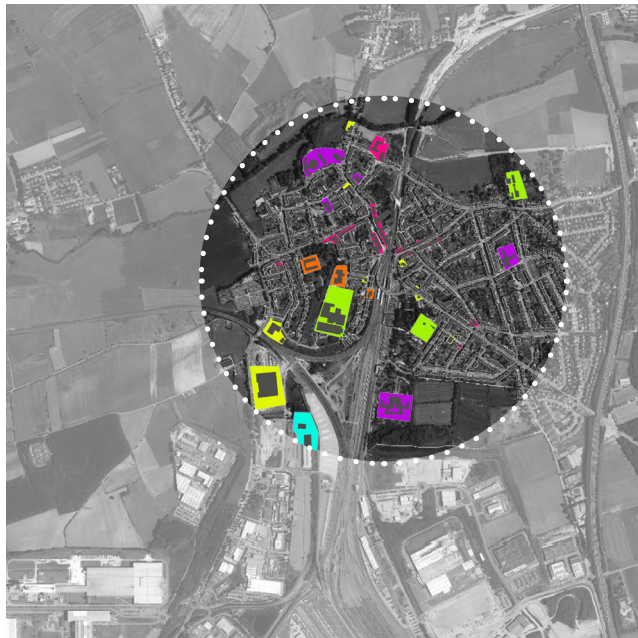
STRATEGY CASE STUDY EXAMPLE

Infrastructure network



Background image retrieved from <http://map.geoportail.lu>

Functions



- industrial use
- educational use
- sports and culture
- mixed use
- administrative use and public services
- commercial use

Land use



- high building density (city)

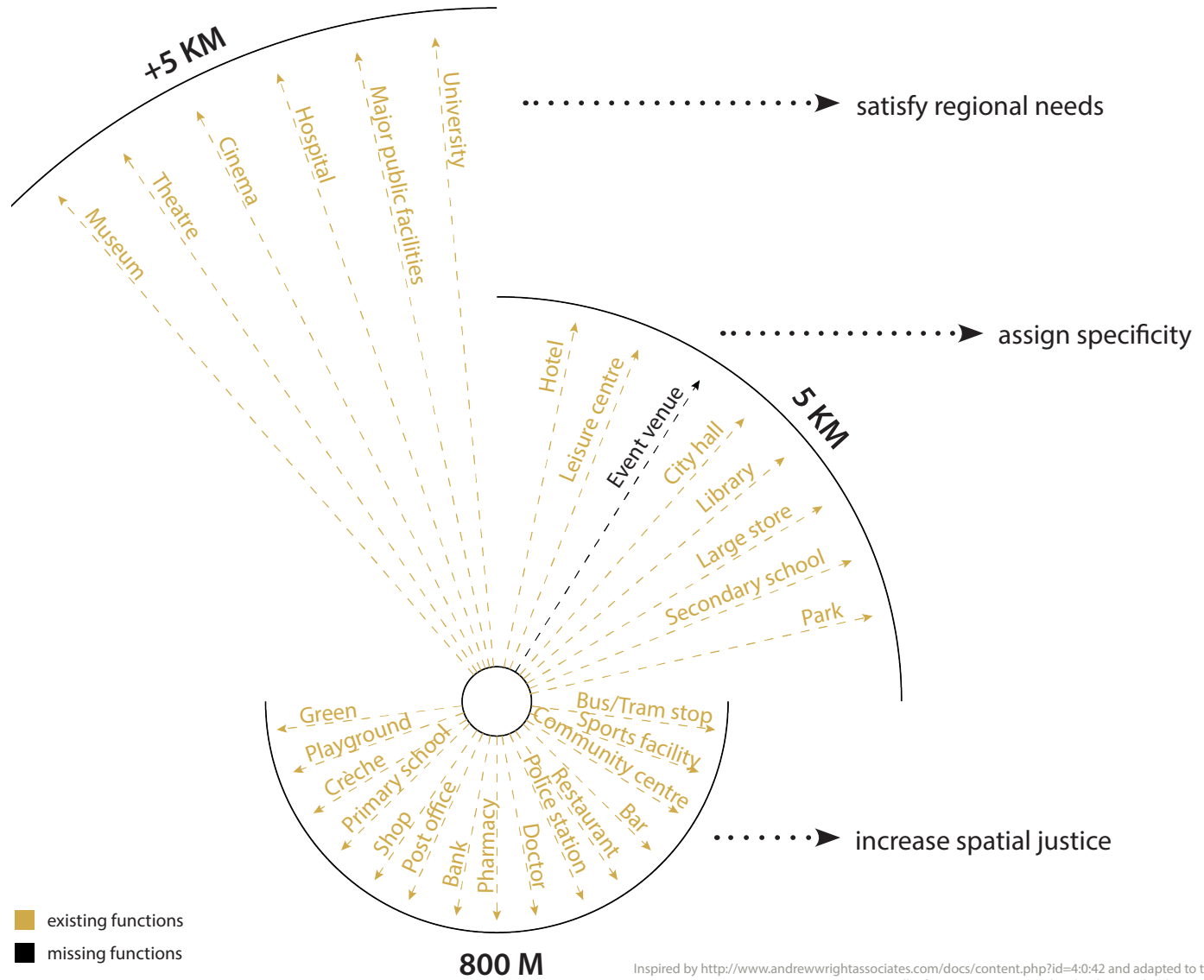
Limitations



- bird protection zones Natura 2000

STRATEGY CASE STUDY EXAMPLE

Level of urbanity



Inspired by <http://www.andrewwrightassociates.com/docs/content.php?id=4:0:42> and adapted to the Luxembourgish context. All information represented in the diagram has been retrieved from google maps. Own drawing

