Fachhochschule des Mittelstands



Research&Development

"Sector Coupling for a Sustainable Future: The Kalletal-Herford Project"





Sector Coupling for a Sustainable Future

- Integration of energy sectors (electricity, heating, mobility)
- Focus on renewable energy and hydrogen
- Project region: Kalletal and Herford (OWL region)



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Kalletal - Hydrogen producer

- Location with potential
- Direct purchase of renewable energy possible
- Water availability
- 10 MW electrolysis capacity
- Dynamic hydrogen production
 - 730 tonnes of green hydrogen
- Green waste heat as a recyclable material
 - Heat requirement 3,500,000 kWh



Kalletal - Hydrogen production



Why Sector Coupling and Hydrogen?



- Hydrogen as a flexible energy carrier (for storage, transport, and fuel)
- Hydrogen production from renewable sources (solar and wind energy)



Project Overview: Kalletal-Herford Region

- Kalletal: Rural, renewable energy exporter (wind, solar)
- Herford: Urban, energy demand for transport and industry
- Hydrogen value chain: Production in Kalletal, consumption in Herford Herford district Municipality of Kalletal





Hydrogen value chain -From the Kalletal to the district of Herford



Raising awareness and education

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Introduction to Sustainability Evaluation

- FHM's role in evaluating sustainability impacts
- Aim: Visualise the effects and impacts of the project on the sustainability of the municipality of Kalletal and the district of Herford
- <u>Quantitative</u> status quo values and the <u>qualitative</u> assessment (expert workshop) provide the basis for the sustainability assessment





Sustainability Measurement Process



Source: Indikatorensteckbriefe Nachhaltige Kommune: <u>https://www.bertelsmann-</u> stiftung.de/fileadmin/files/Projekte/Monitor_Nac <u>hhaltige_Kommune/SDG-</u> Indikatoren_fuer_Kommunen_Steckbriefe_2021-<u>05-06.pdf</u>

Municipal relevance screening



Step 2-3

Municipal relevance screening & weighting



Municipal sustainability assessment



Area Education and institutional strengthening	Area Environmental and health goals	Area Sustainable Economy		
SDG 4 Quality education 25 Sustainable schools 26 Sustainable daycare centres	SDG 3 Health and well-being 12 Noise pollution 19 Emission of air pollutants	SDG 7 Affordable and clean energy 35 Share of renewable energies in gross energy consumption 36 Share of electricity from renewable sources in gross electricity consumption		
SDG 16 Peace, justice and strong institutions 109 Tax revenue 115 Informal citizen participation	SDG 13 Climate action 86 "Municipal climate adaptation" index 91 Greenhouse gas emissions - industry and manufacturing industry	WILDCARD Utilisation of hydrogen WILDCARD infrastructure hydrogen charging points 40 Expenditure for the municipal expansion of renewable energies		
SDG 17 Partnerships to achieve the goals WILDCARD partnerships in the sector coupling project	 92 Greenhouse gas emissions - trade, commerce, services (GHD) and other 93 Greenhouse gas emissions - municipal facilities 95 Greenhouse gas emissions - public transport WILDCARD Greenhouse gas savings through the sector coupling project 	62 Number of cars with electric drive WILDCARD stock of fuel cell vehicles WILDCARD Quantity of hydrogen dispensed at refuelling stations 67 Land utilisation 68 New land utilisation 71 Completed residential buildings with renewable heating energy 72 Pate of another officient of which page 46 buildings		
SDG 9 Industry, innovation and infrastructure WILDCARD Number of co-operative members WILDCARD expenditure for the municipal expansion of heating and energy infrastructure	SDG 15 Life on land 102 Nature conservation areas 103 Landscape quality 104 Undissected open spaces 105 Bird biodiversity	SDG 12 Responsible consumption and production patterns 77 Drinking water consumption - industry, commerce, trade and services 79 Energy consumption - industry, commerce, trade and services 83 operating sites with environmental or sustainability certificates		

Municipal sustainability assessment



Step 4

Municipal sustainability assessment

A panel of experts was responsible for the qualitative assessment of the sustainability indicators

Expert panel		Evaluation	Sustainability assessment of the municipality of	Sustainability assessment of the municipality of
Municipality of Kalletal	Herford district	-3 strongly negative -2	Kalletal	Kreis Herford
 education & institutional strengthening → 4 experts environmental & health goals → 4 experts sustainable economy → 4 experts 	 education & institutional strengthening → 4 experts environmental & health goals → 4 experts sustainable economy → 4 experts 	negative		
		-1 slightly negative		
		+1 slightly positive		
		+2 positive		
		+3 strongly positive		

Sustainability description

Step 5

Sustainability description

FHM prepared a sustainability report with input on indicators and assessments incl. sustainability compasses Municipality of Kalletal + District of Herford



Kalletal:

0.9



Looking Ahead: The Future of Sector Coupling // Realization Phase

• Long-term vision:

- A regional hydrogen economy
- Expanding infrastructure (more electrolysis plants, refueling stations)
- Public participation and local benefits
- Community Involvement and Education
 - Regular energy forums for knowledge exchange
 - Educational modules on hydrogen and renewable energy
 - Involves community in decision-making and learning