Stream B & D Joint Workshop | 16.05.2024

Co-funded by
the European Union

6GSNS

TARGET-X | Overall Objective

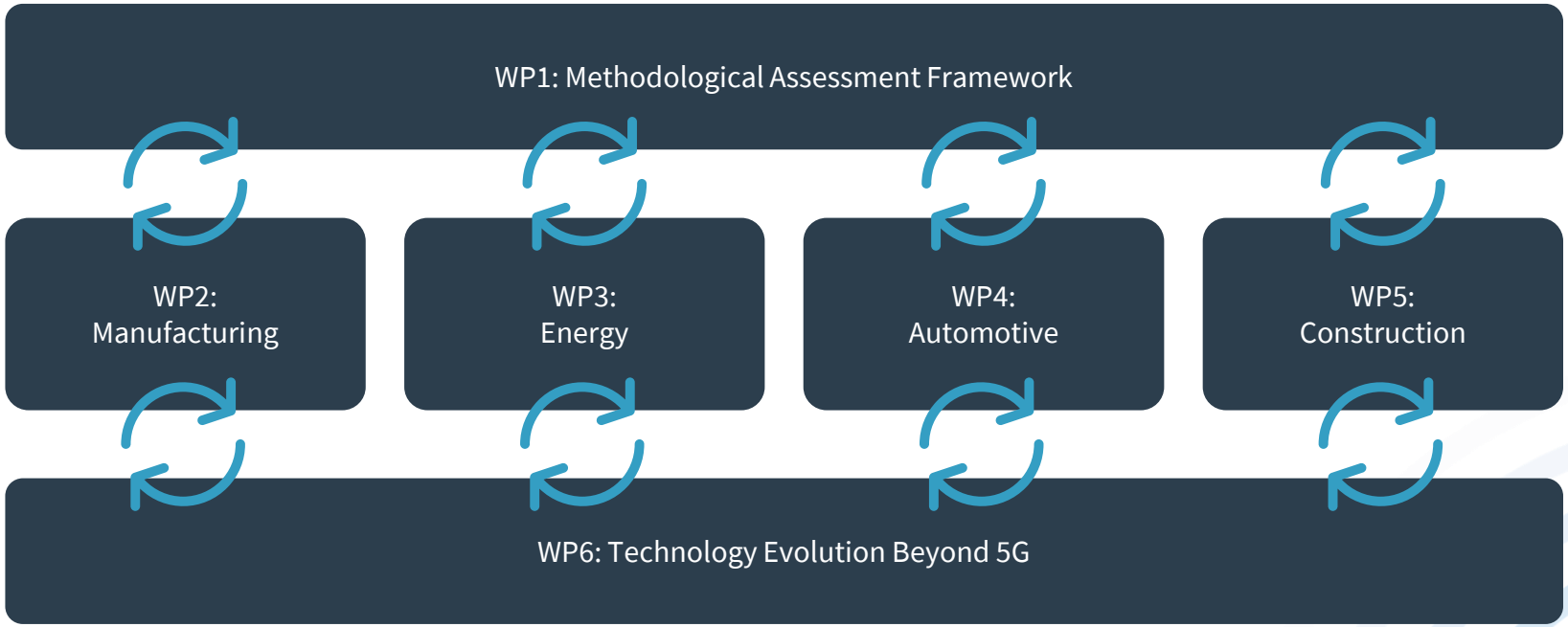
TARGET-X envisions to accelerate the digital transformation of different verticals based on the integration of 5G technology into these verticals

- Installation of trial sites and prototypes
- Knowledge transfer to new verticals
- Gathering knowledge through practical experience for the further development of 5G and 6G
- Transfer to industry through cascaded funding

TARGET-X | Structural Approach

Work Package Structure

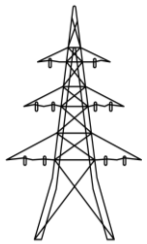
- 9 interdisciplinary work packages in total
- 6 work packages focusing on the technical aspects of the project



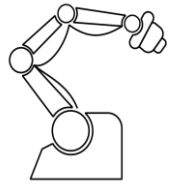
TARGET-X | Overall Concept

- Broaden the exposure of 5G by onboarding new verticals
- Increase learnings on needs of new verticals
- Identify synergies