STRATEGY GENERAL PRINCIPLES



Accessibility by public transportation



Density



Mixed use



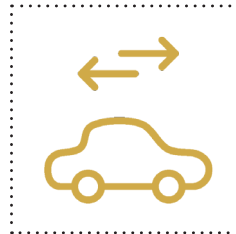
Soft mobility



Different house types



Car free zones



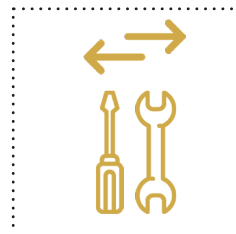
Car and bike sharing



Compact living space













Modular building construction

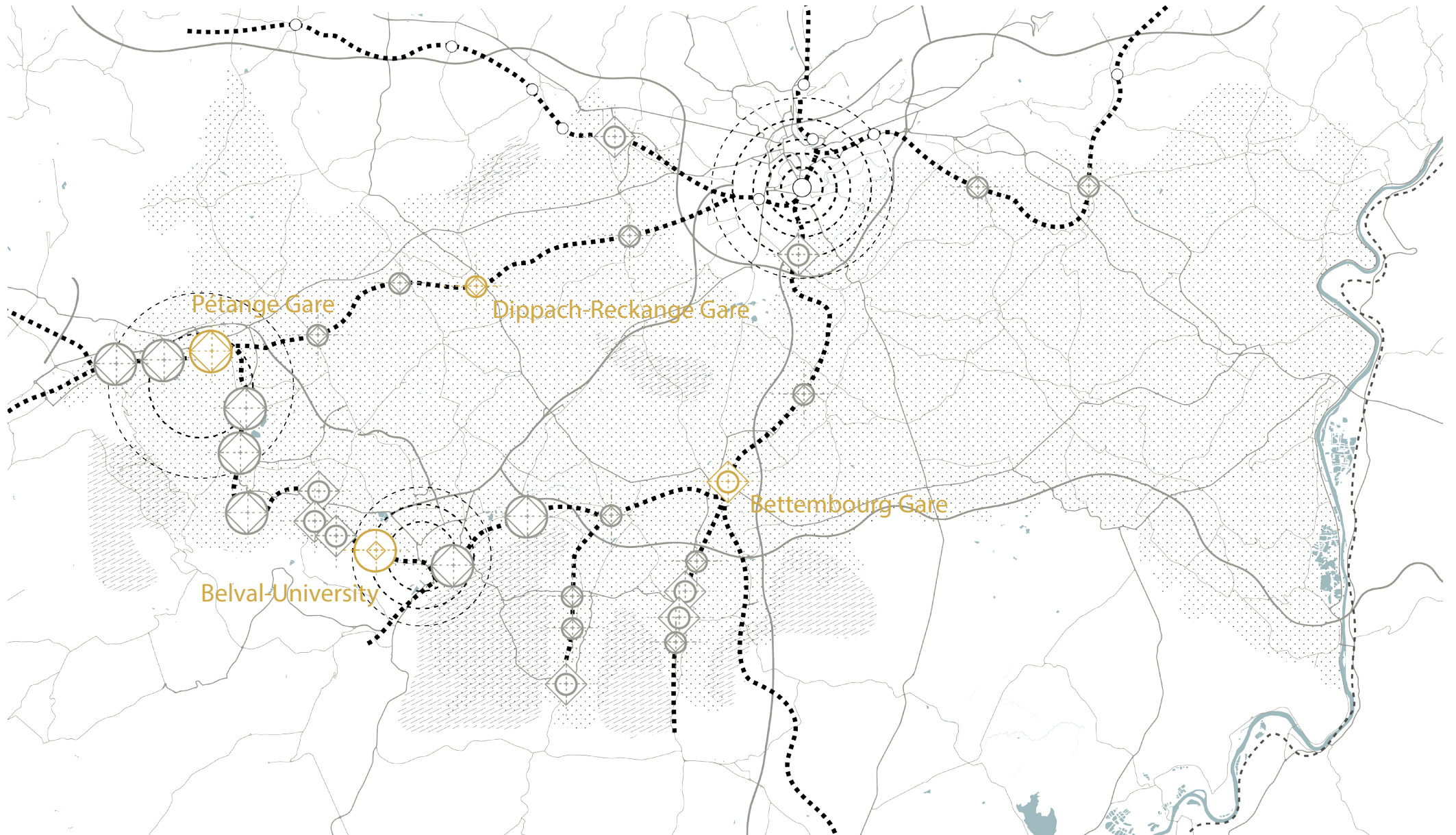


Commodities sharing

STRATEGY GENERAL PRINCIPLES

	Regional	Transit zone	Neighbourhood	Building	TOD	Spatial justice	Circular economy
	█	█			█	█	
	█	█	█		█	█	█
	█	█	█	█	█	█	
		█	█		█	█	█
		█	█			█	
		█	█			█	█
		█	█				█
				█		█	█
				█			█
			█				█

