Territory based Industrial Product-Service System design

2014-2015 (Second Year)

Department : Sociotechnical Engineering of Knowledge, Networks and Sustainable Development

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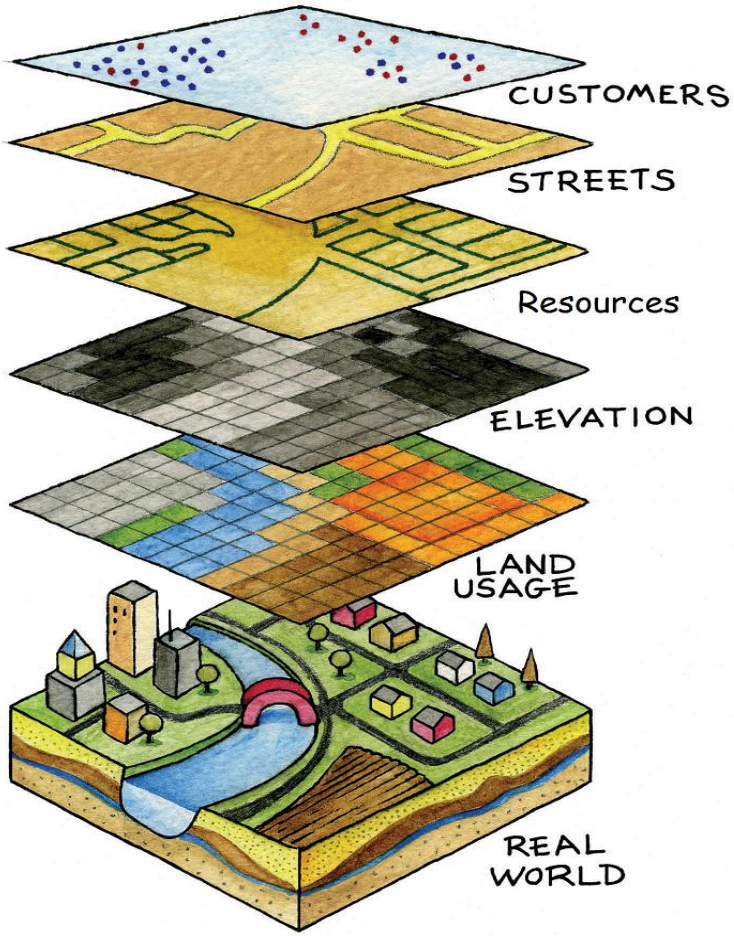
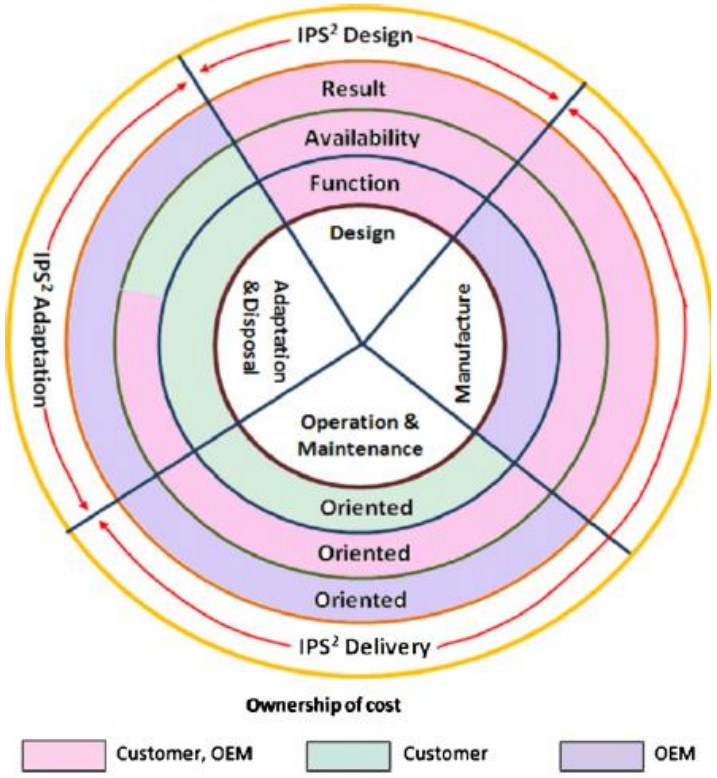
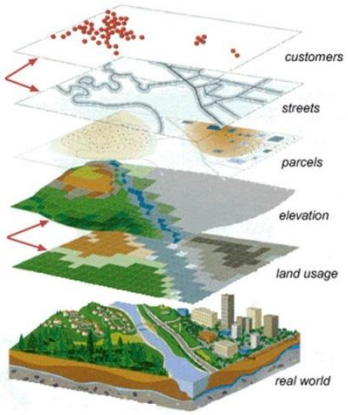
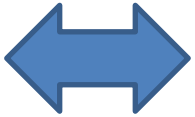