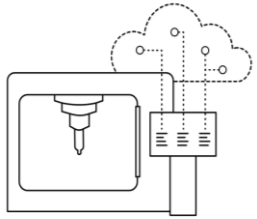
KPIs, KVIs and business models



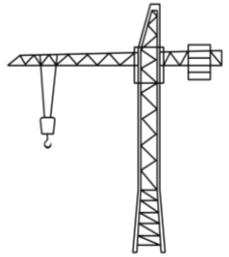
5G for energy monitoring



5G for mobile robotics



5G for cloud native production



5G for construction

5G for autonomous driving

5G integration in new verticals

ACS testbed at the 5G-ICE, Aachen (DE)

WZL testbed at the 5G-ICE, Aachen (DE)

IPT testbed at the 5G-ICE, Aachen (DE)

Construction site at the 5G-ICE, Aachen (DE)

IDIADA test track, Tarragona (ES)

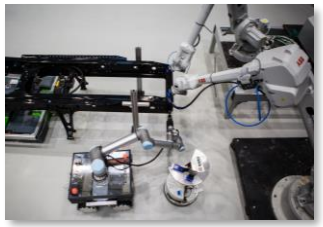
New 5G/6G features

- Derive KPIs and KVIs for use case evaluation
- Develop a methodological assessment framework (MAF)

- In-depth study and use of key beyond 5G features
- Close interaction between devices, NW and services