STRATEGY IMPLEMENTATION CASES




STRATEGY IMPLEMENTATION CASES



Plan and Partner
Category 1 - Pétange Gare

 high population density

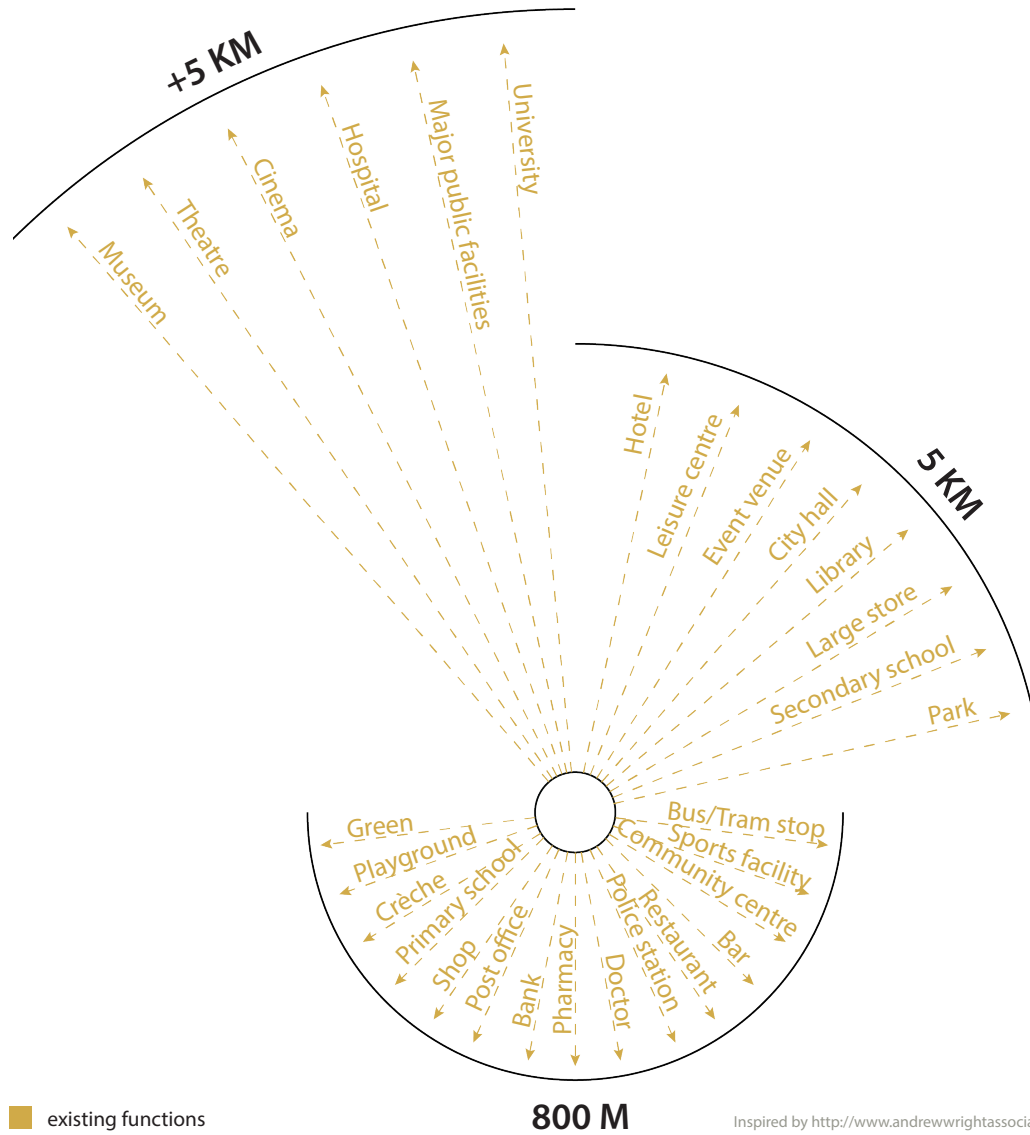
 high level of urbanity

 clustered intervention

STRATEGY IMPLEMENTATION CASES