Datta PP, Roy R (2009)

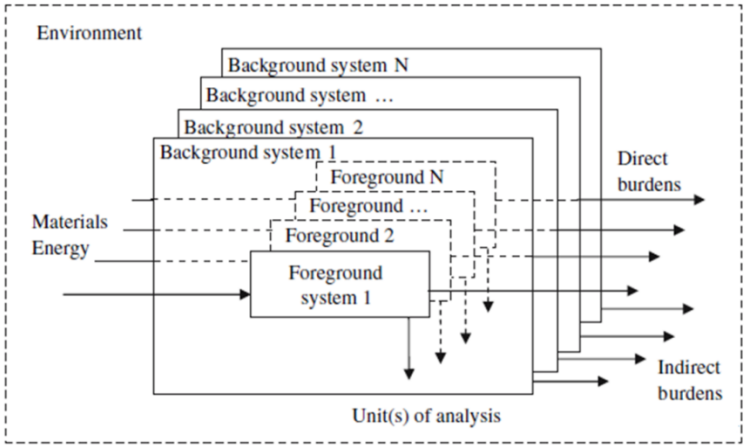
1- What is the role of geographical information in sustainable product service system design?





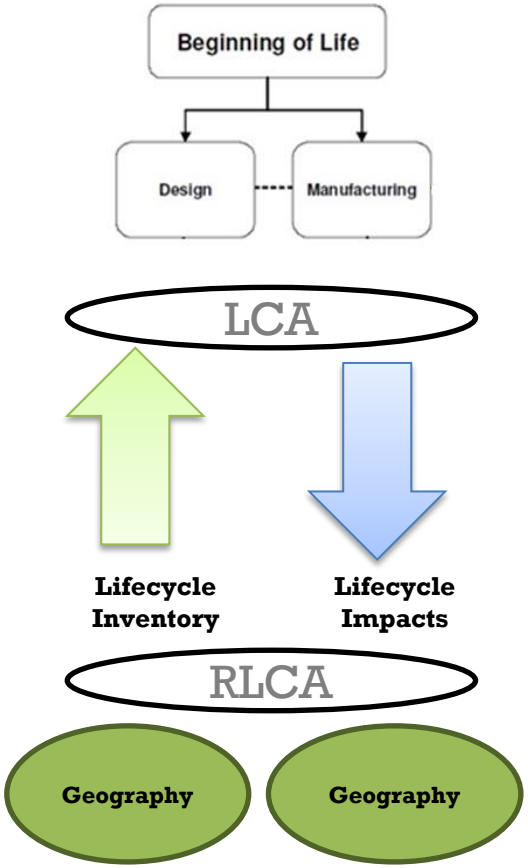
2- How can designers use geographical information to make better decision ?

3- How localization as much as possible could have improvement in sustainability?



Adisa Azapagic , Carol Pettit , Phil Sinclair , 2007

Environmental View



Product & Environment Link

Life cycle Assessment (LCA)

One of the techniques to assess environmental impacts associated with all the stages of a product's life from-cradle-to-grave.

Inventory:

- Country level data
- Uncertainty data
- Low/high population density

Impact assessment:

- Global Warming
- Ozone Depletion

Environment & Geography Link

Regionalization in Life cycle Assessment (RLCA)