TARGET-X | Testbeds in Europe

5G for energy monitoring



5G for mobile robotics

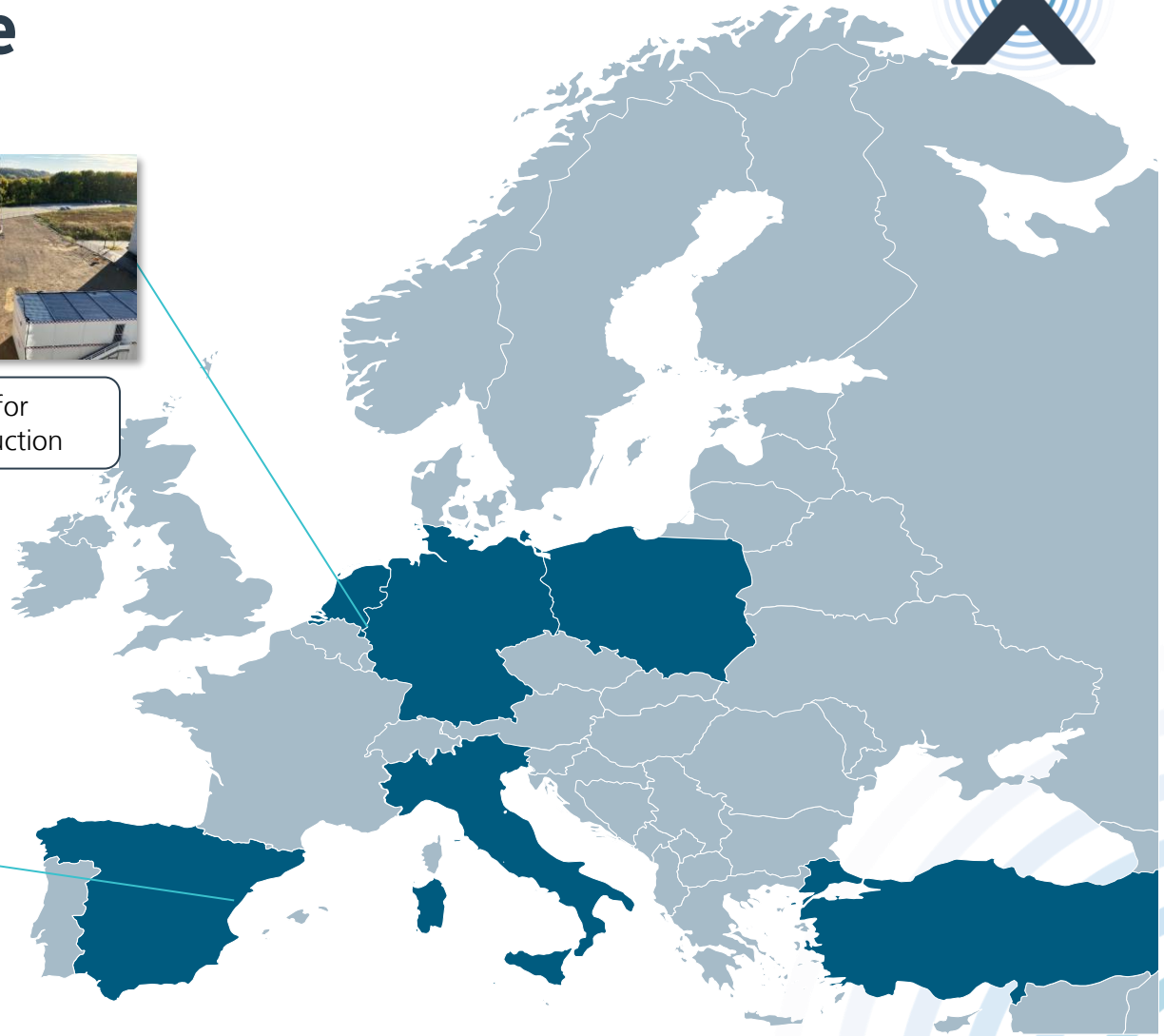
5G for cloud native production

5G for construction

Am 5G-Industry Campus Europe (5G-ICE) in Aachen

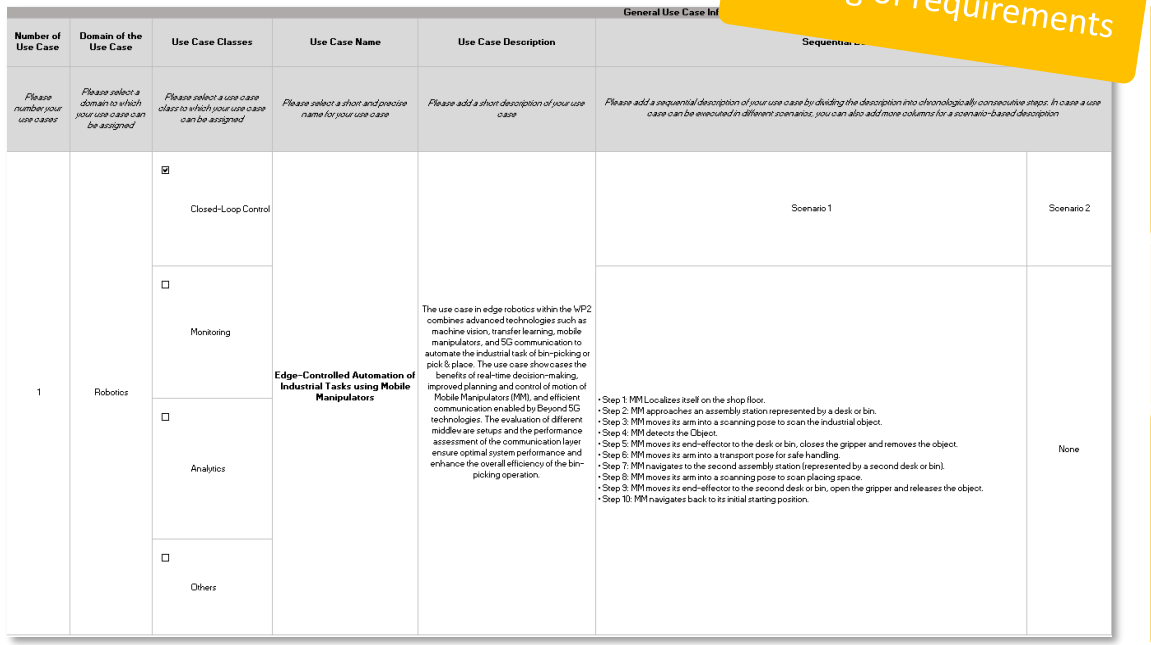
5G for autonomous driving

IDIADA Testbed in Tarragona (Spain)