Category 1
high population density /
high level of urbanity



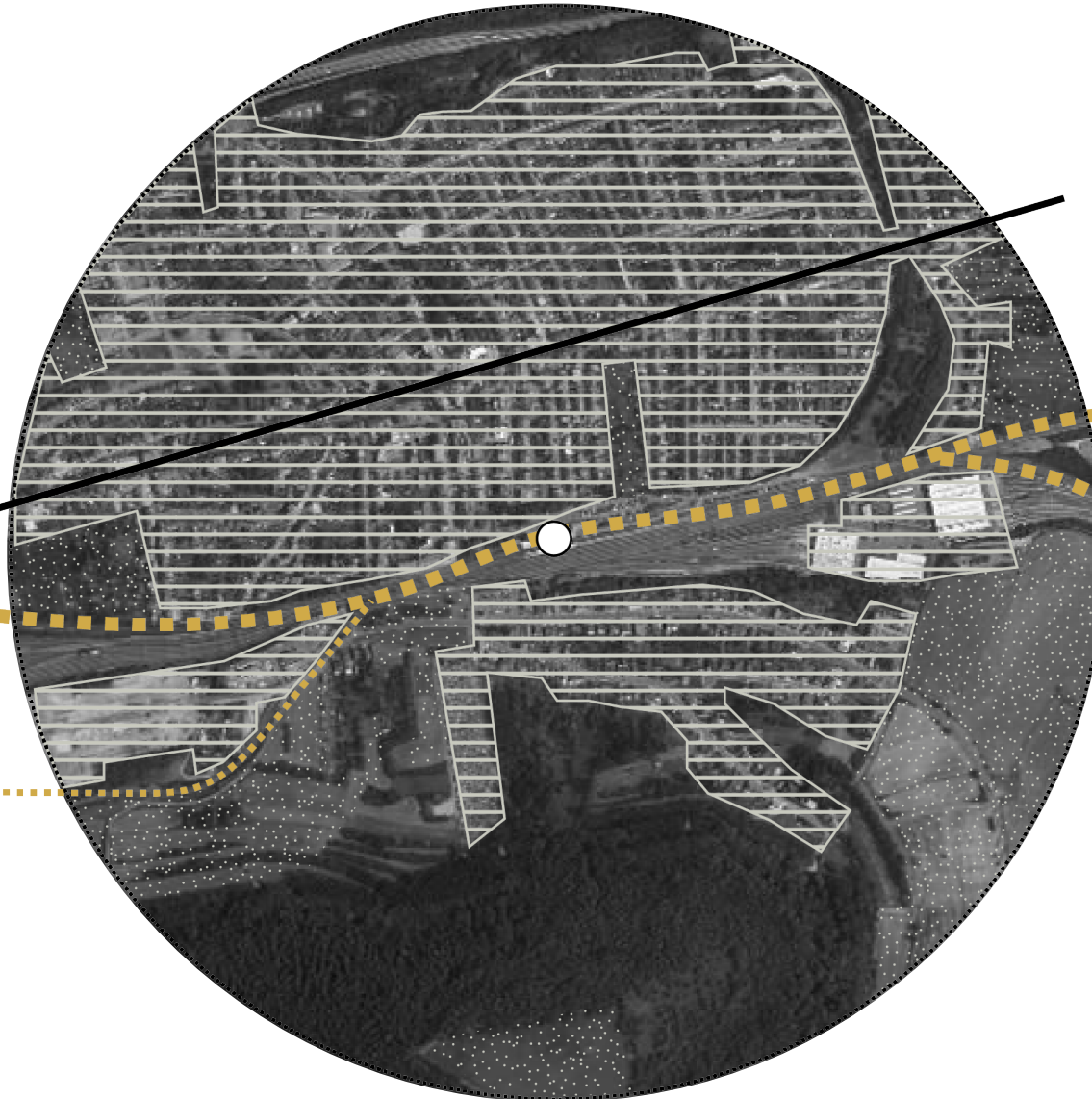
■ existing functions
■ missing functions

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STRATEGY IMPLEMENTATION CASES



