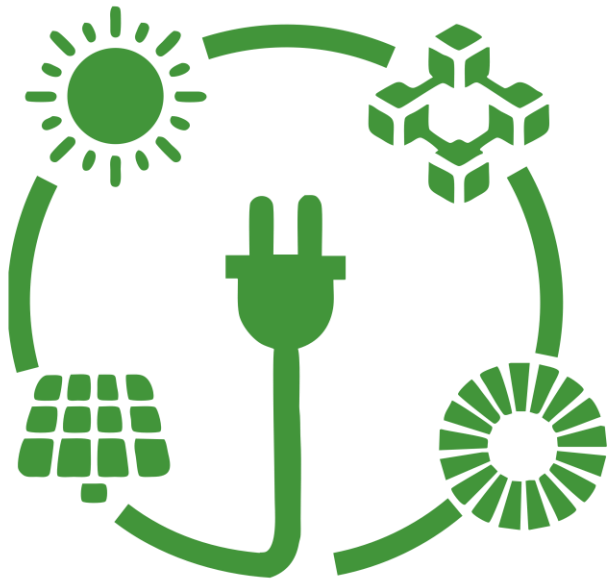


SUSTAINABLE ENERGY IMPACT



bringing power to the people



Hochschule Bochum
Bochum University
of Applied Sciences



Sustainable Energy Impact

Bringing power to the people

*Sustainable energy and mobility
concepts in developing countries using
light electric vehicles, sharing systems,
decentralized energy systems, and
blockchain technology*

Agenda

1. Background Information
2. Project Environment
3. Project Team
4. Project Task Forces
5. Work Examples

Agenda

1. Background Information
2. Project Environment
3. Project Team
4. Project Task Forces
5. Work Examples

Key Information

- Sustainable Energy Impact (SEI) is a project study / student project
- SEI started in 2019
- Research focus:



Sustainable Energy Systems



Sustainable Mobility Offers



Circular Economy



Supported Scientific Projects

Since 2019 members of SEI contributed to the following scientific projects:

EmmGh – E-Micromobility in Ghana

- Funding Body: BMZ/GIZ (PAMA & Invest for Jobs Ghana)
- Funding Volume: 145.200,00€

MoNaI – Mobility sustainably through the life cycle

- Funding Body: Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection
- Funding Volume: 397.382,00 €

GH2GH – Green Hydrogen to Ghana

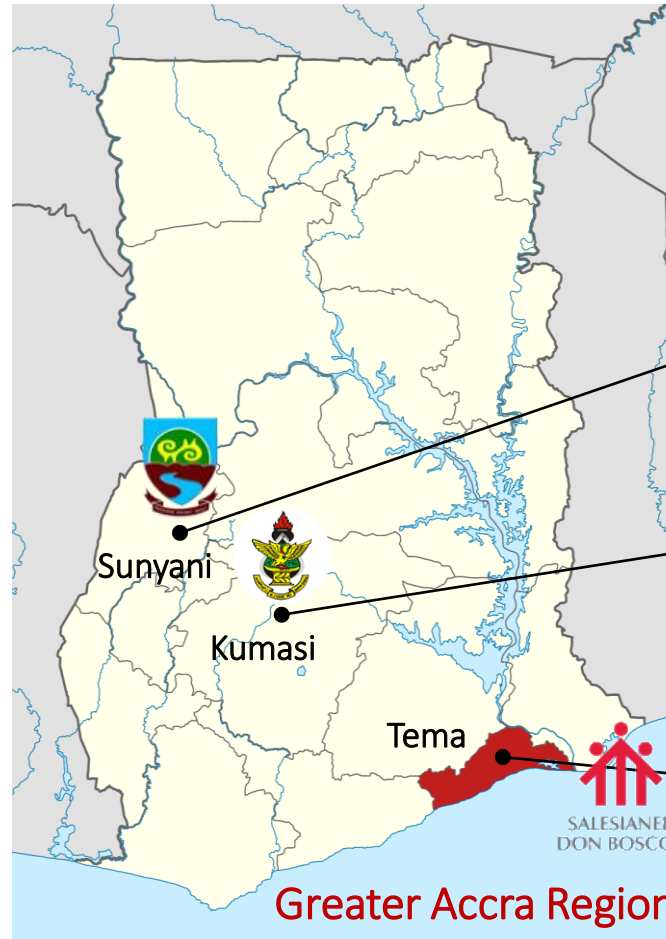
- Funding Body: Federal Ministry for the Environment, Nature Conservation, Nuclear Safety
- Funding Volume: 1.245.075 €