TARGET-X | Use Case and KPI/KVI Definition

Catalog of requirements



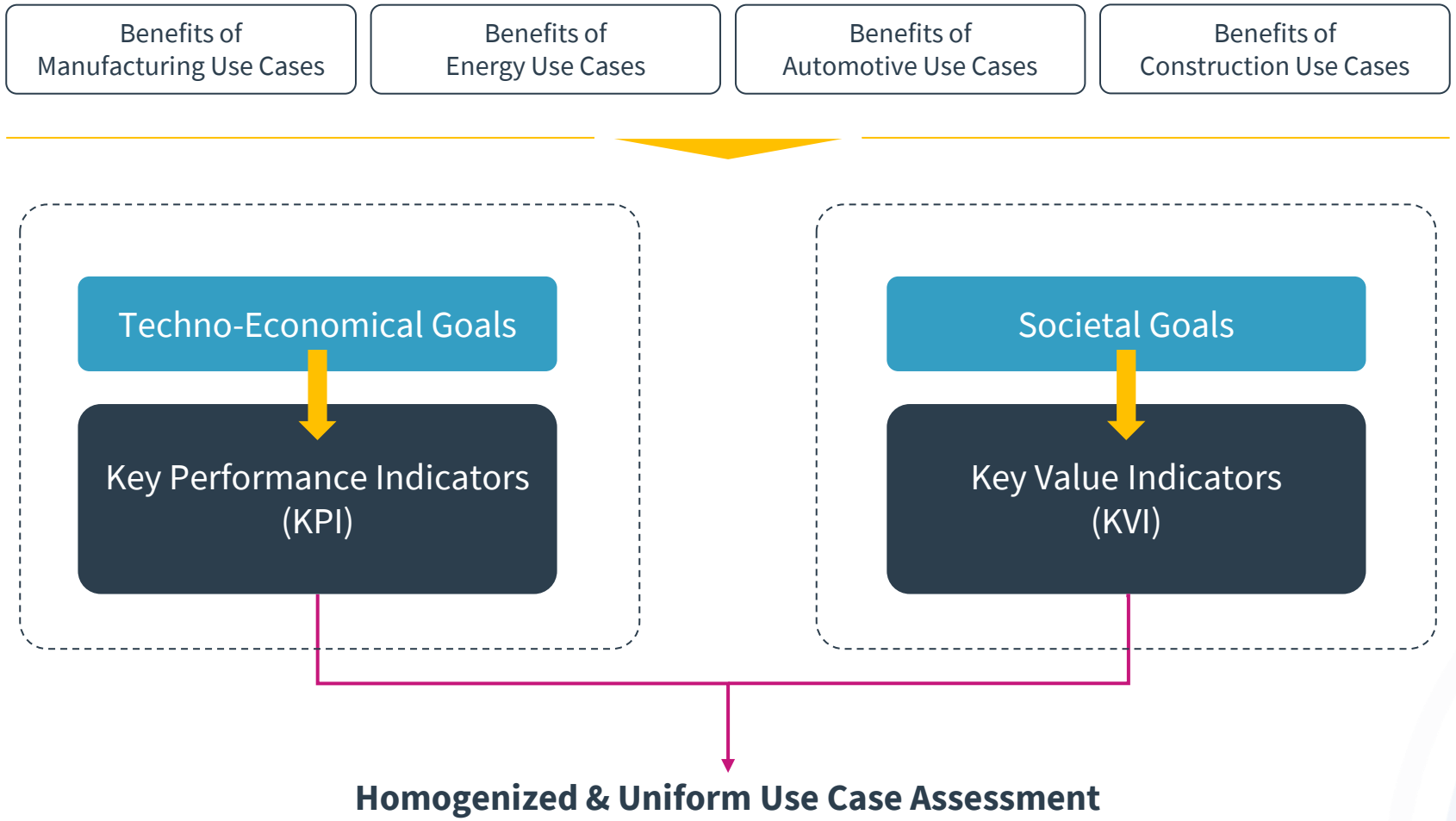
General Use Case Information						
Number of Use Case	Domain of the Use Case	Use Case Classes	Use Case Name	Use Case Description	Sequential Description	
Please number your use cases	*Please select a domain to which your use case can be assigned*	*Please select a use case class to which your use case can be assigned*	*Please select a short and precise name for your use case*	*Please add a short description of your use case*	*Please add a sequential description of your use case by dividing the description into chronologically consecutive steps. In case a use case can be executed in different scenarios, you can also add more columns for a scenario-based description*	
1	Robotics	☑ Closed-Loop Control	**Edge-Controlled Automation of Industrial Tasks using Mobile Manipulators**	The use case in edge robotics within the WP2 combines advanced technologies such as machine vision, transfer learning, mobile manipulators, and 5G communication to automate the industrial task of bin-picking or pick & place. The use case showcases the benefits of real-time decision-making, improved planning and control of motion of Mobile Manipulators (MM), and efficient communication enabled by Beyond 5G technologies. The evaluation of different middlew are setups and the performance assessment of the communication layer ensure optimal system performance and enhance the overall efficiency of the bin-picking operation.	Scenario 1	Scenario 2
		☐ Monitoring			• Step 1: MM Localizes itself on the shop floor. • Step 2: MM approaches an assembly station represented by a desk or bin. • Step 3: MM moves its arm into a scanning pose to scan the industrial object. • Step 4: MM detects the Object. • Step 5: MM moves its end-effector to the desk or bin, closes the gripper and removes the object. • Step 6: MM moves its arm into a transport pose for safe handling. • Step 7: MM navigates to the second assembly station (represented by a second desk or bin). • Step 8: MM moves its arm into a scanning pose to scan placing space. • Step 9: MM moves its end-effector to the second desk or bin, open the gripper and releases the object. • Step 10: MM navigates back to its initial starting position.	None
		☐ Analytics				
		☐ Others				