Category 1
high population density /
high level of urbanity

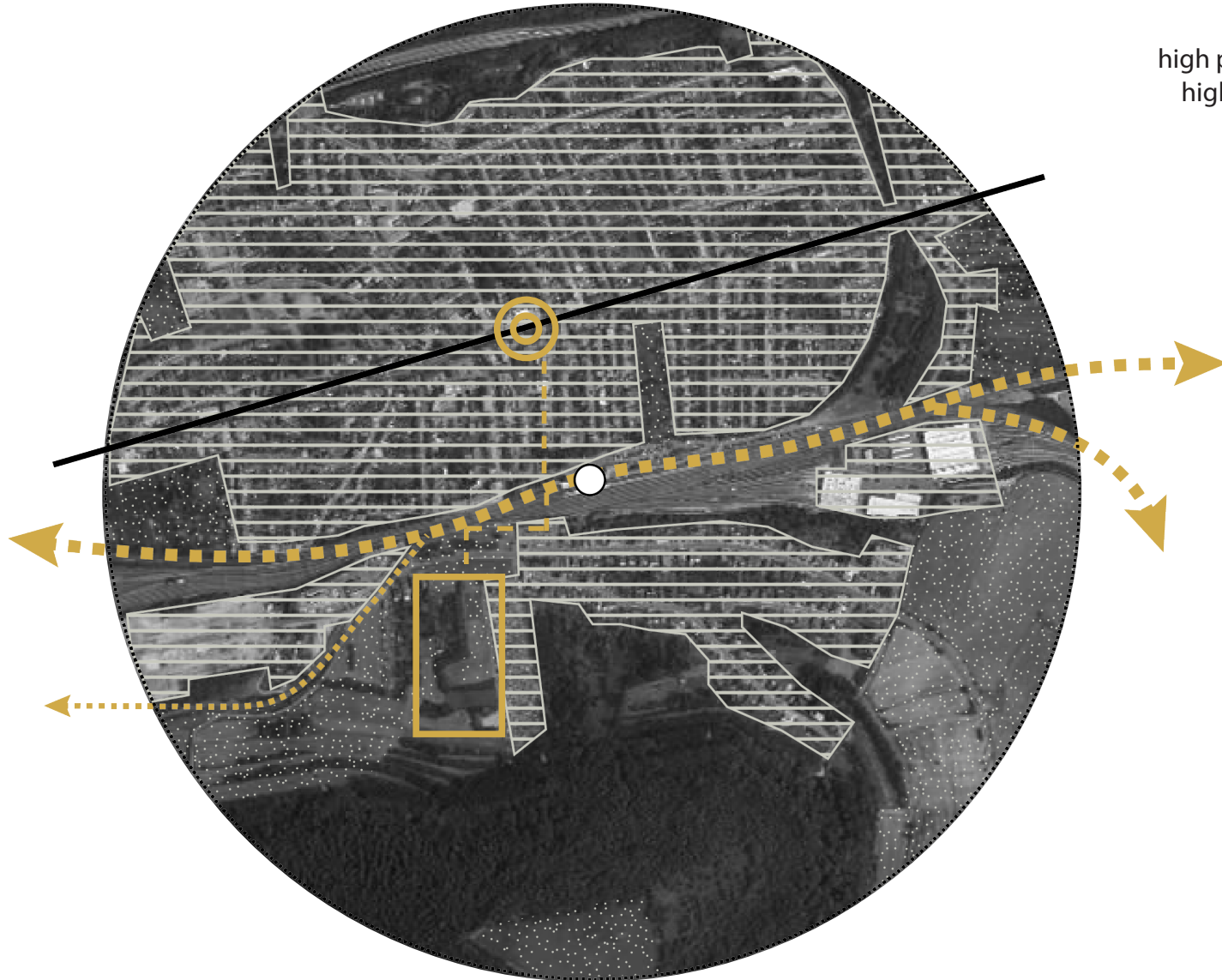


All photos have been taken by the author.
Background image retrieved from <http://map.geoportail.lu>
Own drawing

STRATEGY IMPLEMENTATION CASES



Category 1
high population density /
high level of urbanity






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STRATEGY IMPLEMENTATION CASES





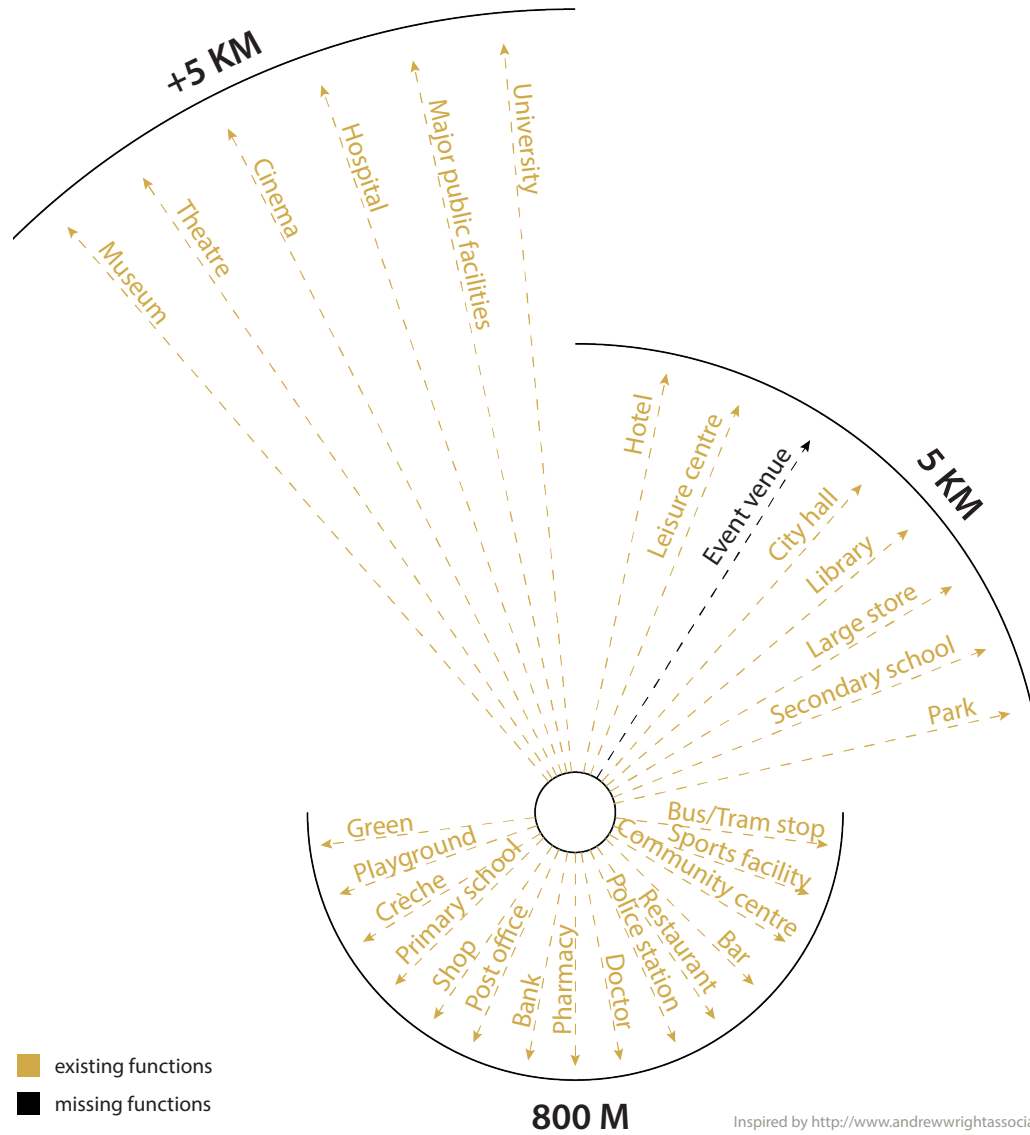
Infill and Enhance
Category 3 - Bettembourg Gare