Gefördert durch:



Project Sites



University of Energy and
Natural Resources (**UENR**),
Sunyani

Kwame Nkrumah University
of Science and Technology
(**KNUST**), Kumasi

Don Bosco Solar and
Renewable Energy Centre,
Tema, Ghana

Don Bosco Solar and Renewable Energy Centre

The project
addresses the
following

SDGs*

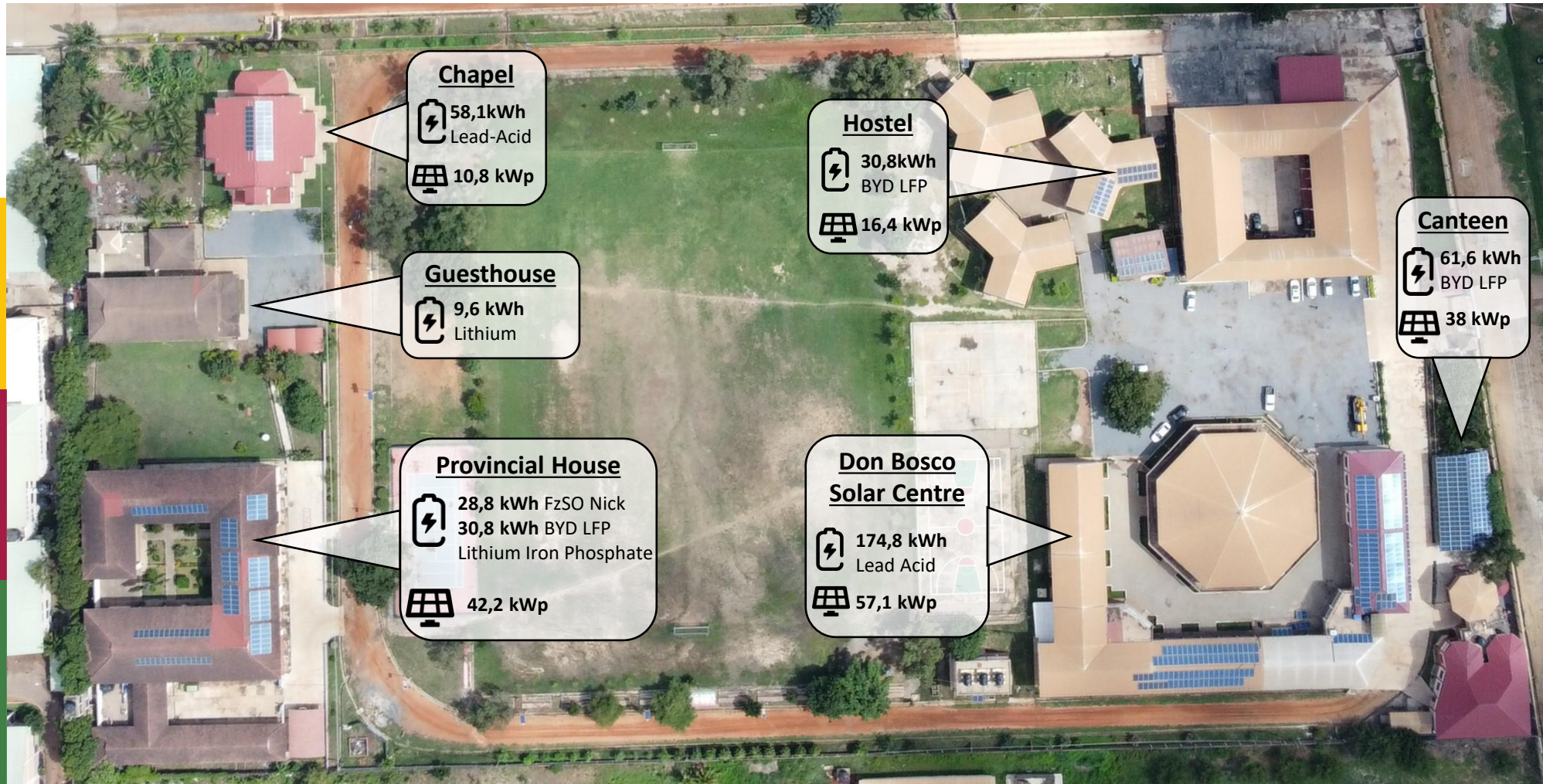
7 AFFORDABLE AND
CLEAN ENERGY



8 DECENT WORK AND
ECONOMIC GROWTH



13 CLIMATE
ACTION



*SDG = Sustainable Development Goals

Don Bosco Solar and Renewable Energy Centre



Workshops at the UENR & KNUST



Agenda

1. Background Information
- 2. Project Environment**
3. Project Team
4. Project Task Forces
5. Work Examples

Project Environment

External partner



Partner Universities



Funding organizations



Agenda

1. Background Information
2. Project Environment
- 3. Project Team**
4. Project Task Forces
5. Work Examples

Team Winter Semester 22/23



Lukas Sturm

- **Project Management**
- B.Sc. Business Administration
- M.Sc. Applied Sustainability



Joshua Dugbenu

- **TF Environmental Impact**
- B. Sc. Automobile engineering



Fine Zaika

- **TF Environmental Impact**
- B.Sc. Sustainable Development



Eugene Asare Agyei

- **TF Communication & PR**
- B.Sc. Automobile engineering



Tobias Pflug

- **TF Mobility Concept, TF Environmental Impact**
- B.Sc. Logistics Management
- M.Sc. Applied Sustainability



Florence Afia Danso

- **TF Environmental Impact**
- B.Sc. Environmental science



Svenja Piorr

- **TF Environmental Impact**
- B. Sc. Sustainable Development