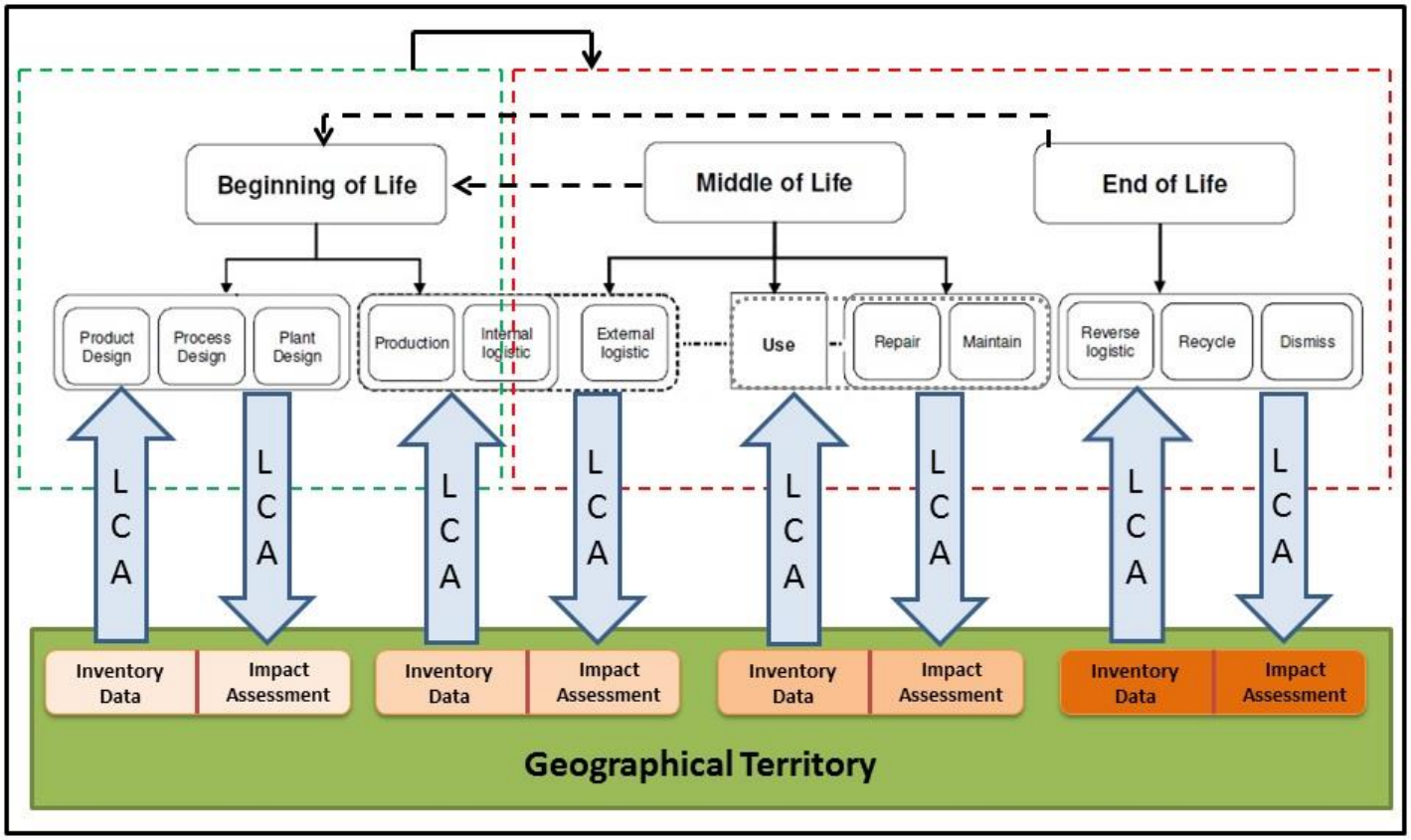
A technique to improve the accuracy and precision of life cycle assessment (LCA) results.

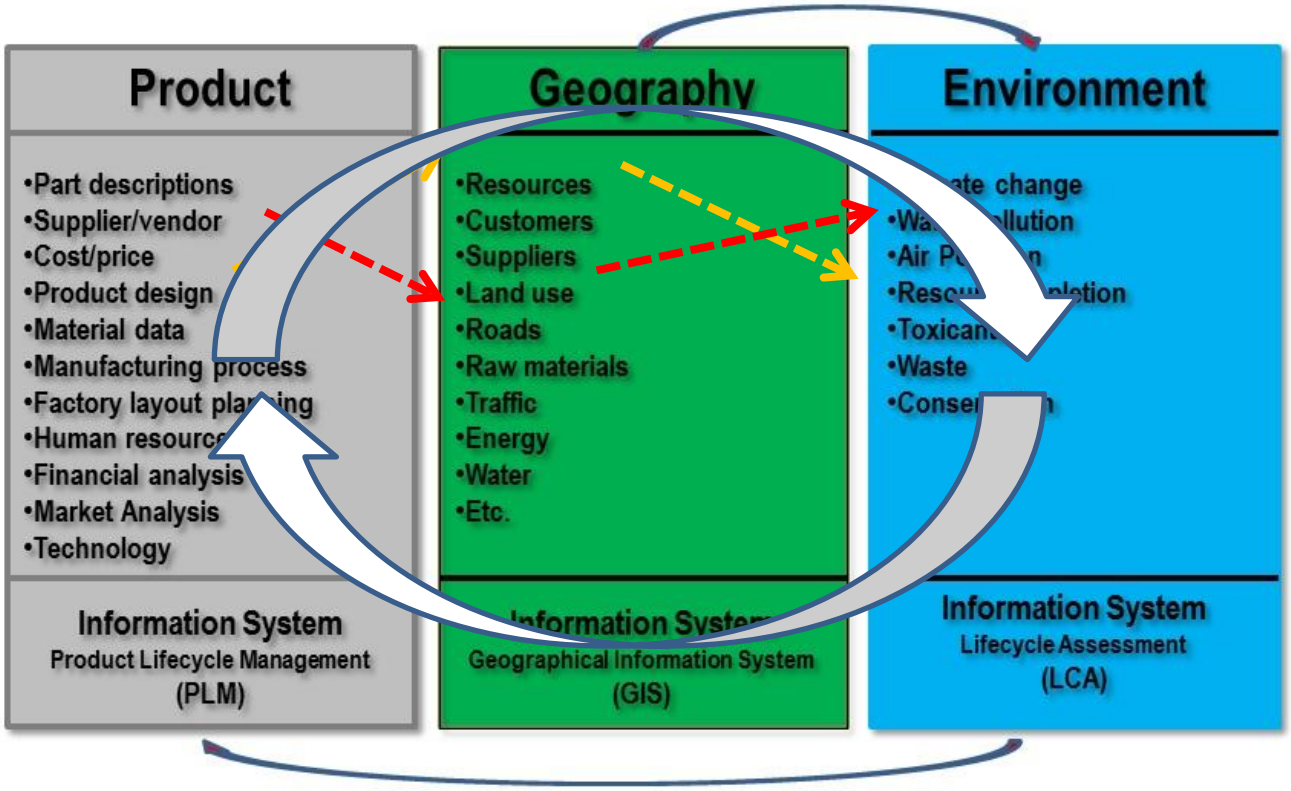
Inventory:

- Regional/ Local level data
- High certainty data

Impact assessment:

- Acidification
- Eutrophication
- Land Use
- Resource Consumption


Beginning of Life
Middle of Life
End of Life
Product Design
Process Design
Plant Design
Production
Internal logistic
External logistic
Use
Repair
Maintain
Reverse logistic
Recycle
Dismiss
LCA
Inventory Data
Impact Assessment
Geographical Territory



- If we connect Product, Environment and Geography information, then we will be able to use geographical information in design process.
- If we access geographical information, we will be able to regionalize product design to be more sustainable

1- Data Model Proposal

2- Tool Proposal

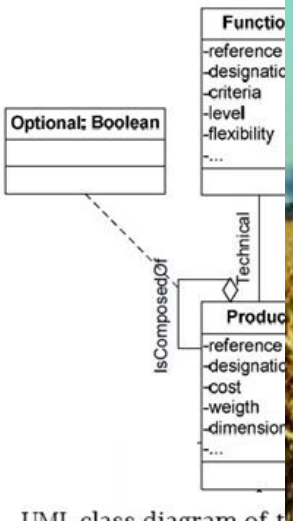
3- Validation

- Case stud
- Building
  study

Re-design
Champagne-
gion

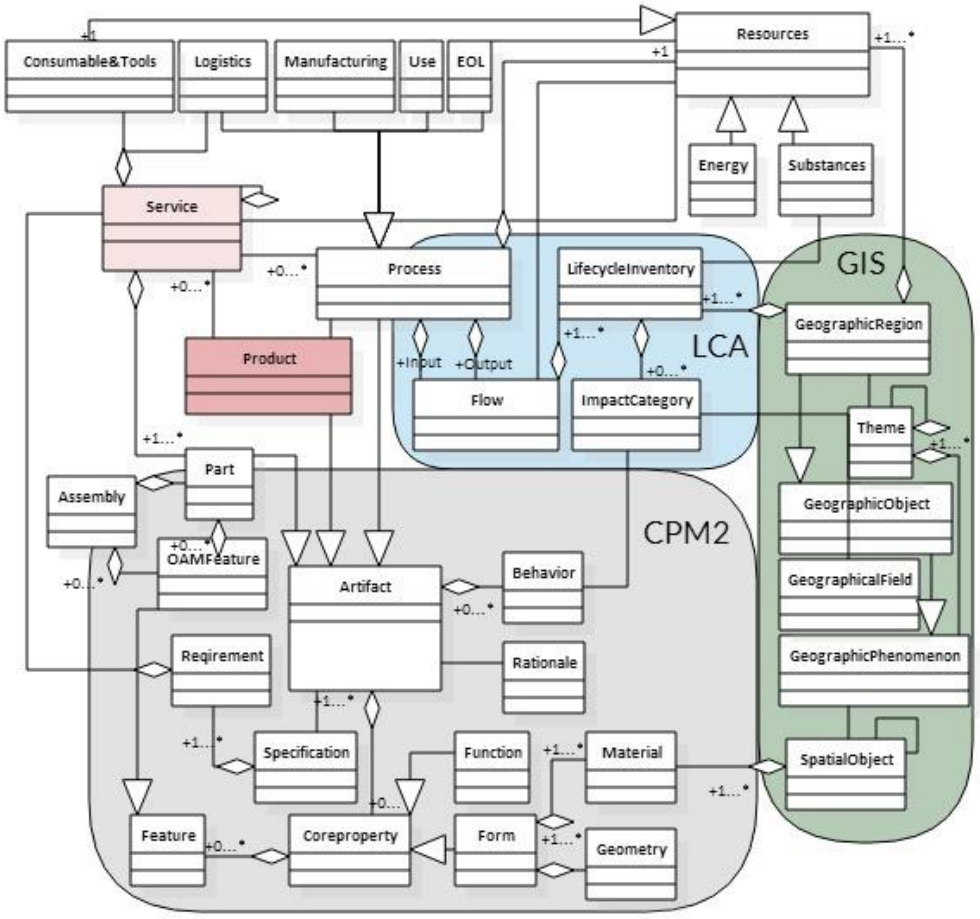
e study for

nat geography
n with product
ıment or not

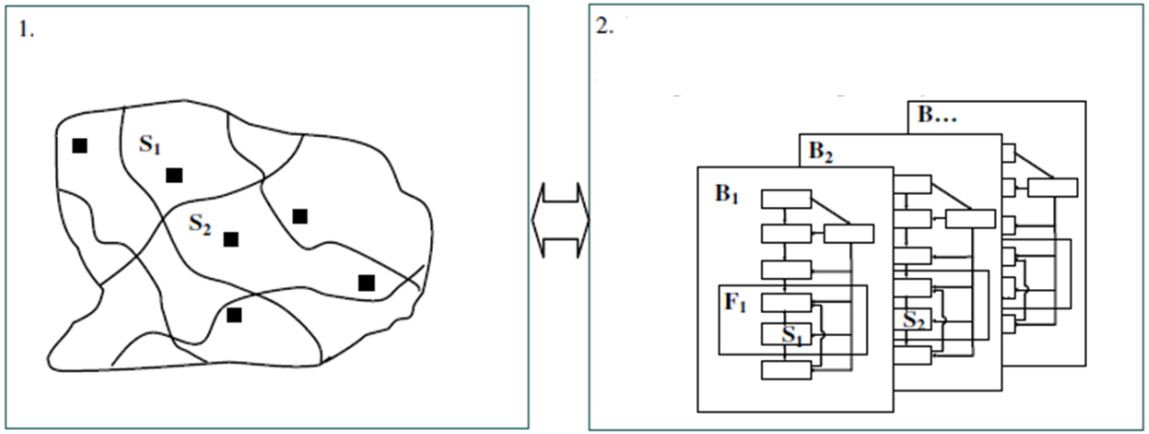


UML class diagram of t

Class Diagrams to link between three areas based on Core Product Model



UML Class Diagram:
Association
Aggregation
Composition



4.

	Total (F)	Receptor
E_1		R_1, R_3
E_2		R_4
E_3		...
...		...
E_k		R_r

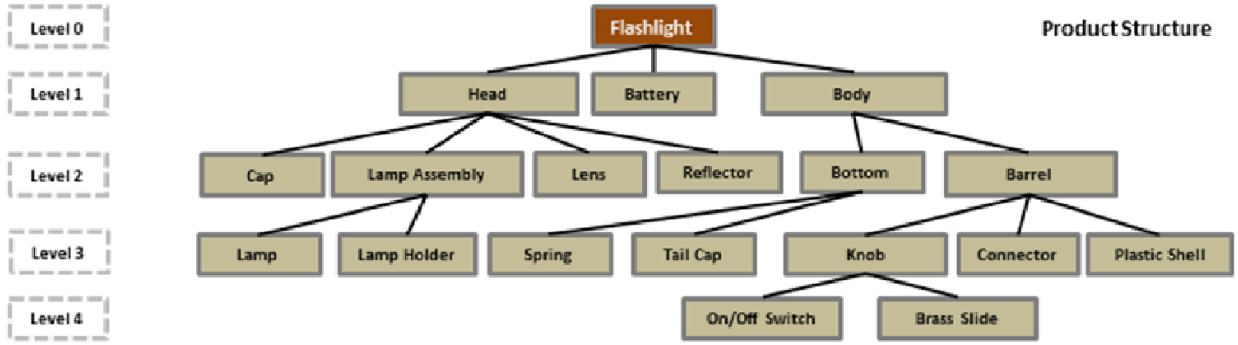
3.

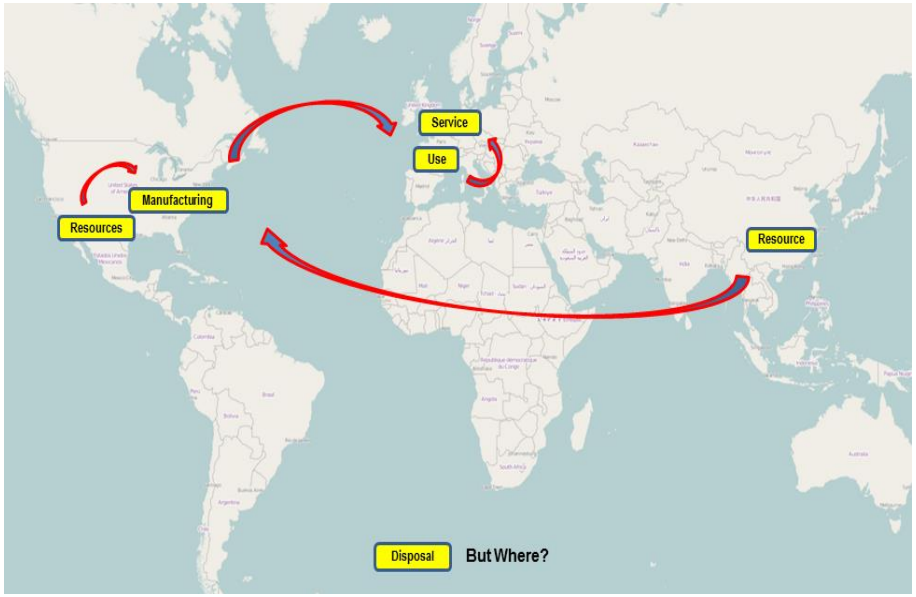
	$S_1(F)$	$S_1(B)$	$S_2(F)$	$S_2(B)$	$S_m(F)$	$S_m(B)$	Total
B_1 (or E_1)	...	...					...
B_2 (or E_2)	...	...					...
B_3 (or E_3)	...	...					...
...	...	...					...
B_j (or E_k)	...	...					...

