



# “How advanced communications can support sustainability goals”

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# Hexa-X-II

Advanced communications contributing to sustainability

[hexa-x-ii.eu](http://hexa-x-ii.eu)





## Advanced communications

Hexa-X-II  
Use Cases

Example:  
Collaborative  
Robots

contributing

Causality?

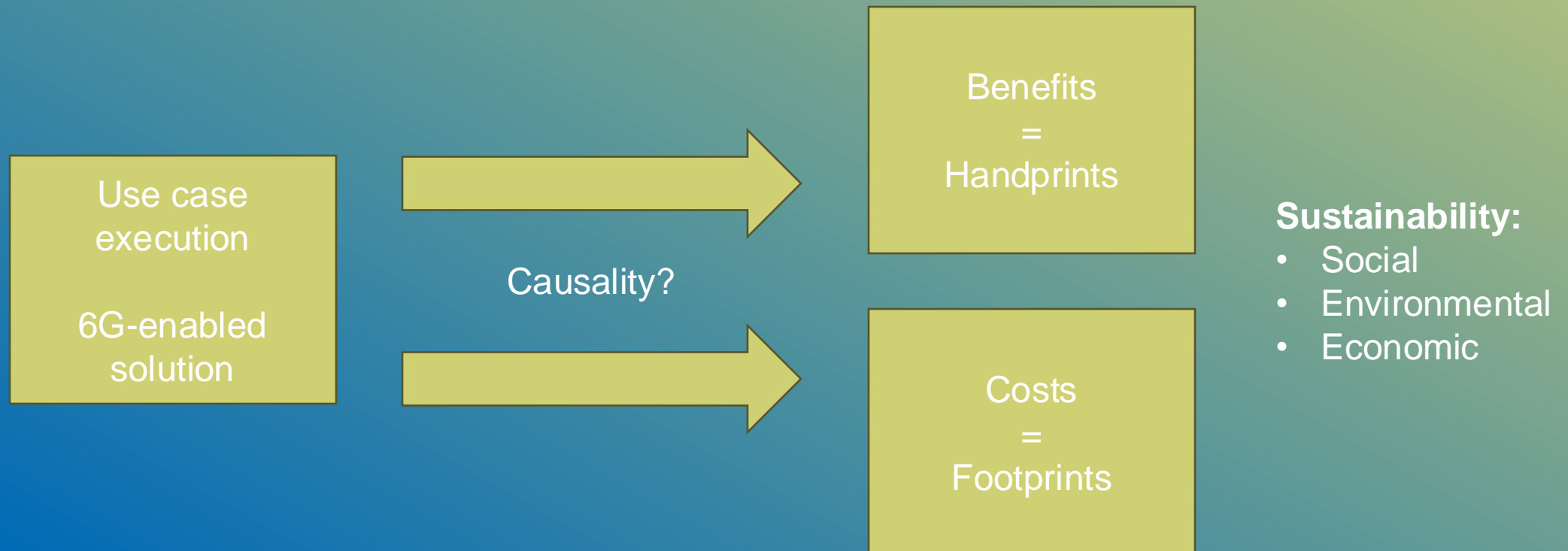
to sustainability

6G for  
sustainability

Method