Julian Bajo

- **TF Business Development**
- B.Sc. International Management
- M.Sc. Applied Sustainability



Richmond Osagyefo

- **TF Environmental Impact**
- B.Sc. Renewable Energy Engineering



Viktoria Venz

- **TF Environmental Impact**
- B.Sc. Sustainable Development



Henry Kwasi Nukunu Aboadi jr.

- **TF Environmental Impact**
- B.Sc. Environmental science



Julia Neumann

- **TF Environmental Impact**
- B.Sc. Design-Engineer Textile
- M.Sc. Applied Sustainability



Eva-Maria Kempe

- **TF Communication & PR**
- M.A. Comparative Literature
- M.Sc. Applied Sustainability

Agenda

1. Background Information
2. Project Environment
3. Project Team
- 4. Project Task Forces**
5. Work Examples

Task Forces



Taskforce Environmental Impact

- Development of Life-Cycle-Analysis (LCA) of E-mopeds, E-cargo bikes, solar charging stations
- Research on recycling concepts for Photovoltaic (PV) and Lithium-ion batteries
- Research on EOL options for E-waste



Taskforce Business Development

- Creation of a business plan for an E-moped sharing system



Taskforce Communications

- Communication about the project on several channels, blogs and magazines both in Germany and in Ghana



Taskforce Mobility Concept

- Development of a survey for social acceptance of Light Electric Vehicles in Ghana
- Development of an criteria catalogue including economic, ecological and social indicators of E-mopeds



Taskforce Technical Development

- Visualization of data generated by the smart mini grid
- Testing of energy management systems