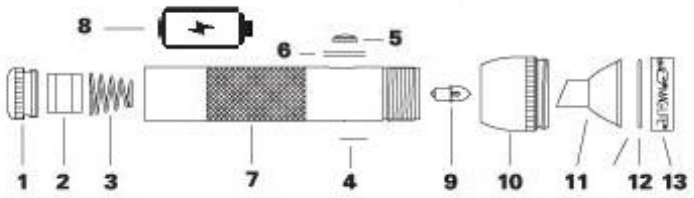
Redesign of a Plastic Flashlight produced in US in Champagne-Ardenne regions characteristics

Item	Product	Data accessibility	Less Complex	Mechanical System	Manufacturing system	Sum
1	Flashlight	3	3	3	2	11
2	Office Chair	3	3	2	2	10
3	Filter (Car)	2	2	3	3	10
4	Urban lights	2	3	3	2	10
5	Bicycle	3	3	2	2	10
6	Toothbrush	3	3	2	2	10
7	Wire Basket	3	3	2	2	10
8	Knife	3	3	2	2	10
9	Lawn Mover	2	2	3	2	9
10	Urban Bin	2	3	2	2	9
11	Lamp	2	2	2	3	9
12	Fan	3	2	2	2	9
13	Glass	2	3	2	2	9
14	Battery	2	2	3	2	9
15	Coffee Machin	2	2	3	2	9
16	Pencil	3	3	1	2	9
17	Wire	2	2	2	2	8
18	Scooter	2	2	2	2	8
19	Shoes	3	3	1	1	8
20	Refrigerator	2	1	3	2	8
21	Phone	1	1	2	2	6