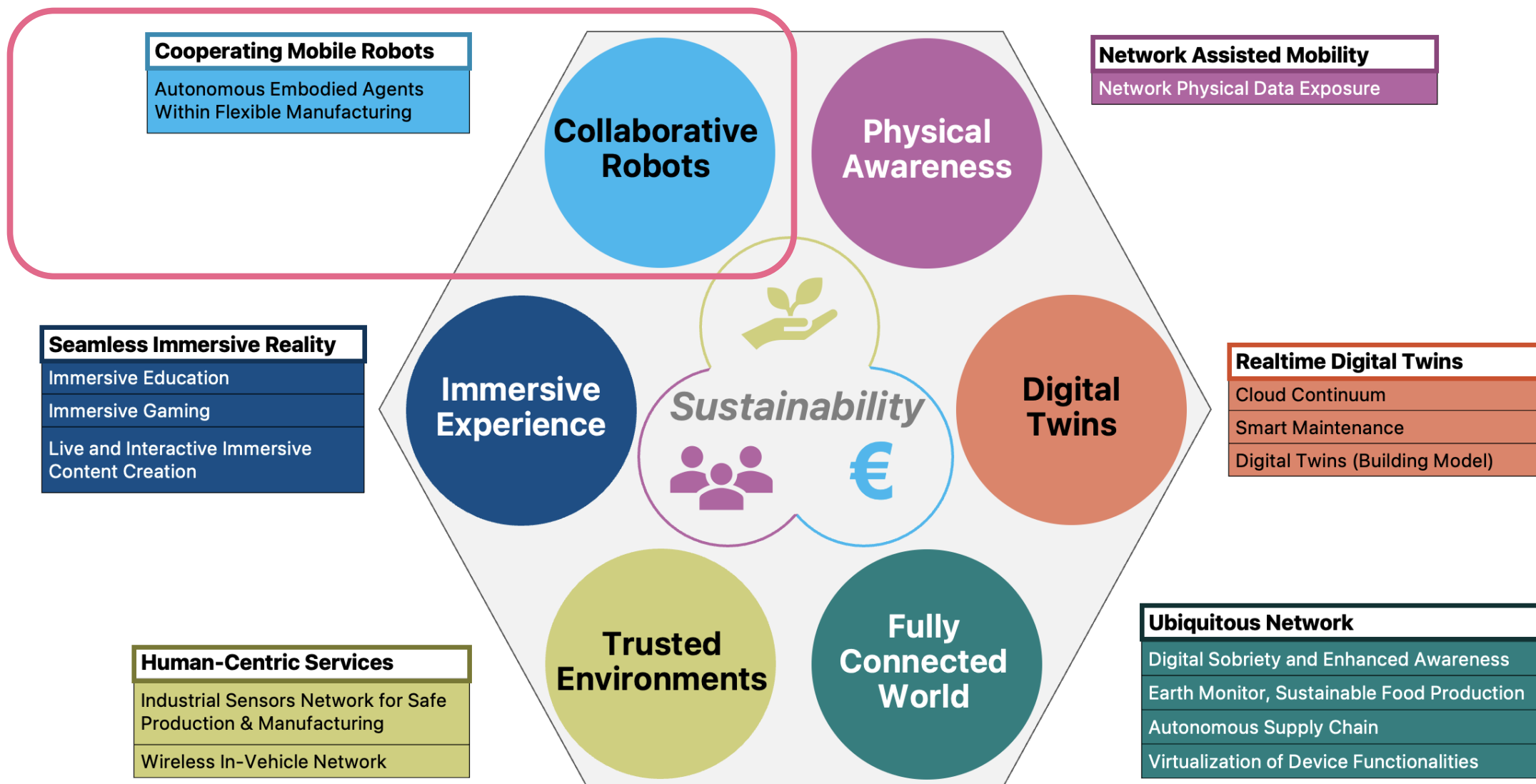
# Duality

- **Sustainable 6G:** referring to the ambition to minimise the negative effects of the 6G system and its deployment in the three sustainability pillars
- **6G for Sustainability:** referring to the indirectly induced contribution (benefits and costs) of 6G (i.e. the use case execution), and the ambition to maximise positive effects in the three sustainability pillars and minimise the negative effects.