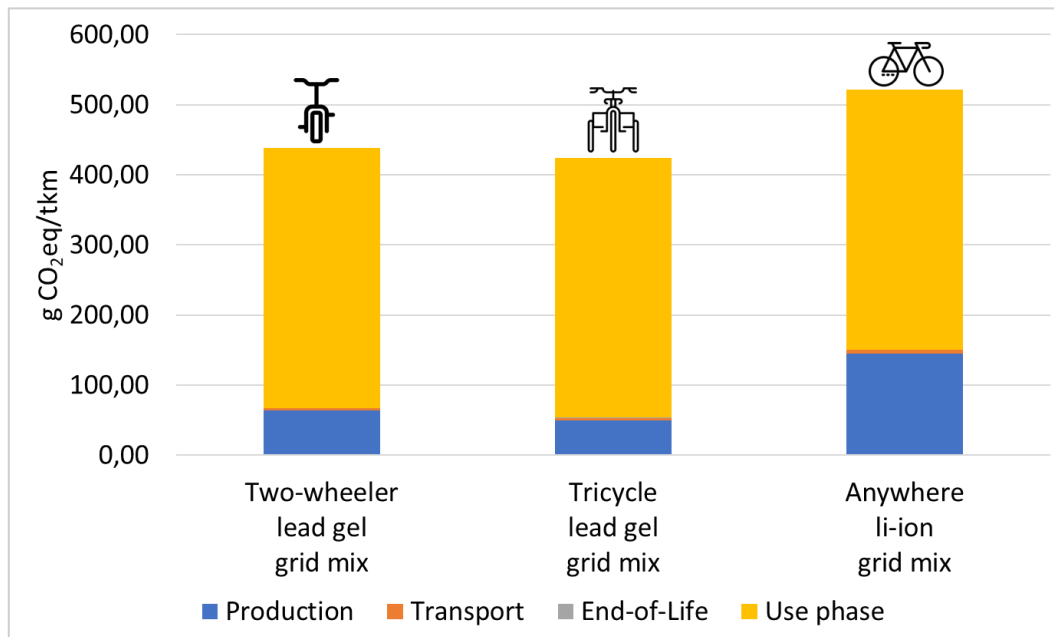
Agenda

1. Background Information
2. Research Focus
3. Project Environment
4. Project Team
5. Project Task Forces
6. **Work Examples**

LCA of E-Cargo Bikes used in Ghana

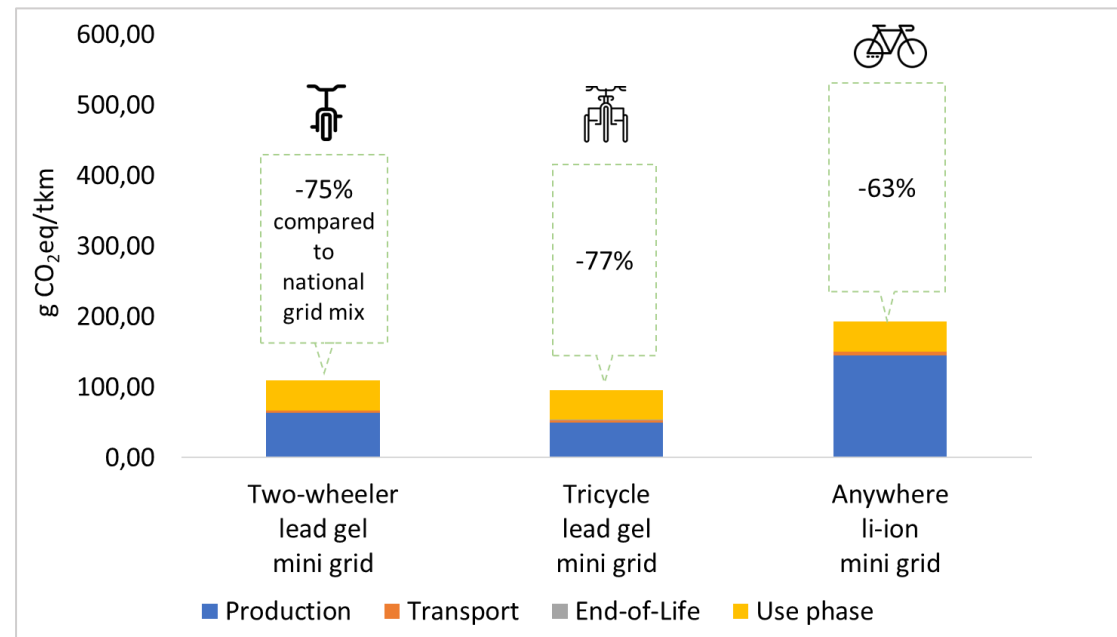
Comparison of the **GWP100*** per tkm over Lifecycle of 3 E-cargo bikes