Use Case Descriptions

- Creation of a **uniform use case descriptions** with the catalog of requirements for all verticals
- Description of **11 use cases** in total
- Identification of the **benefits** that can be achieved through use case implementations and application
- Benefits from a techno-economical perspective: Expressed with **KPI**
- Benefits from a societal perspective: Expressed with **KVI**

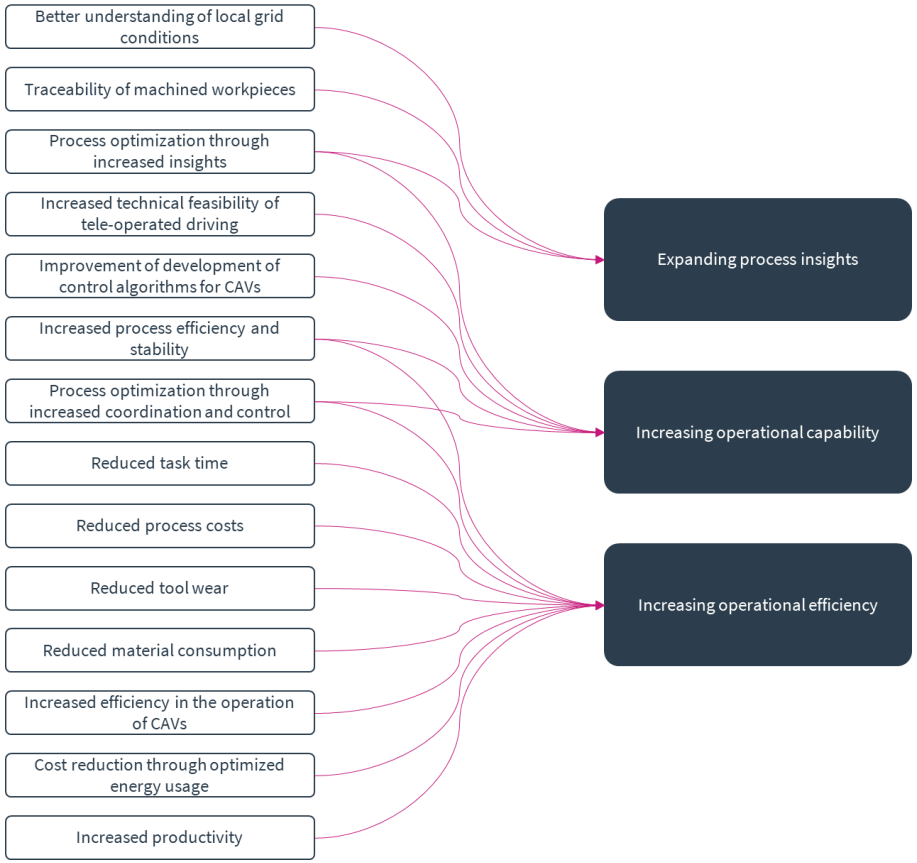
Uniform Use Case Description as a Foundation for the Evaluation of the Use Cases