# Hexa-X-II Use Case Families

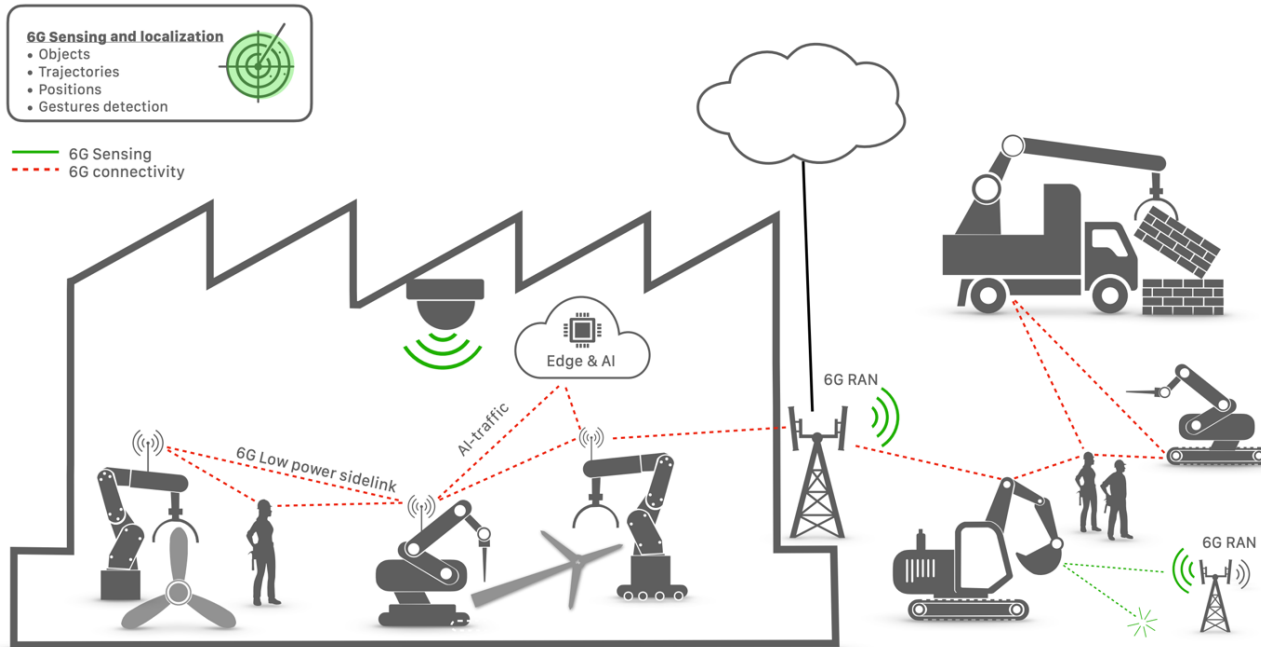
(more details in Hexa-X-II Deliverable D1.2)



Hexa-X-II Use Cases with **Highlighted** Representative Use Cases



# Cooperating Mobile Robots



## Cooperating mobile robots

Robots communicate locally to perform tasks beyond their individual capabilities. E.g., flexible manufacturing, autonomous construction site

## Autonomous embodied agents

AI/ML and integrated sensing enable tools/machines to make decisions.

### Example Scenarios

- Cooperative carrying with robots
- Lot size 1 production
- Automated industrial tasks (e.g., quality checks)
- Autonomous farming
- Autonomous construction site
- Smart workshop

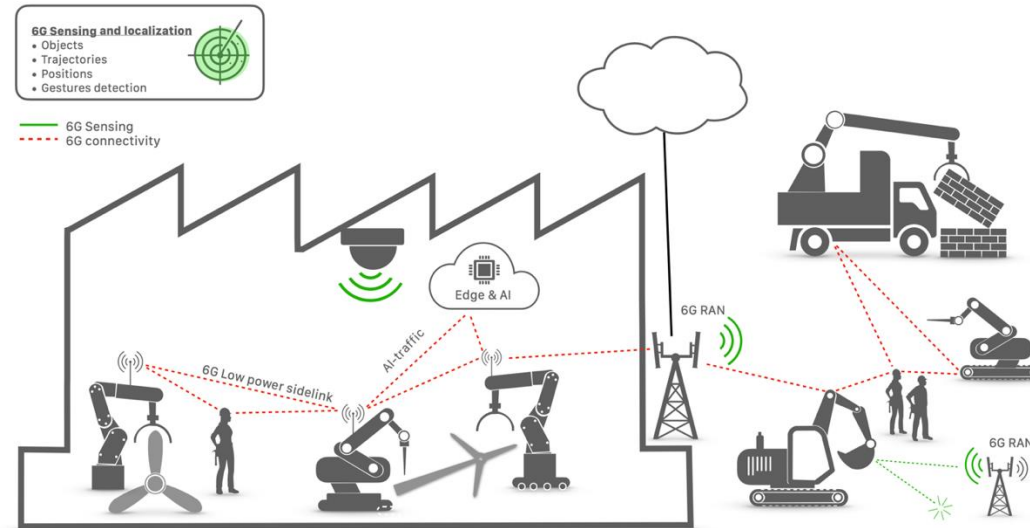
### Problem(s) to be Solved/Challenges

- Understanding and addressing the communication requirements of machines in the future
- Using limited resources efficiently
- Adapting to dynamic requirements of the market
- End-user access to custom manufacturing
- Safe and trustworthy interactions with tools that can make decisions