-  low population density
-  high level of urbanity
-  targeted intervention

STRATEGY IMPLEMENTATION CASES



Category 3
low population density /
high level of urbanity

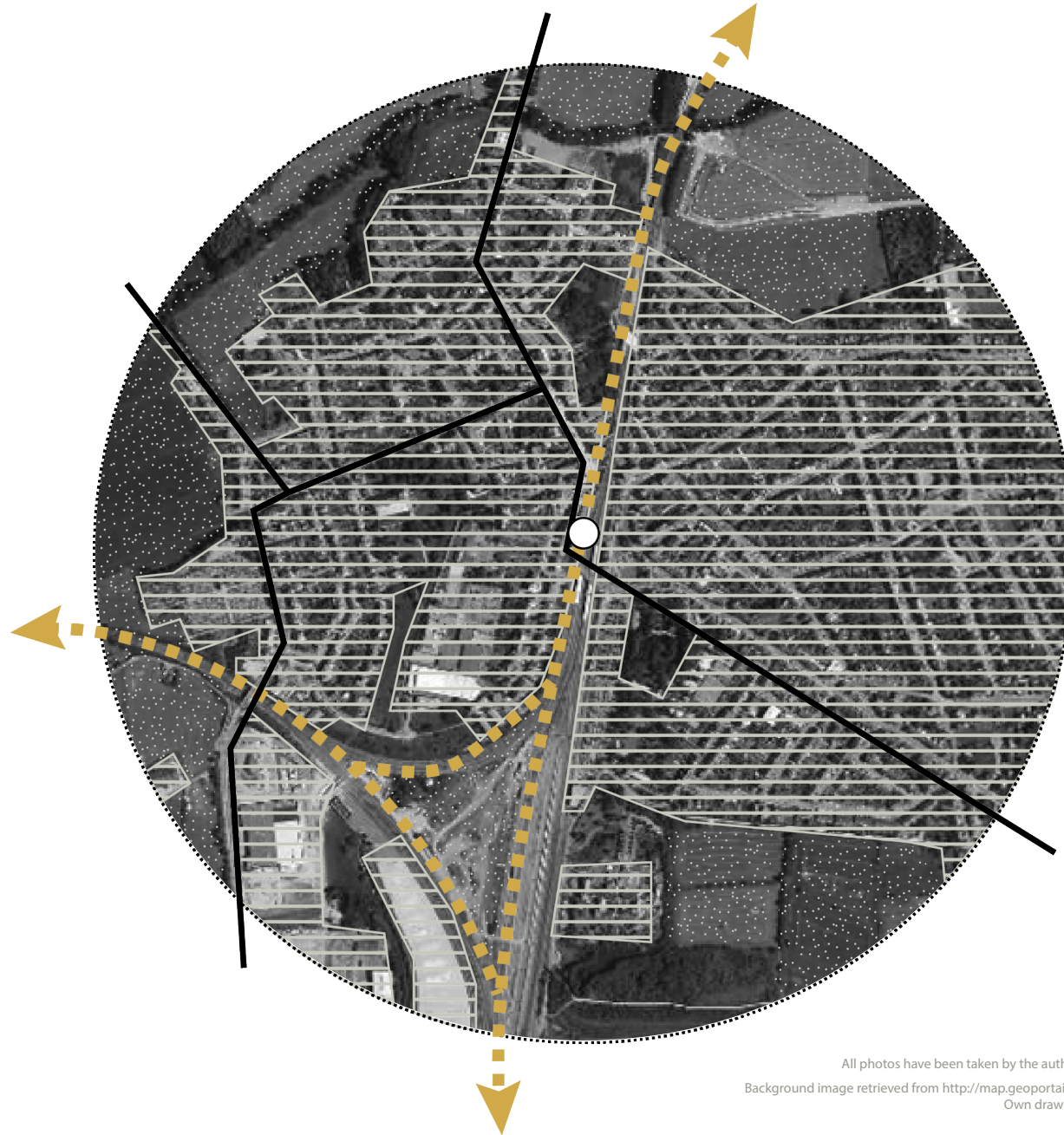


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STRATEGY IMPLEMENTATION CASES



Category 3
low population density /
high level of urbanity



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STRATEGY IMPLEMENTATION CASES



