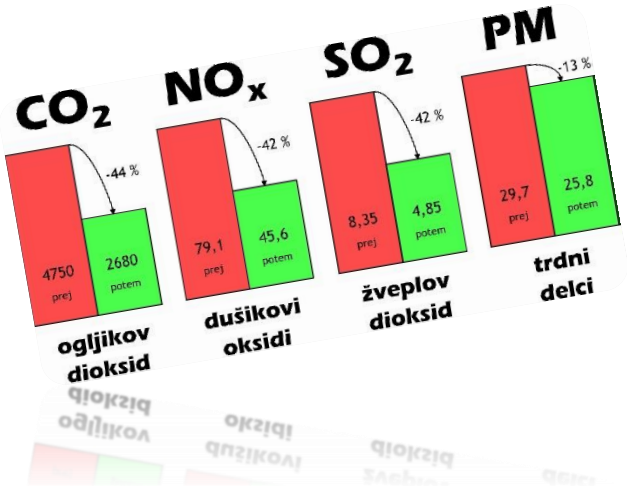
LIFE SustainHuts

Sustainable Mountain Huts in Europe



Basic facts

C. Implementation actions (obligatory)

C1	Renewable energy production
C2	Renewable hydrogen production
C3	Energy efficiency and new insulation materials
C4	Execution of demo-sites
C5	Life cycle assesment and enviromental analysis
C6	Replicability and transferability of results
C7	Guidelines and methodologies to achieve SUSTAINHUTS

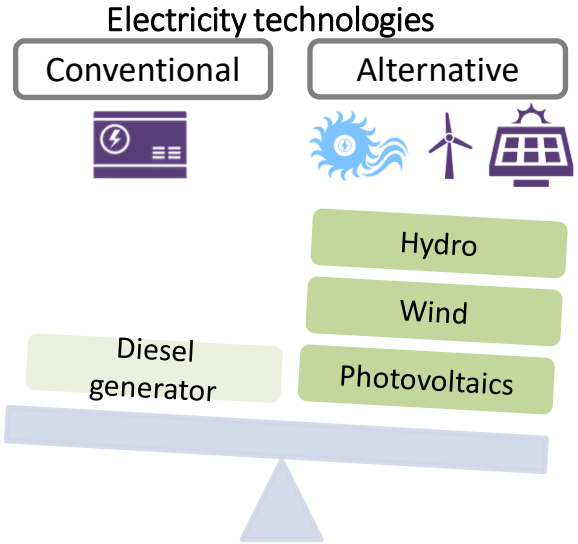
Target in C5 work package

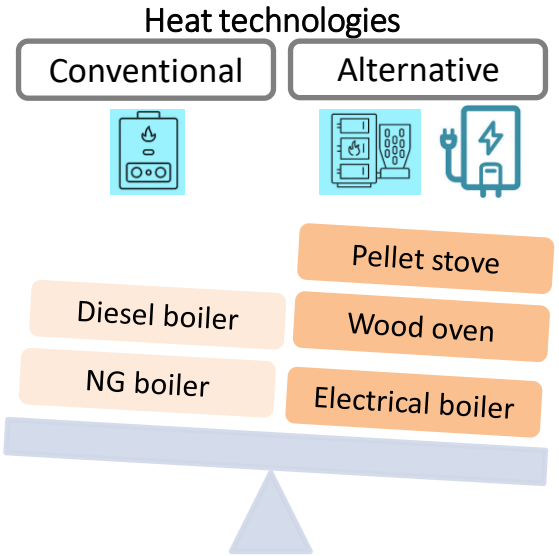
- **C5.1** • Identification of technologies used in mountain huts and specifications of huts construction
- **C5.2** • Life cycle inventory analysis (LCIA): Mass and energy balances of mountain huts
- **C5.3** • Life cycle assessment model (LCA) of RE technologies implementation and sensitivity analysis
- **C5.4** • LCA model of case study with all listed technologies implemented
- **C5.5** • LCA guideline final report: “Life Cycle Assessment in sustainable mountain huts”

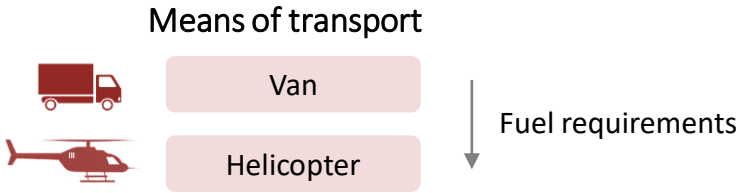
Work done

- **5 reports** in the scope of the project
- **New inventories** based on real operation data LCI
- **Target emissions**: CO2, NOx, SOx, particles
- **CML2001 methodology** with 11 environmental indicators
- **5 master thesis** from Spanish students
- 2 scientific papers (Bachimana, Lizara)
- **LCA of 8 huts**: Lizara, Bachimaña, Estós, Cap de Llauset, Montfalcó, Torino, Pogačnikov and Staničev