### Why 6G?

- 5G URLLC does not meet the latency, reliability, and scalability requirements in demanding scenarios.
- Benefit greatly from advances in ML, and network-side support (e.g., training, offloading, edge computing)
- Sensing and positioning capabilities to enrich advanced ML applications

# Cooperating Mobile Robots - Key Values

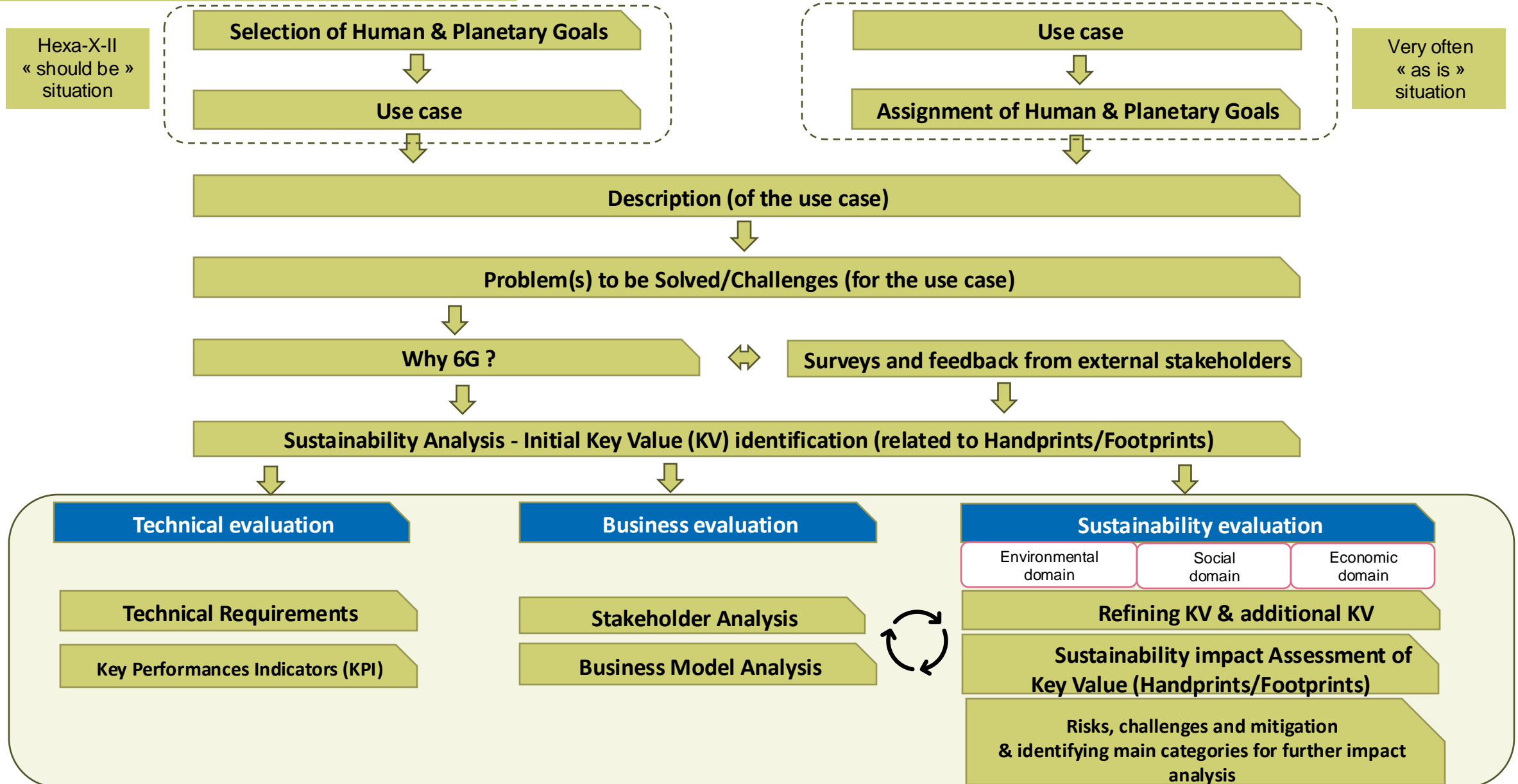


non-exhaustive list

## Sustainability Analysis / Key Values

	Handprints (benefits)	Footprints (costs)
Env.	<ul style="list-style-type: none"> <li>Increased efficiency in production processes</li> <li>Reduced need for multiple machines due to function integration</li> </ul>	<ul style="list-style-type: none"> <li>Increased material and energy consumption throughout full life cycle of the robots and associated services</li> <li>Increased electronic waste</li> </ul>
Social	<ul style="list-style-type: none"> <li>Improved accessibility from tasks beyond human capabilities</li> <li>Safer working environments</li> <li>M2H support</li> </ul>	<ul style="list-style-type: none"> <li>Elimination of jobs</li> <li>Uneven distribution of benefits from robots and cobots</li> <li>Unauthorized use of sensors and associated privacy concerns</li> </ul>
Eco.	<ul style="list-style-type: none"> <li>Enhanced productivity and competitiveness</li> <li>New business and job opportunities</li> </ul>	<ul style="list-style-type: none"> <li>Barriers for small businesses</li> <li>Monopolization risks</li> <li>Financial loss in case of service failure or cyber-attacks</li> </ul>