STRATEGY IMPLEMENTATION CASES



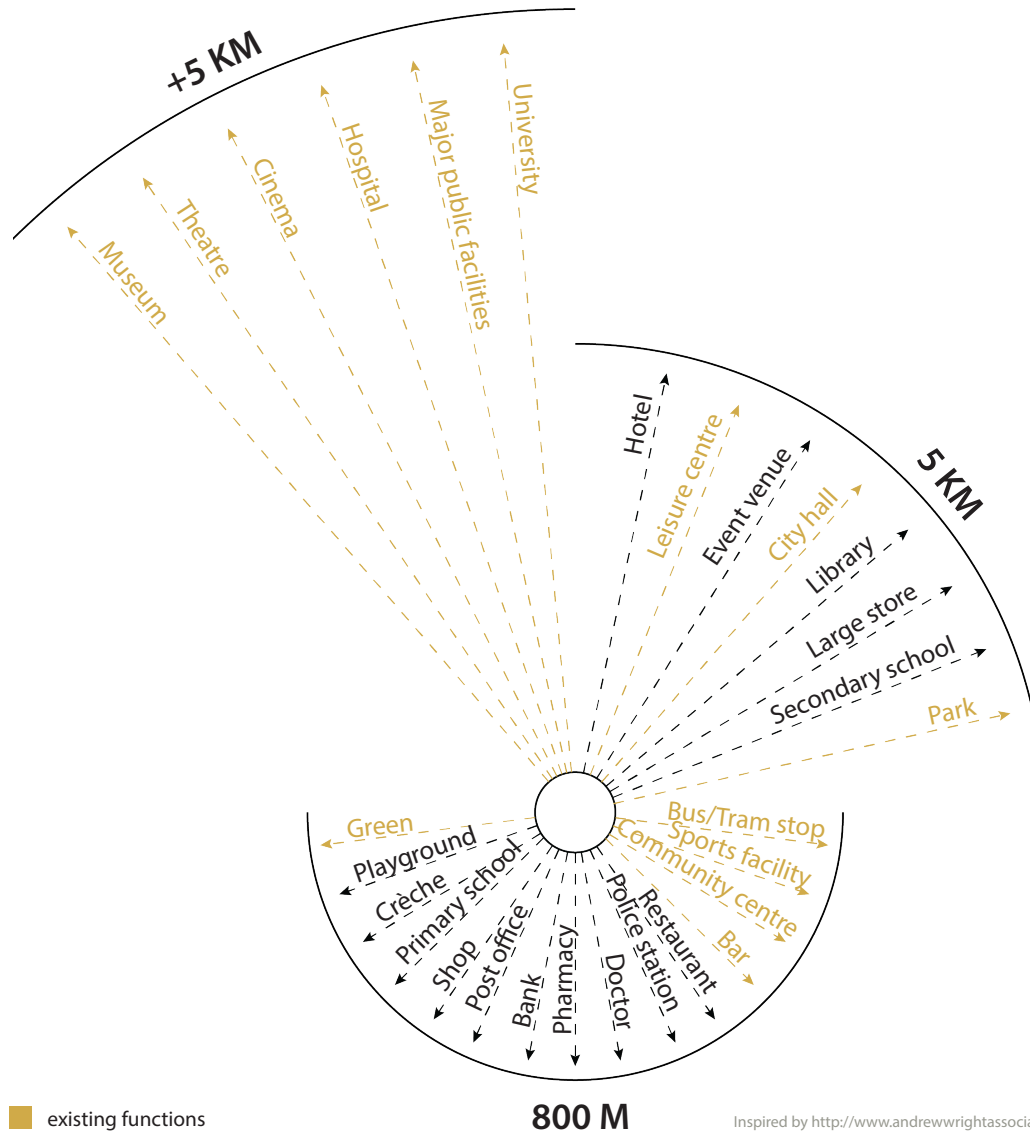
Catalyse and Connect
Category 4 - Dippach-Reckange Gare

-  low population density
-  low level of urbanity
-  linear intervention

STRATEGY IMPLEMENTATION CASES



Category 4
low population density /
low level of urbanity



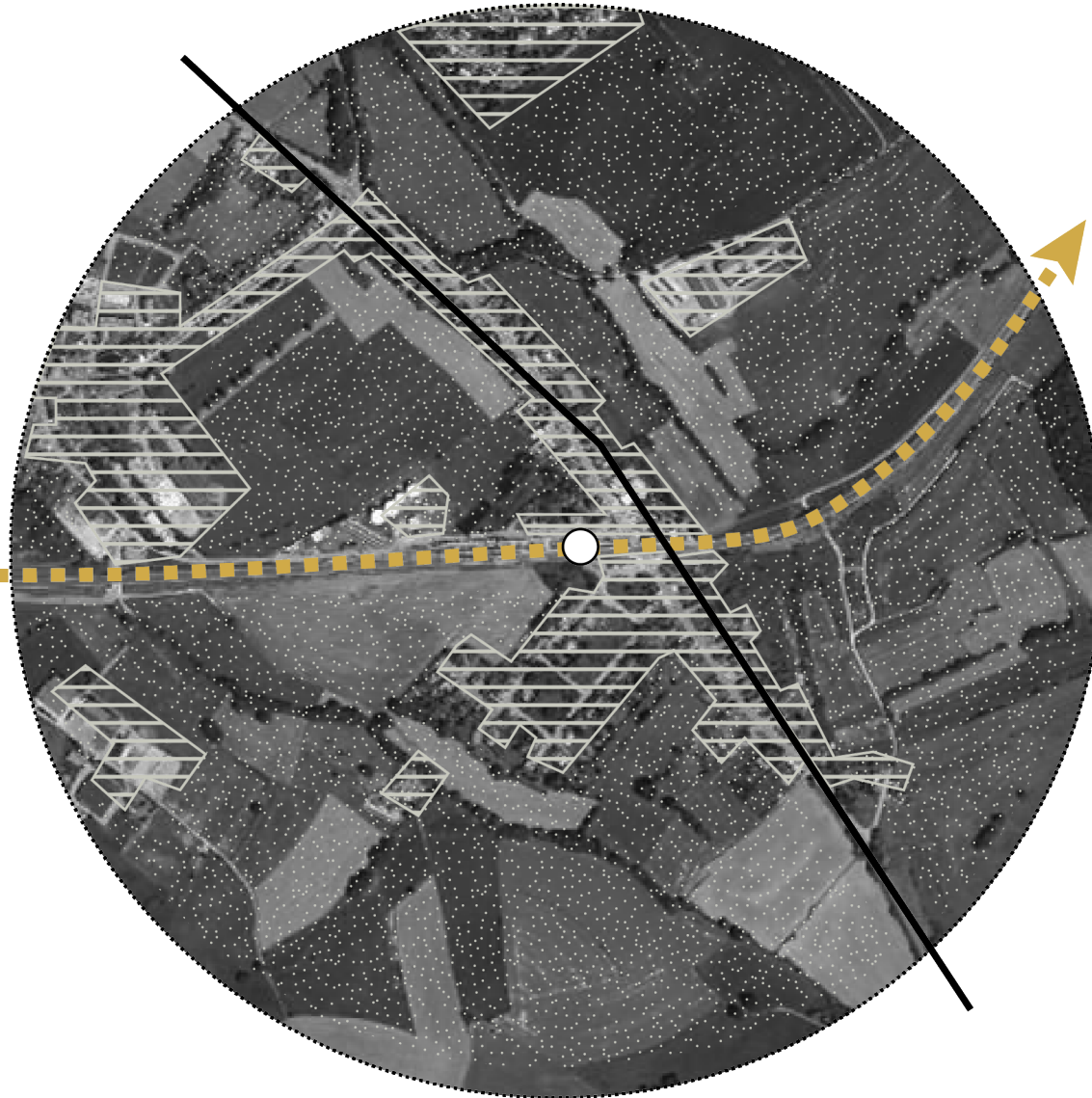
- existing functions
- missing functions