Assumption: Bikes are charged by national grid mix Ghana



Comparison of the **GWP100** per tkm over Lifecycle of 3 E-cargo bikes

Assumption: Bikes are charged by solar mini-grid



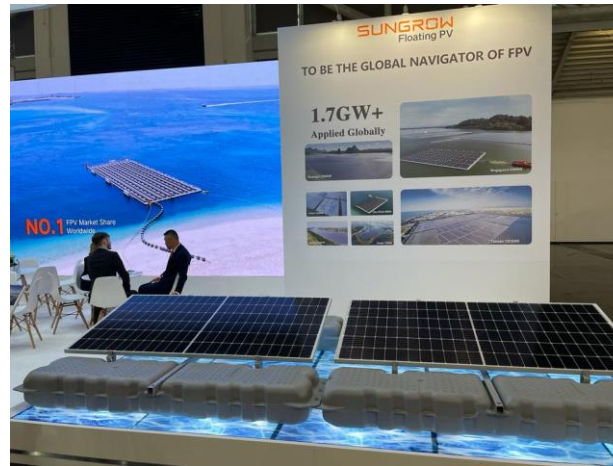
*GWP100 = Global Warming Potential over 100 years

Work Examples

Attendance at the Intersolar Trade Fair

Key questions to which an answer should be found:

1. What are the **state-of-the-art recycling processes** and what do they look like?
2. What **software** is available on the market to **visualize data generated by Smart Mini Grids (off grid)**?
3. Which **PV recycling companies** are operating in Ghana



Work Examples

Research on Practical Recycling Concepts for Photovoltaics

- Plant tour at the largest PV recycler in Germany



Storage of PV panels



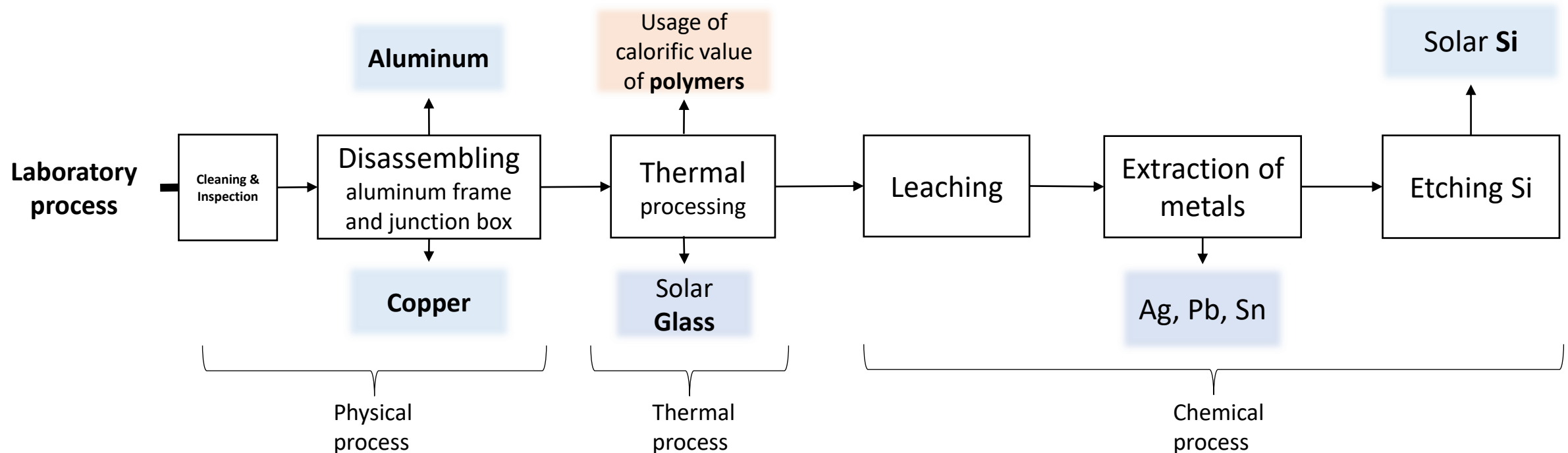
Shredded PV panels



Recycled glass of PV panels

Work Examples

Research on Theoretical Recycling Concepts for Photovoltaics (PV)



Fraunhofer ISE (2022); Tsanakas et al. (2020); Chowdhury et al. (2020); Cuchiella et al. (2015); Tao et al. (2020)