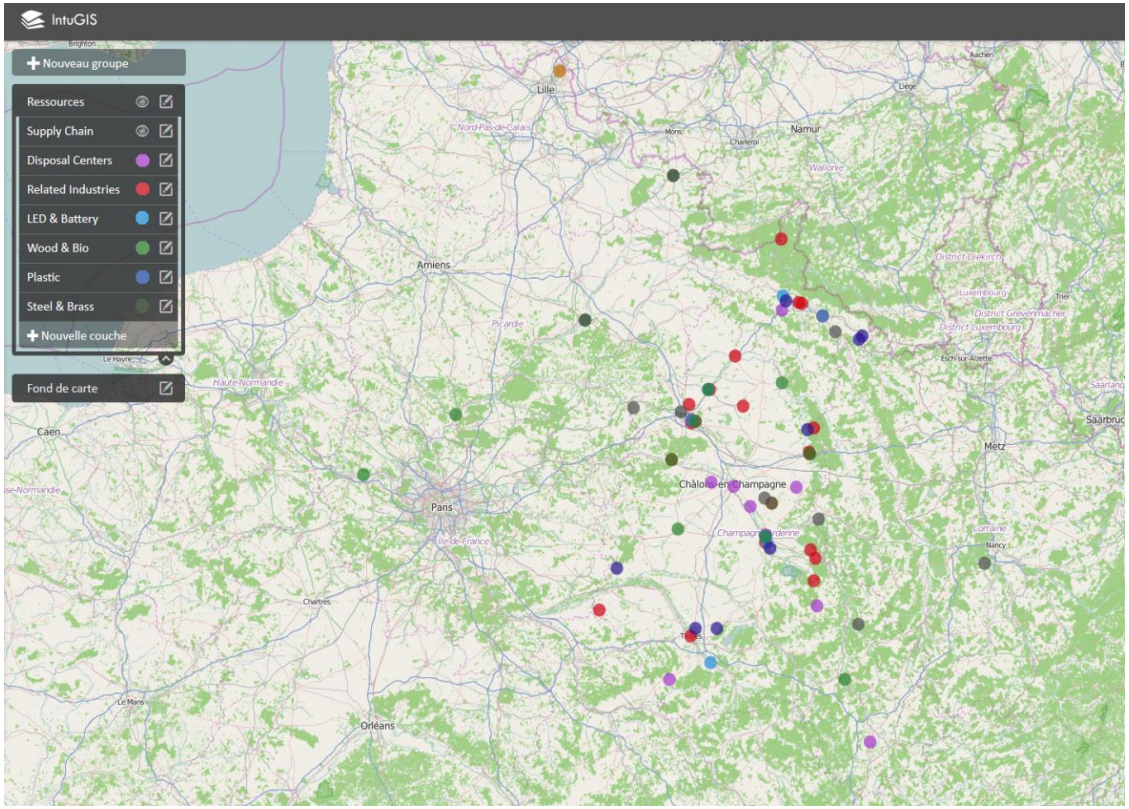
Low =1, Medium = 2, High = 3

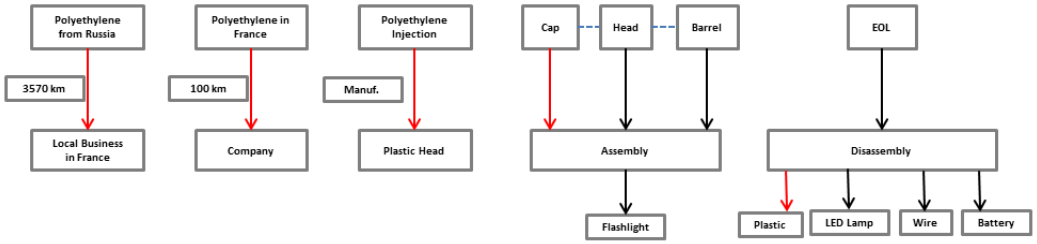

Level 0
Level 1
Level 2
Level 3
Level 4
Flashlight
Head
Battery
Body
Cap
Lamp Assembly
Lens
Reflector
Bottom
Barrel
Lamp
Lamp Holder
Spring
Tail Cap
Knob
Connector
Plastic Shell
On/Off Switch
Brass Slide
Product Structure


Service
Use
Manufacturing
Resources
Resource
Disposal
But Where?

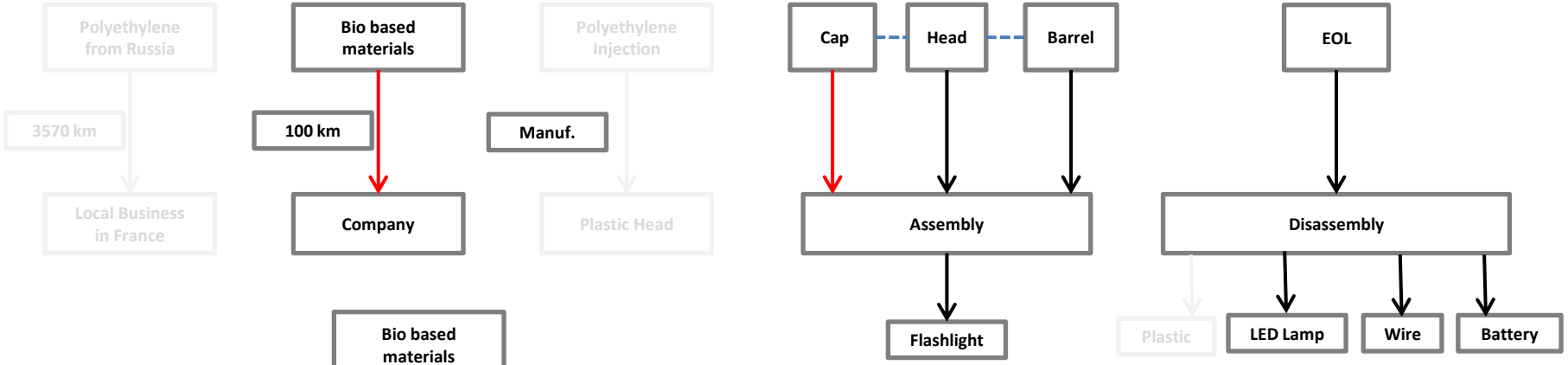

8
6
5
1
2
3
7
4
9
10
11
12
13

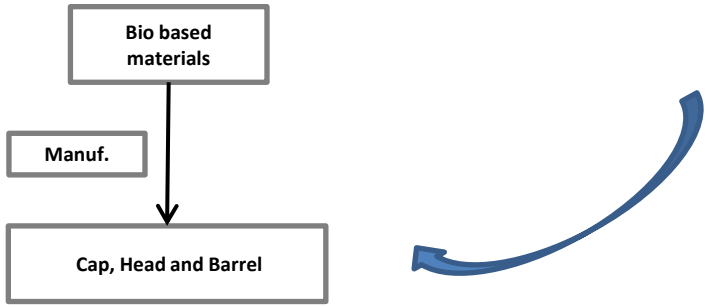
To start Re-Design process , we need geographical information about the region





