German, Italian & Latin American consortium for resource efficient logistics hubs & transport

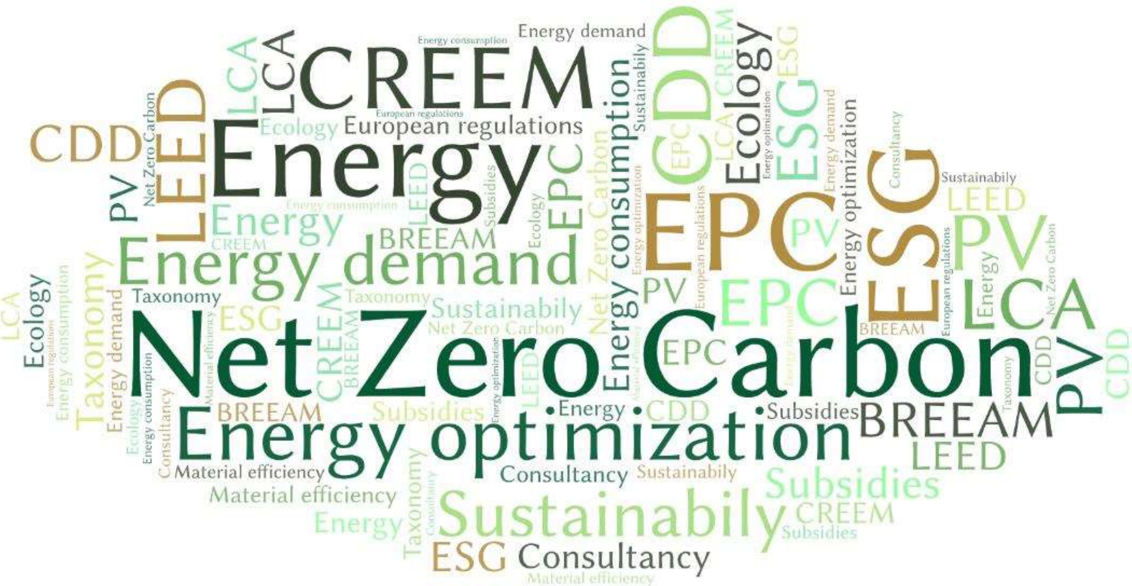
Alliance for Logistics Innovation through Collaboration in Europe

SUSTAINABILITY AND GHG PERFORMANCE AT LOGISTICS HUBS

Joint webinar of the GILA project and ETP ALICE

- GHG emissions quantification of logistics sites aligned with ISO 14083
  Jan-Philipp Jarmer, Fraunhofer IML
- Annual market studies & overall GHG performance indicators for logistics hubs
  Andrea Fossa, GreenRouter & Kerstin Dobers, Fraunhofer IML
- Possible solutions for decarbonising logistics hubs
  Sara Perotti, Politecnico di Milano
- Sustainability of hubs: a key driver for maintaining value over time
  Scarlet Romano, Arcadis Germany

Trend Study and Development Paths



- In achieving a climate-neutral building sector (85-95 % of the building stock will exist in 2050), the existing buildings must be strongly considered and renovated.

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Master model for sustainable prototype

- ▶ Assessment and Benchmarking of existing Construction types

Data Collection via site visits & experience

Organization and Grouping of Information

Benchmarks

STEP 1

18 Halls* were inspected in Germany in 2021 - 2022

+

STEP 2

Type of use
Asset type
Size
Year of construction / modifications
Energy certificate

=

STEP 3

3a Capex

3b Carbex

Capex = Capital Expenditure
Carbex = Carbon Expenditure

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Master model for sustainable prototype

- Assessment of existing Construction Types
- Capex = Capital Expenditure

1. The benchmarks were separated into three tables based on the condition of the buildings at the time of assessment (good = markup of 1, fair = markup of 1,1, poor = markup of 1,2).
2. The life cycle costs of different building equipment to determine the required investment for maintenance were considered

Condition	Factor
good	1

Benchmarks Capex per building age (€/sqm) // Office			
	Capex*		
Age	Year 1 (€)	Year 2 - 5 (€)	Year 6 - 10 (€)
10	6,40	25,60	32,00
20	15,10	60,40	75,50
30	18,40	73,60	92,00
40	14,30	57,20	71,50
50	18,40	73,60	92,00

Benchmarks Capex per building age (€/sqm) // Warehouse			
	Capex*		
Age	Year 1 (€)	Year 2 - 5 (€)	Year 6 - 10 (€)
10	5,40	21,60	27,00
20	13,10	52,40	65,50
30	16,40	65,60	82,00
40	12,90	51,60	64,50
50	17,10	68,40	85,50