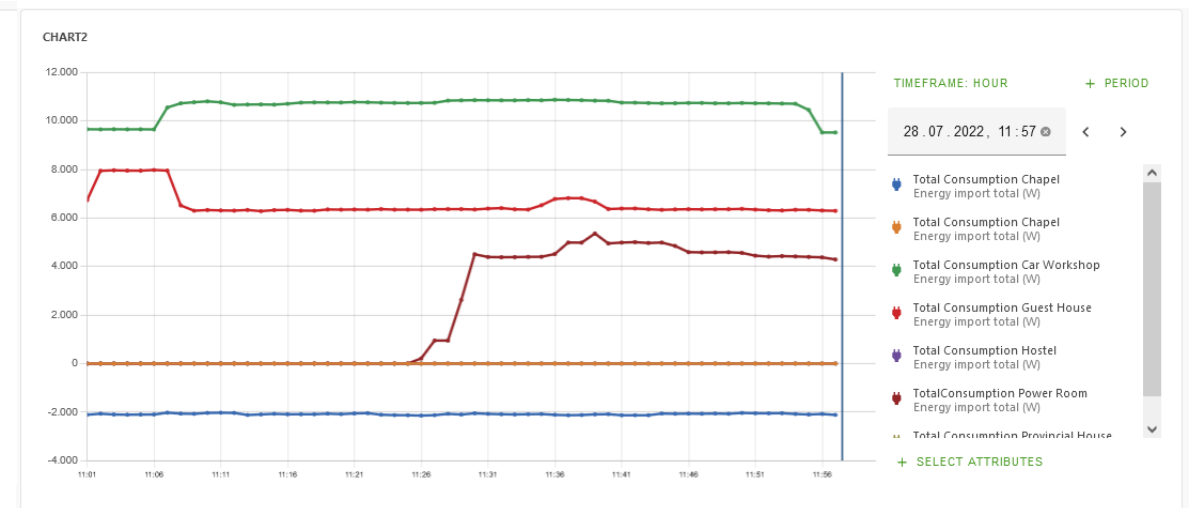
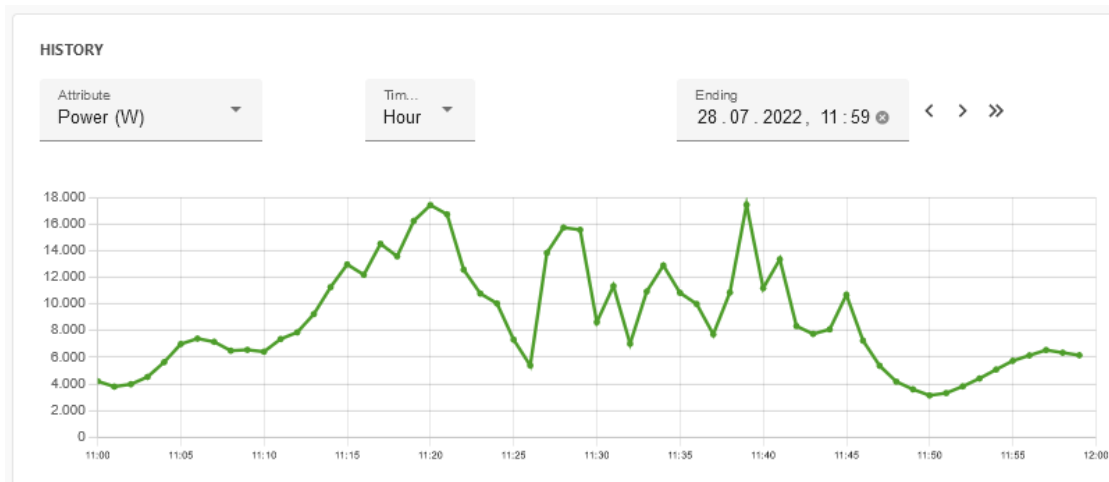
Work Examples

Visualization of data generated by the Solar Mini Grid with IOT* software OpenRemote