Sustainability improvement







Estos case - electricity

ELECTRICITY GENERATION

Facility	Parameter	SOPB	SOPE	
Large diesel generator	Power [kW]	24.80	24.80	
	Generation [kWh/year]	9,225	17	↓↓
Small diesel generator	Power [kW]	-	10.40	
	Generation [kWh/year]	-	684	
PV power	Installed power [kWp]	0.50	2.50	
	Generation [kWh/year]	595	3,460	↑↑
Hydro-turbine	Power [kW]	5	5	
	Generation [kWh/year]	5,004	15,95	↑↑
	El. consumption [kWh/year]	11,279	11,27	

Location: Huesca (Spain)

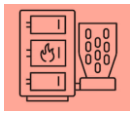
Altitude: 1,890 m

Capacity: 115 people

Open the whole year

Estos case - Heat

HEAT GENERATION



Facility	Parameter	SOPB	SOPE
Diesel boiler	Diesel consumption [l/year]	1,991	1,370
	Generation [kWh/year]	15,987	11,487
Pellet boiler	Pellet consumption [kg/year]	-	1,000
	Generation [kWh/year]	-	4,500
	Heat consumpt. [kWh/year]	15,987	15,987

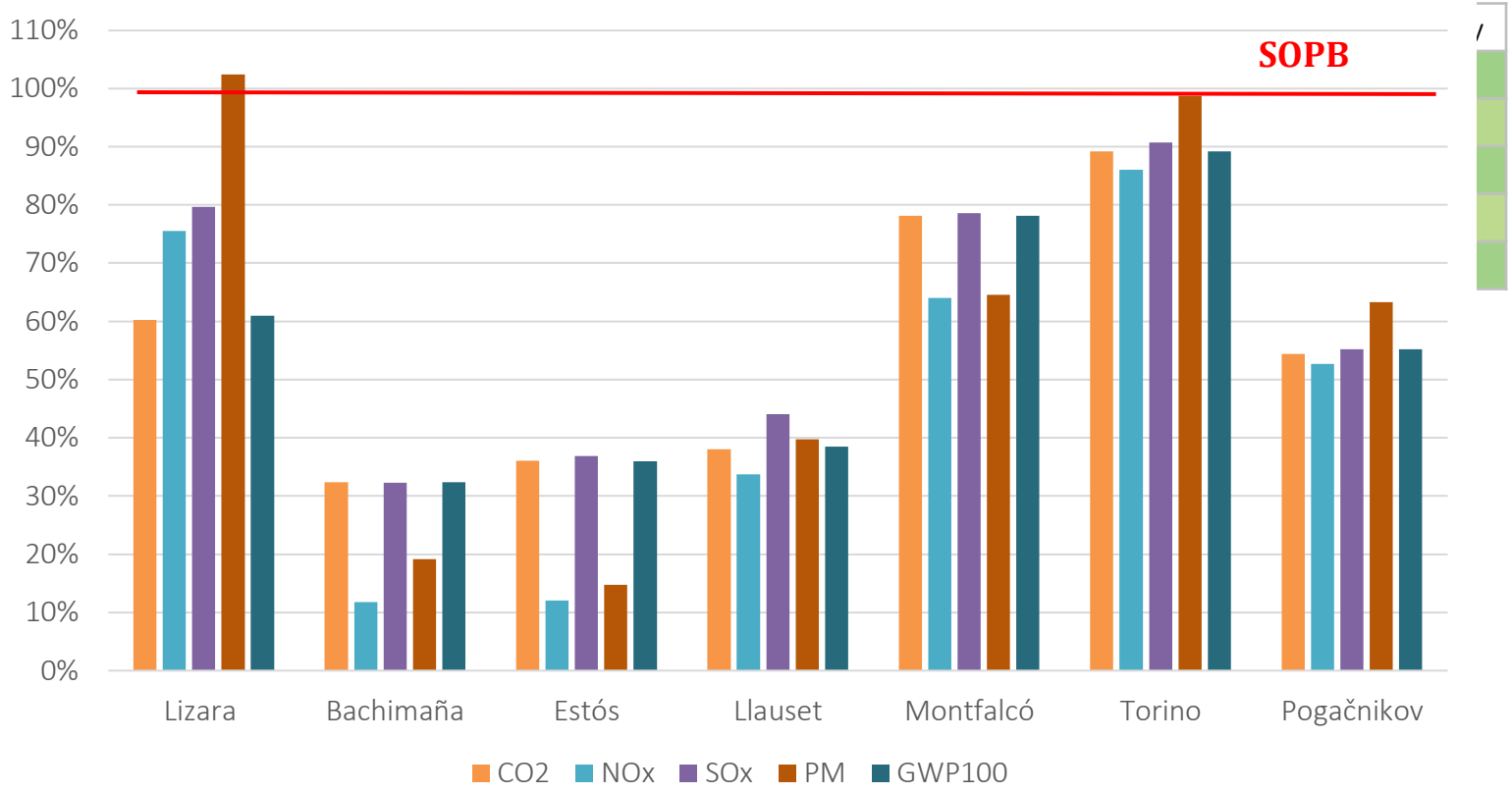
↓

Estos case - Transport

TRANSPORT

	Facility	Parameter	SOPB	SOPE	
	Van	Fuel load [kg/year]	4,660	2,383	
		Factor [km·kg]	20.05	10.25	↓
	Helicopter	Fuel load [kg/year]	4,660	2,383	