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STRATEGY IMPLEMENTATION CASES



Category 4
low population density /
low level of urbanity

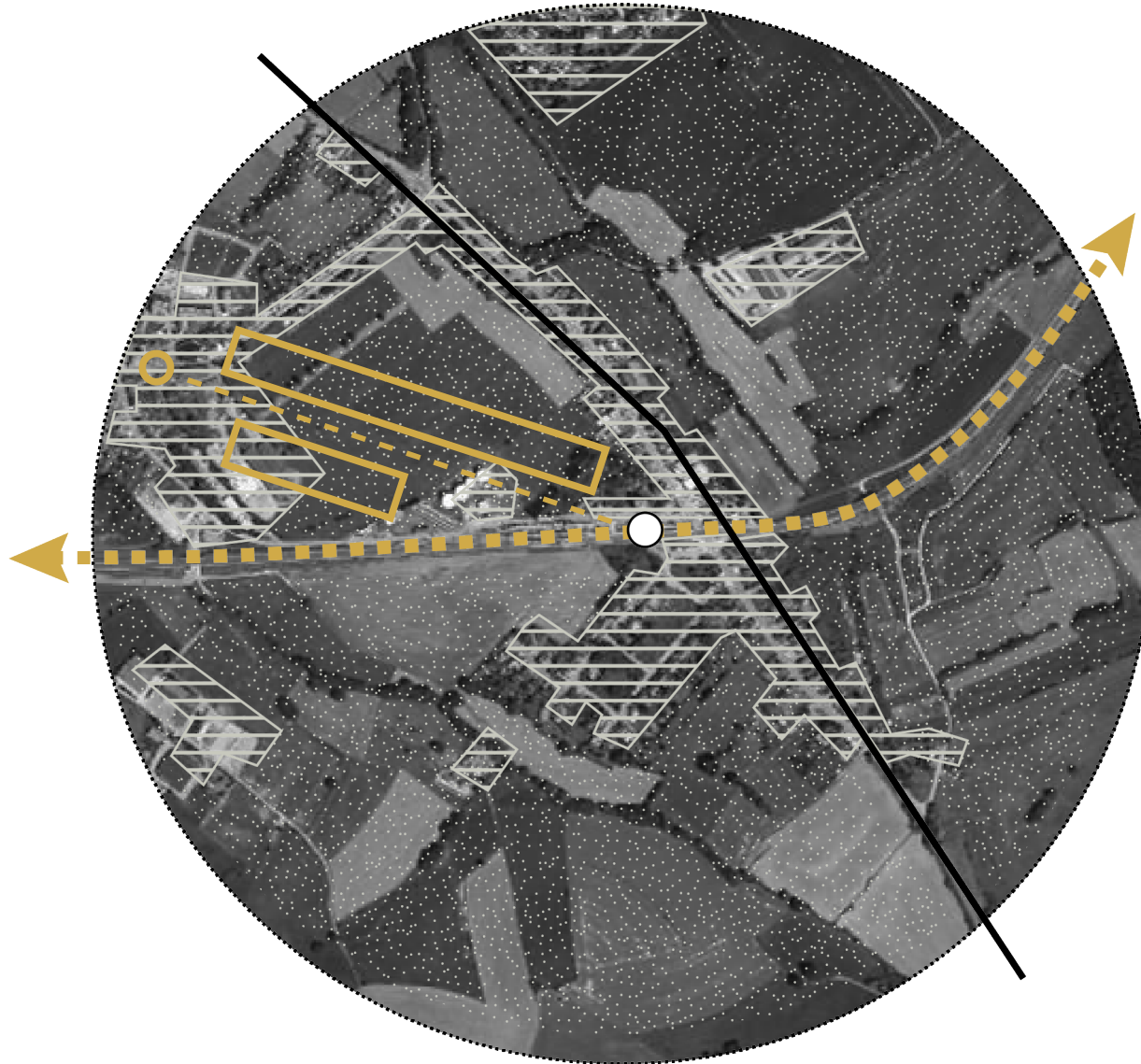


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STRATEGY IMPLEMENTATION CASES



Category 4
low population density /
low level of urbanity



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STRATEGY IMPLEMENTATION CASES



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