

# Making urban factories more sustainable through circularity design

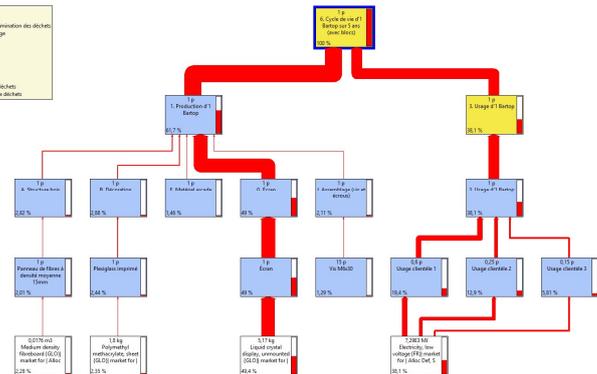
Walid Ijassi\*, Damien Evrard, Peggy Zwolinski  
\* walid.ijassi@grenoble-inp.fr

## A 3 phases method to integrate local solutions in the development of sustainable urban factories

- **Case study in Grenoble:** reduce **climate change (586 kg CO2 eq)** and **resources consumption (32,100 MJ)** impacts related to the life cycle of an **arcade machine** over 5 years.

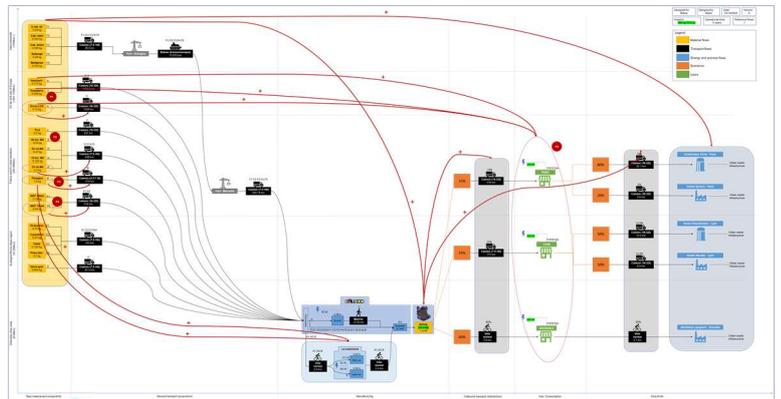
### (1) Exploratory phase

Identification of environmental impact hotspots and prioritization (LCA results)



#1: screen, #2: electricity in usage, #3: plexiglass  
#4: fiberboards, #5: screws

Delimitation of the scope of action on the system's visualization (giga-map)



### (2) Formative phase

Design of sustainable business models utilizing circularity (step supported by 3 databases of best practices and patterns)

3 examples from the 7 designed solutions



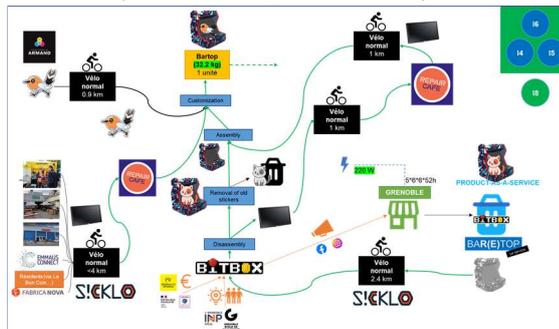
### (3) Evaluative phase

Evaluation of designed models and prioritization

Analysis and improvement (iteration)

Proposal of a performance monitoring system

extract		Formulation of general proposal							Priority	
Proposition ID	Action ID	Circular step	Formulation of action	Action manager	Indicators (from the exploratory phase)	Cost	Performance	Time	Feasibility	Priority
					Climate change	Resources				
11A1	Processing	Cycle to play	Develop a conversion system that transforms mechanical parts energy into electrical energy	R&D						Not prior
11A2	Processing	Store energy	adding a battery to collect energy for later use of the arcade machine	R&D						Not prior
14A1	Collect	Launch a communication campaign to collect second-hand screens on LeBonCoin, Pinter, and social networks	Procurement							Prior (short term)
14A2	Collect	Make video rounds to local donors and resource owners	Procurement							Prior (short term)
14A3	Collect	Observe local logistics to SIEKLO	In-house logistics							Prior (short term)
14A4	Processing	Give faulty screens repaired at a local repair café	Procurement							Prior (short term)



extract						
Environmental and circularity indicators		Climate Change Impacts (kg CO2 eq)		Resources Impacts (MJ primary)		Amount of avoided waste (kg)
MONTH 1	MONTH 2	MONTH 1	MONTH 2	MONTH 1	MONTH 2	MONTH 1
48	48	2788	2788	48	48	48
48	48	2788	2788	48	48	48
48	48	2788	2788	48	48	48
48	48	2788	2788	48	48	48
48	48	2788	2788	48	48	48

## Conclusions

- The proposed method has allowed to design circular strategies and business models to act on specific sustainability objectives with regards to the geographic context and the value chain's model;
- The iterative nature of the method has pushed for the design of an additional solution;
- Local stakeholders' engagement has been leveraged to improve the designs' economic feasibility.