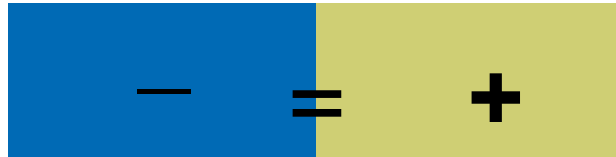
# WP1 - Use Cases & Sustainability Analysis



# Sustainability Impact Assessment of Collaborative Robot Use Case



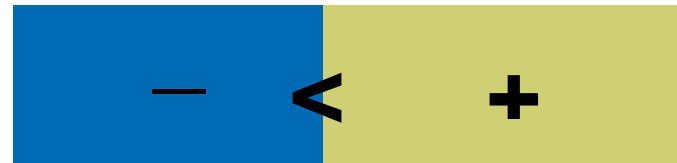
## Environmental Domain



+ Function integration eliminates the need for multiple dedicated machines with individual functions

- Energy is consumed and materials are used to manufacture, deploy, and operate robots and associated services

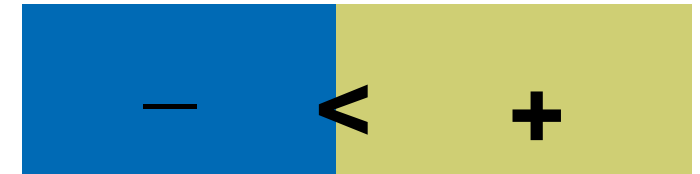
## Social Domain



+ Help people perform tasks beyond human capabilities, including the possibility for females to perform heavy work

- Benefits of robots and co bots might not be distributed evenly among society

## Economic Domain



+ Increased local and global productivity, cost efficiency and enhanced competitiveness from the use of the collaborative robots

- High initial CAPEX/investment as a hurdle for starting a business with use of collaborative robots including building skill sets, buying equipment, etc.



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## References

<https://hexa-x-ii.eu/>

[Deliverable D1.1 – Environmental, social, and economic drivers and goals for 6G](#)

[Deliverable D1.2 – 6G use cases and requirements](#)

[D1.3 – Environmental and social view on 6G](#)

<https://hexa-x-ii.eu/hexa-x-ii-view-on-key-values-and-key-value-indicators-a-tutorial-webinar/>

# Cooperating Mobile Robots: Ecosystem pie