Condition	Factor
Fair	1,1

Benchmarks Capex per building age xx // Office			
	Capex*		
Age	Year 1 (€)	Year 2 - 5 (€)	Year 6 - 10 (€)
10	7,04	28,16	35,20
20	16,61	66,44	83,05
30	20,24	80,96	101,20
40	15,73	62,92	78,65
50	20,24	80,96	101,20

Benchmarks Capex per building age xx // Warehouse			
	Capex*		
Age	Year 1 (€)	Year 2 - 5 (€)	Year 6 - 10 (€)
10	5,94	23,76	29,70
20	14,41	57,64	72,05
30	18,04	72,16	90,20
40	14,19	56,76	70,95
50	18,81	75,24	94,05

Condition	Factor
Poor	1,2

Benchmarks Capex per building age xxx // Office			
	Capex*		
Age	Year 1 (€)	Year 2 - 5 (€)	Year 6 - 10 (€)
10	7,68	30,72	38,40
20	18,12	72,48	90,60
30	22,08	88,32	110,40
40	17,16	68,64	85,80
50	22,08	88,32	110,40

Benchmarks Capex per building age xxx // Warehouse			
	Capex*		
Age	Year 1 (€)	Year 2 - 5 (€)	Year 6 - 10 (€)
10	6,48	25,92	32,40
20	15,72	62,88	78,60
30	19,68	78,72	98,40
40	15,48	61,92	77,40
50	20,52	82,08	102,60

Example: An office building constructed in 1990 (age ca. 30 years) and a fair condition has the following Capex (€/sqm) for the next 10 years (2023 – 2032, depending on date of assessment):

Year 1	Years 2-5	Years 6-10
20,24	80,96	101,20

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Master model for sustainable prototype

- Assessment of existing Construction Types
- Carbex = Carbon Expenditure

1. The benchmarks were separated into three tables based on the condition of the buildings at the time of assessment (good = markup of 1, fair = markup of 1,1, poor = markup of 1,2).
2. The required investment to transform the existing buildings towards zero carbon buildings, were considered.

Condition	Factor
good	1

Benchmarks Capex per building age (€/sqm) // Office			
	Carex*		
Age	Year 1 (€)	Year 2 - 5 (€)	Year 6 - 10 (€)
10	1,70	6,80	8,50
20	5,60	22,40	28,00
30	7,70	30,80	38,50
40	9,30	37,20	46,50
50	11,30	45,20	56,50

Benchmarks Capex per building age (€/sqm) // Warehouse			
	Carex*		
Age	Year 1 (€)	Year 2 - 5 (€)	Year 6 - 10 (€)
10	1,30	5,20	6,50
20	4,40	17,60	22,00
30	6,50	26,00	32,50
40	7,80	31,20	39,00
50	9,70	38,80	48,50

Condition	Factor
Fair	1,1

Benchmarks Capex per building age xx // Office			
	Carex*		
Age	Year 1 (€)	Year 2 - 5 (€)	Year 6 - 10 (€)
10	1,87	7,48	9,35
20	6,16	24,64	30,80
30	8,47	33,88	42,35
40	10,23	40,92	51,15
50	12,43	49,72	62,15

Benchmarks Capex per building age xx // Warehouse			
	Carex*		
Age	Year 1 (€)	Year 2 - 5 (€)	Year 6 - 10 (€)
10	1,43	5,72	7,15
20	4,84	19,36	24,20
30	7,15	28,60	35,75
40	8,58	34,32	42,90
50	10,67	42,68	53,35

Condition	Factor
Poor	1,2

Benchmarks Capex per building age xxx // Office			
	Carex*		
Age	Year 1 (€)	Year 2 - 5 (€)	Year 6 - 10 (€)
10	2,04	8,16	10,20
20	6,72	26,88	33,60
30	9,24	36,96	46,20
40	11,16	44,64	55,80
50	13,56	54,24	67,80

Benchmarks Capex per building age xxx // Warehouse			
	Carex*		
Age	Year 1 (€)	Year 2 - 5 (€)	Year 6 - 10 (€)
10	1,56	6,24	7,80
20	5,28	21,12	26,40
30	7,80	31,20	39,00
40	9,36	37,44	46,80
50	11,64	46,56	58,20

Example: An office building constructed in 1990 (age ca. 30 years) and a fair condition has the following Carbex (€/sqm) for the next 10 years (2023 – 2032, depending on date of assessment):

Year 1	Years 2-5	Years 6-10
8,47	33,88	42,35

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Master model for sustainable prototype

- Assessment of existing Construction Types
- Capex + Carbex

By considering Capex + Carbex, the following values per time span should be considered:

Invest	Year 1	Years 2-5	Years 6-10
Capex	20,24	80,96	101,20
Carbex	8,47	33,88	42,35
Sum	**28,71**	**114,84**	**143,55**

Results:

- Initial benchmarks for the respective clusters were produced. These benchmarks referred to similar asset classes on similar construction years, whereby the energy consumption, maintenance and repair costs, as well as CO2 emissions were determined and compared.