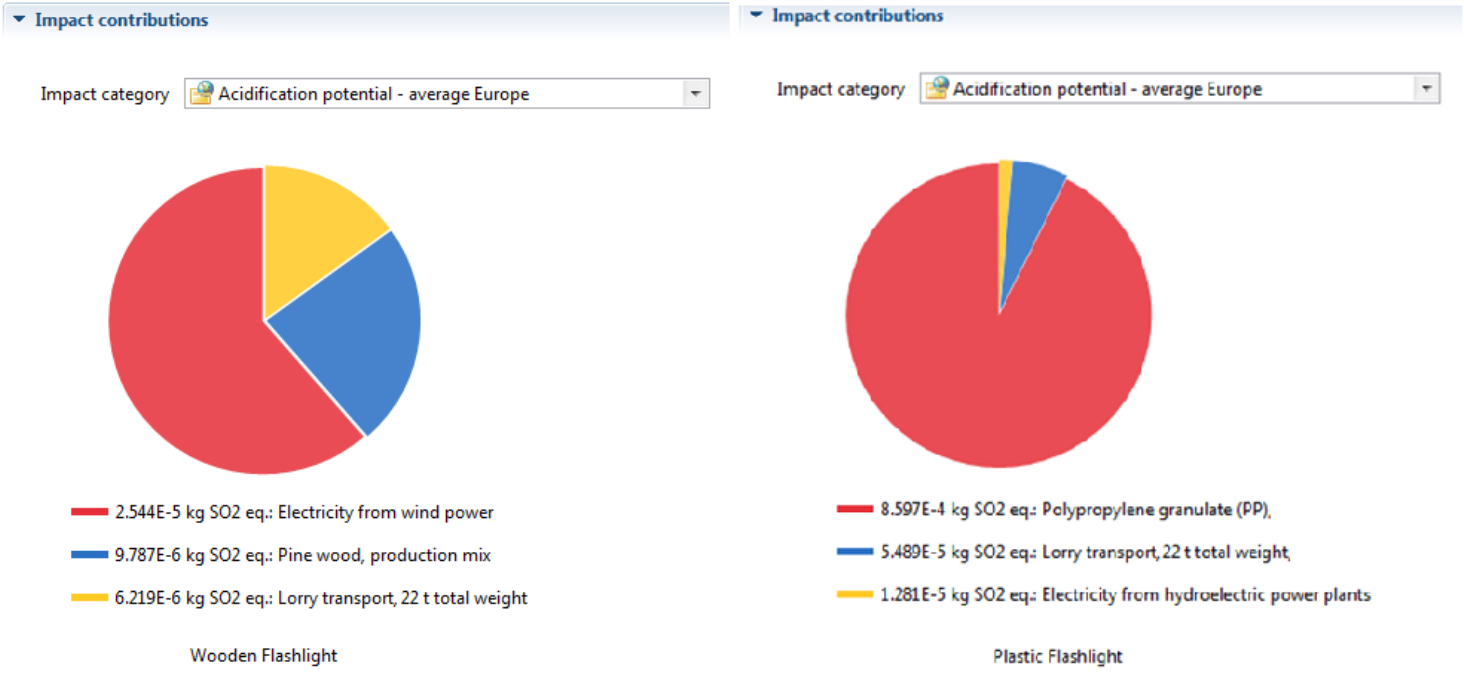
Redesign





Bio based materials :
Corn, Tapioca, Wheat, Potato, Rice,

LCA results in terms of product materials and transportation (From from-cradle-to-grave)



Integrated data model enables designing a more sustainable product service systems

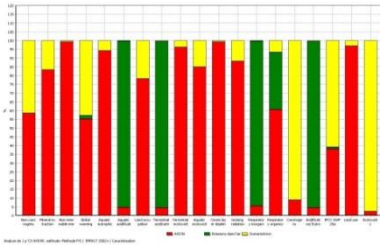
Industrial system / Building scale

Modeling and designing the building lifecycle in PLM

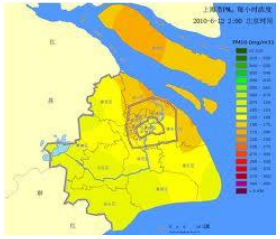
Territory Scale

Building Lifecycle Assessment

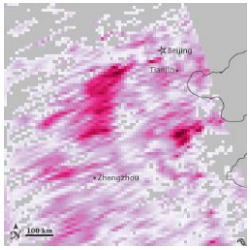
Observation



Simulation



Collecting data and monitoring



Application for Future:

- Urban planning
- Industrial System designing

Results for Future:

- Improving the design intellectual capital's of companies and maturing the structure of PLM
- Regionalization of design
- Positive impacts on social and economical dimensions of sustainability

Thank you for your attention

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