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## Making urban factories more sustainable through circularity design

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# Making urban factories more sustainable through circularity design

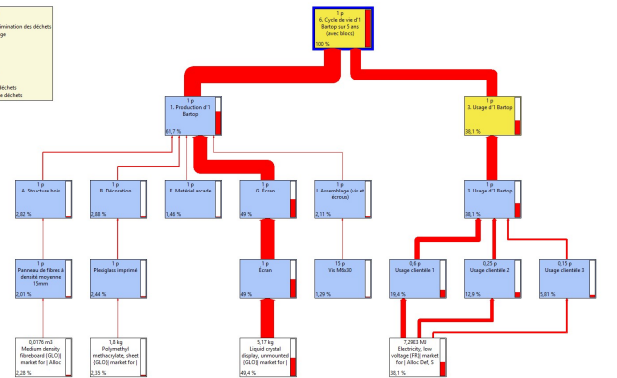
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## A 3 phases method to integrate local solutions in the development of sustainable urban factories

- **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.

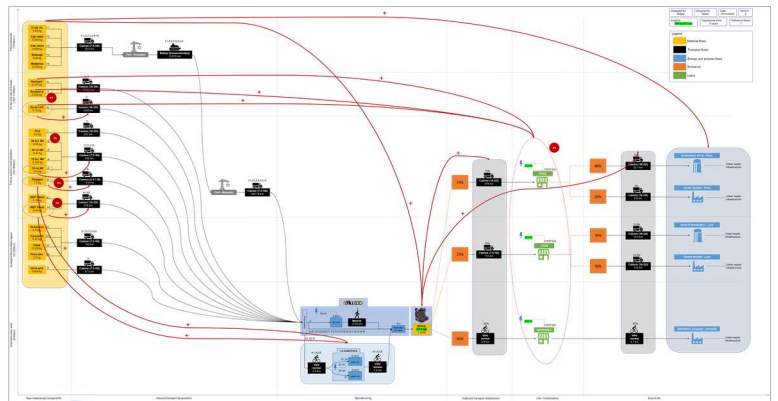
### (1) Exploratory phase

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



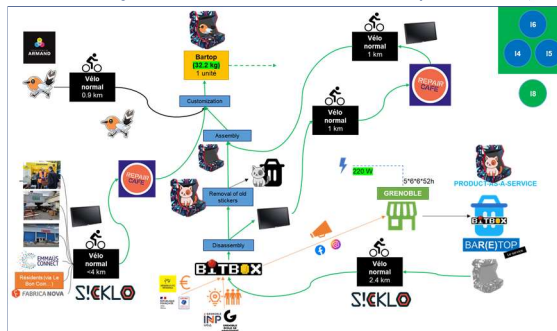
### (3) Evaluative phase

Evaluation of designed models and prioritization

Analysis and improvement (iteration)

Proposal of a performance monitoring system

| Proposition ID | Formulation of general proposal | Formulation of action   | Action manager     | Indicators (from the exploratory phase) | Cost           | Performance | Time | Feasibility | Prioritization     |
|----------------|---------------------------------|---|--------------------|---|----------------|-------------|------|-------------|--------------------|
| Action ID      | Circular step                   | Formulation of action   | Action manager     | Indicators (from the exploratory phase) | Climate change | Resources   |      |             | Prioritization     |
| 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) |



| Environmental and circularity indicators |                                |                              |
|--|--------------------------------|------------------------------|
| Climate Change Impacts (kg CO2 eq)       | Resources Impacts (MJ primary) | Amount of avoided waste (kg) |
| MONTH 1                                  | 528                            | 2788                         |
| MONTH 2                                  | 448                            | 2038                         |
| MONTH 3                                  | 467                            | 1988                         |
| MONTH 4                                  | 527                            | 2738                         |

## 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.