TARGET-X | KPI/KVI Definition

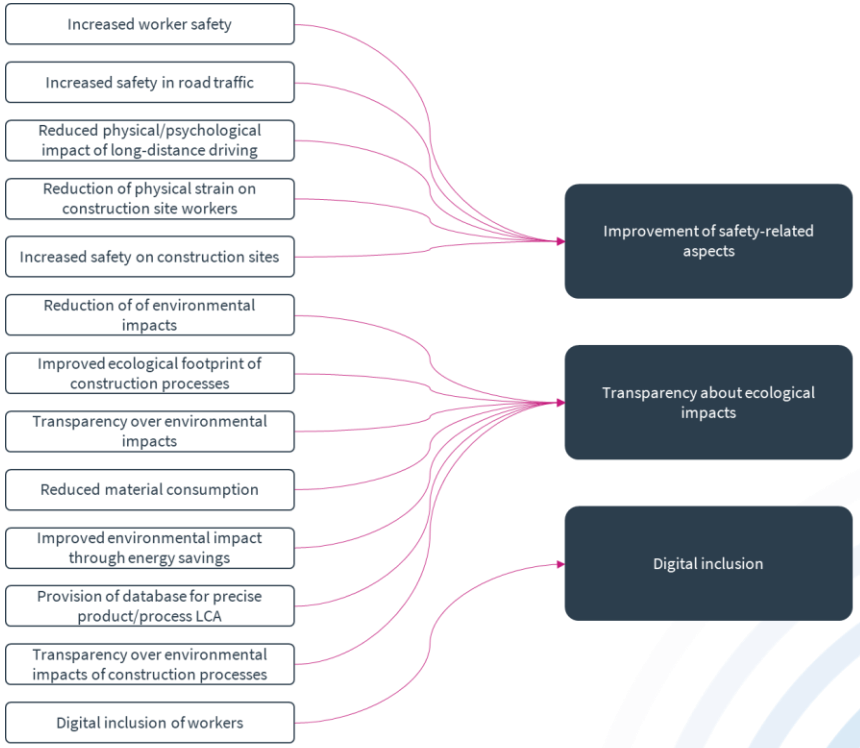


TARGET-X | KPI/KVI Definition

Use Case Benefits → Techno-economic Goals



Use Case Benefits → Societal Goals



TARGET-X | KPI/KVI Definition

Techno-economic Goals	KPIs
Expanding process insights	Accuracy of process and product data
	Completeness of process and product data
	Consistency of process and product data
	Reliability of process and product data
	Timeliness of process and product data
	Uniqueness of process and product data
	Validity of process and product data
Increasing Operational Capability	Process performance index (P_{pk})
	Process capability (c_p & c_{pk})
	Process variability
Increasing Process Efficiency	Cycle time
	Throughput
	First-pass yield
	Overall Equipment Efficiency (OEE)
	Error rate
	Quality rate
	Worker efficiency

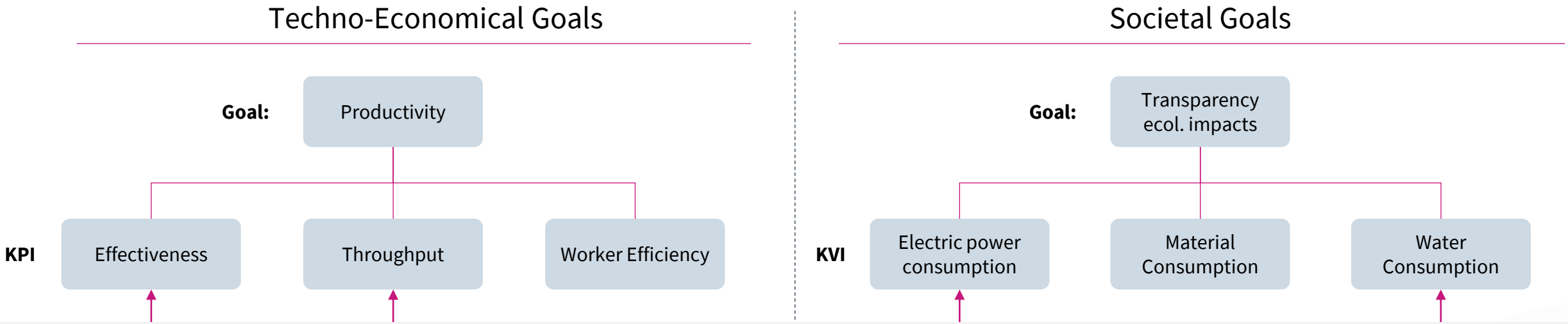
17 KPIs

Societal Goals	KVIs
Improvement of Safety-Related Aspects	Work accident rate manufacturing
	Work accident rate construction
	Absolute number of prevented traffic accidents (sim. based)
Transparency About Ecological Impacts	Global Warming Potential, GWP
	Water consumption
	Ozone depletion
	Photochemical ozone formation
	Depletion of abiotic resources (minerals and metals)
	Depletion of abiotic resources (fossil fuels)
Digital Inclusion	Digital literacy