Technical implementation



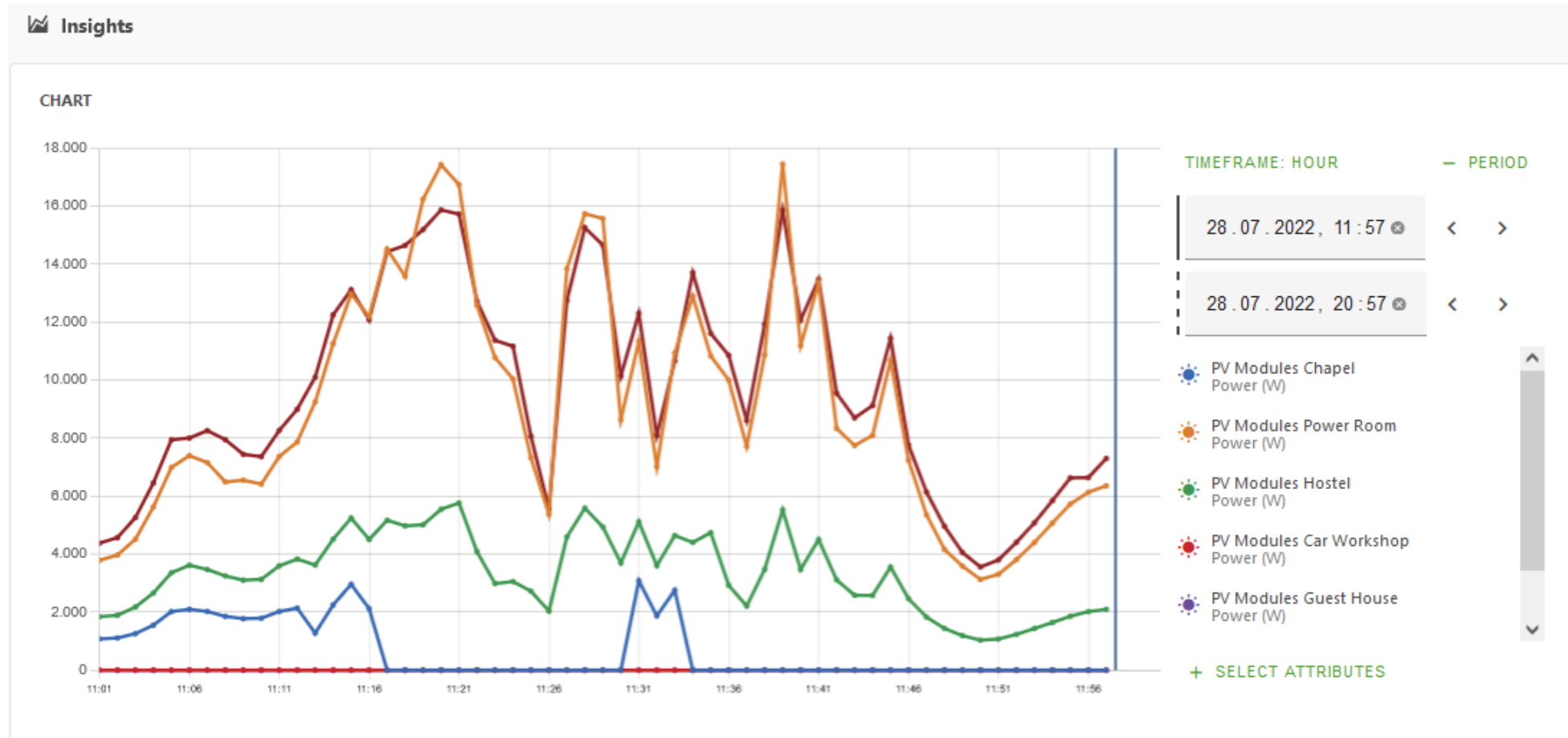
Visualization



*IOT = Internet of Things

Work Examples

Visualization of data generated by the Solar Mini Grid with IOT software OpenRemote



Sources

BMZ (2022): <https://www.bmz.de/de/laender/ghana/kernthema-energie-9880#:~:text=Ghana%20hat%20zwar%20im%20regionalen,Unternehmen%20und%20private%20Haushalte%20dar>

Chowdhury, Md. S. et al., (2020): An overview of solar photovoltaic panels' end-of-life material recycling, Energy Strategy Reviews

Fraunhofer ISE (2022): Photovoltaics report, <https://www.ise.fraunhofer.de/content/dam/ise/de/documents/publications/studies/Photovoltaics-Report.pdf>; 2022 (Accessed 06 June 2022).

IEA, IRENA, UNSD, WHO (2022): <https://www.iea.org/reports/sdg7-data-and-projections/access-to-electricity>

Tao et. al. (2020): Major challenges and opportunities in silicon solar module recycling

Tsanakas, J.A. et al.,(2020): Towards a circular supply chain for PV modules: Review of today's challenges in PV recycling, refurbishment and re-certification, Progress in Photovoltaics: Research and Applications