- From this evaluation, it was possible to see how legal changes to energy-saving measures (respective amendment of the EnEV and GEG) reduced the energy consumption including the respective emissions of the individual logistics halls.

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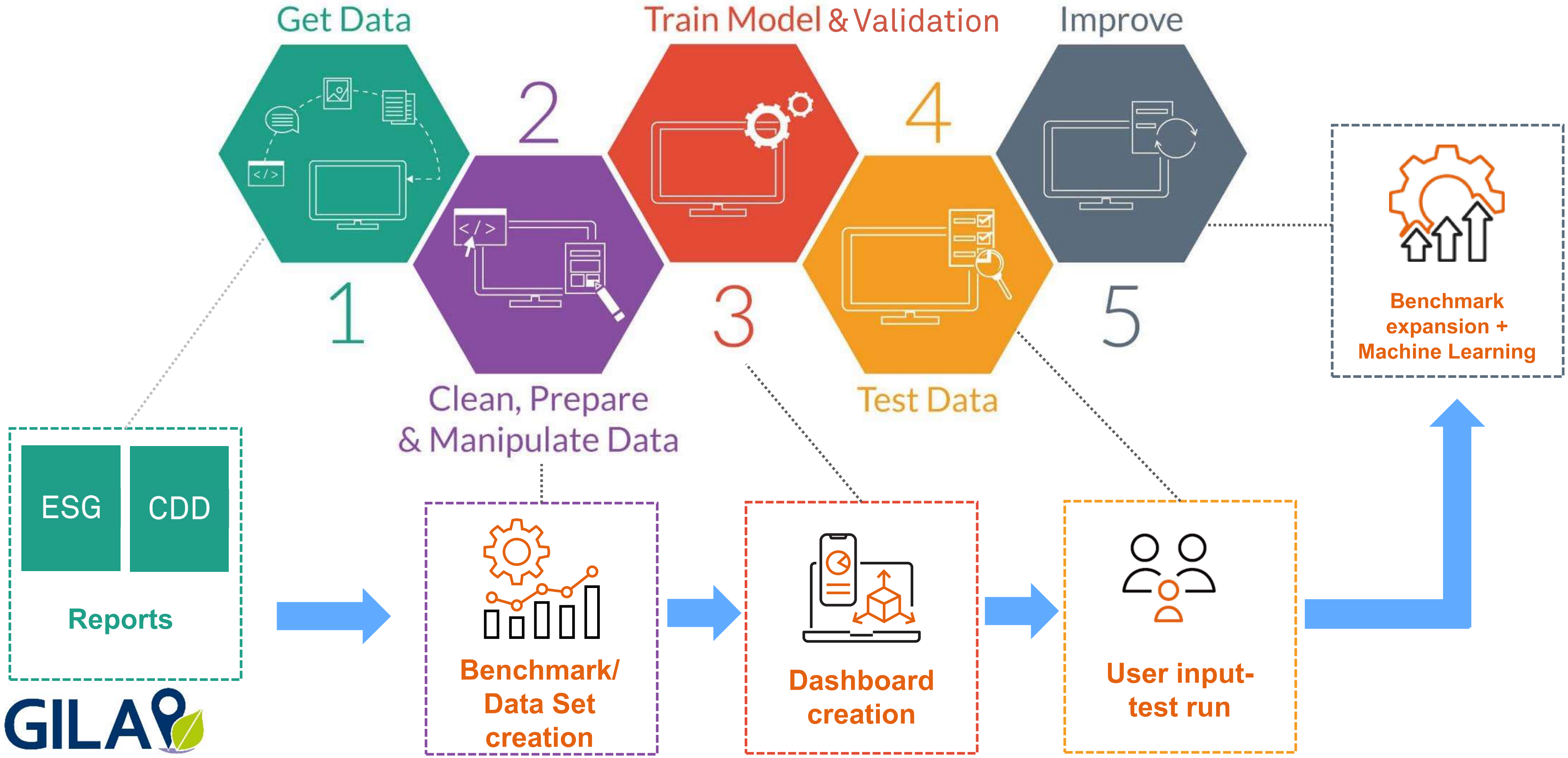
Developing a Sustainable Asset Tool

- The model/sustainable asset tool is developed as a dashboard with the objective to be:
  - Easy to use and understand.
  - Show numerous data visualizations side by side.
  - Provide a general transparent summary information (quality related to the amount of information available) .