10 KVIs

TARGET-X | KPI/KVI Definition

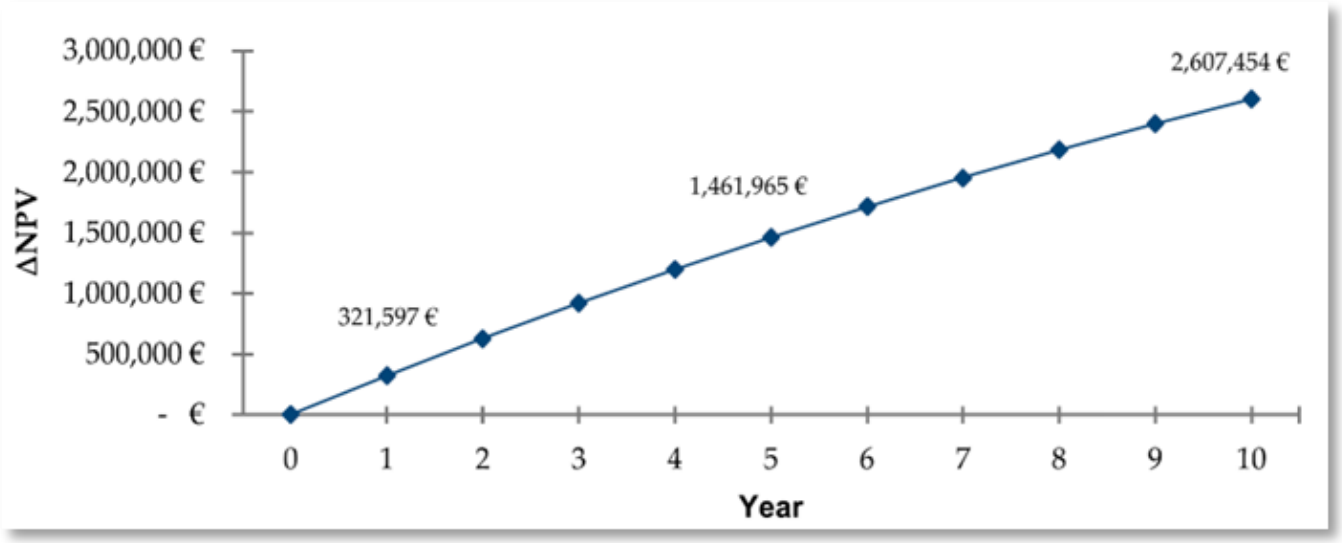
Exemplary KPI/KVI Calculation for the Manufacturing Vertical



Equations will be defined for each **KPI** and **KVI** of each **goal** of each **vertical** so that a **common ground** for the **evaluation** of all use cases from TARGET-X is set

Accuracy ⚡ Generalization

TARGET-X | Outlook

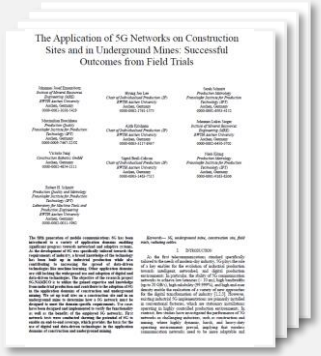


Planned towards the end of the project:

5G RoI Tool is ready to be adapted and can be expanded to include further use cases from TARGET-X

For the MAF conceptualization, an Excel tool will be used

TARGET-X | Publications



- WONS 24 | *The Application of 5G Networks on Construction Sites and in Underground Mines: Successful Outcomes from Field Trials*
- Paper was created with results from 5G.NAMICO and outlook on research activities in TARGET-X
- Extended version will be created with a stronger focus on TARGET-X, will be published in Elsevier Computer Communication

- 5G-ACIA| *Business Value and Return-on-Invest Calculation for Industrial 5G Use Cases*
- Work Item in WG 05 (Industrial 5G in Practice) of 5G-ACIA
- Whitepaper focusing on methodology of the use case assessment will be published in Q3/Q4 2024

TARGET-X

Thank you for attention!

Contact

contact.target-x@ipt.fraunhofer.de

www.target-x.eu

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