		Usage time [h]	4.89	2.44	↓

Reduction in target emissions and environmental impacts



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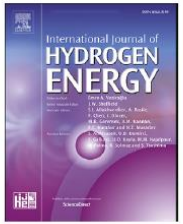

Micro-grid design and life-cycle assessment of a mountain hut's stand-alone energy system with hydrogen used for seasonal storage

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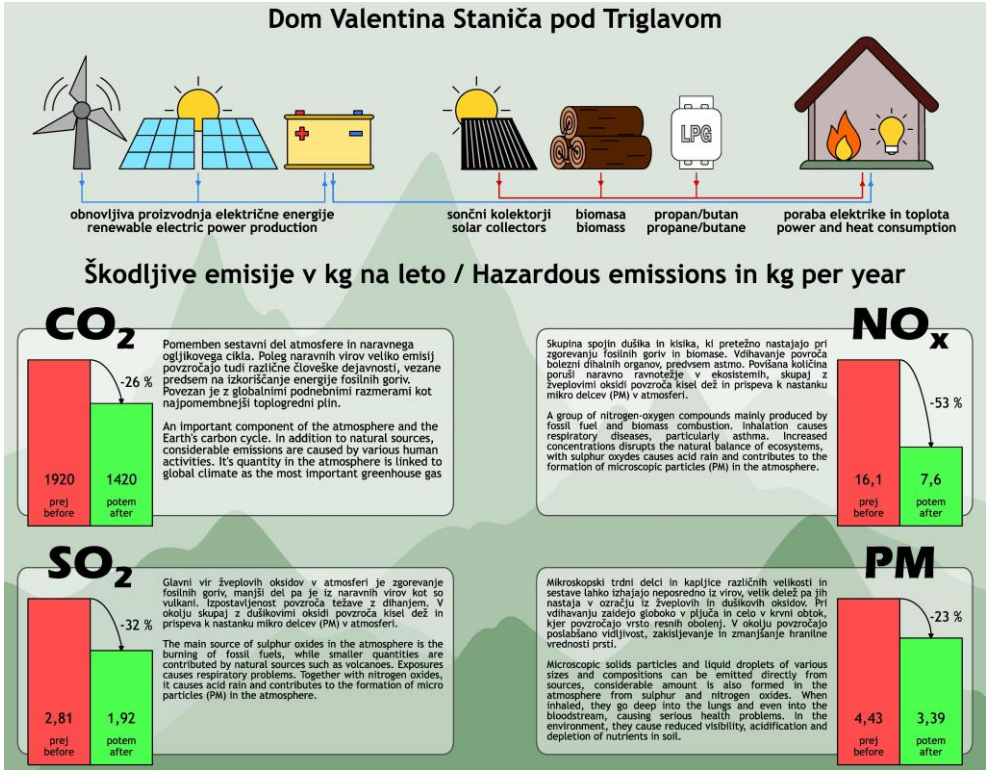
HIGHLIGHTS

- Eight configurations of mountain-hut stand-alone energy system are studied.
- A novel approach using technical, economic and environmental criteria is introduced.
- Hydrogen-storage combined with renewable energy sources is the optimal solution.
- For seasonal energy storage, hydrogen is more favourable than a battery-storage.

Conclusions and Outline

- Crucial: **life cycle inventory**
- No **specific databases** for MH technologies
- **Optimisation** of transport
- Not just target emissions but also **environmental impact indicators**



Thank you for your attention!

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