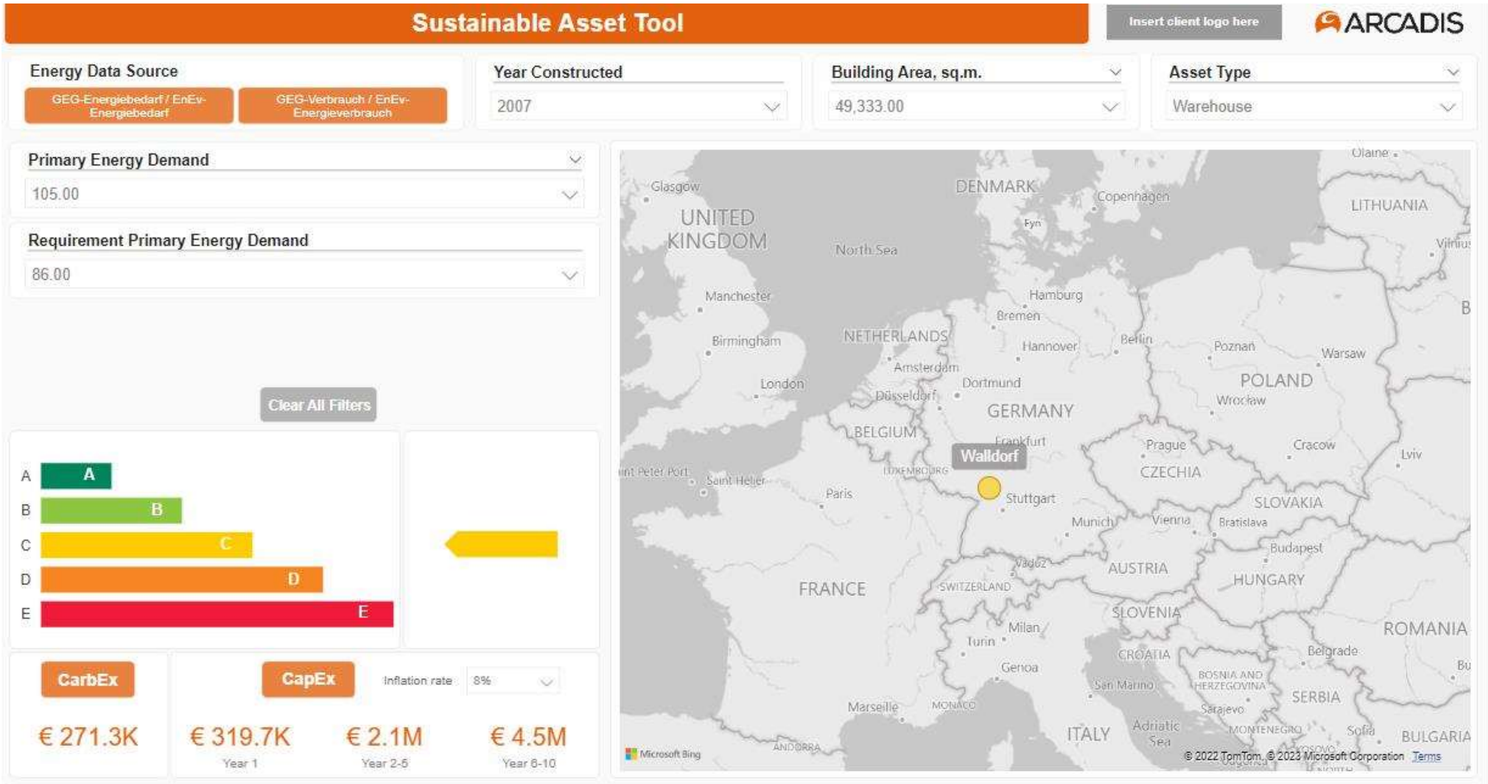
- The objective of this tool is to provide a platform for owners, FM, researchers, etc., to make better, more informed and data-driven decisions regarding actions that can be used as roadmap towards sustainable logistics sites.

- The outcomes are:
  - Embodied carbon benchmark
  - Summary Report on Capex (Maintenance Technical Expenditures) and CarbEx (Carbon Expenditures)
  - Summary Report on inflation rates

Dashboard - How our solution works?



Dashboard visualization



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Thank you for your participation!

Slides of the webinar are provided on https://reff.iml.fhg.de.

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GEFÖRDERT VOM
Bundesministerium für Bildung und Forschung

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