

LES ORRES 10-11 mai 2021

Smart  
Mountain  
for  
tomorrow

# SMART ALTITUDE LIVING LABS

1. Krvavec (SI)
2. Madonna di Campiglio (IT)
3. Verbier (CH)
4. Les Orres (F)

Interreg  
Alpine Space



FRANCE 20/21  
Presidency



GOVERNEMENT  
Liberté  
Égalité  
Fraternité

RÉGION  
PROVENCE  
ALPES  
CÔTE D'AZUR

La Région  
Auvergne-Rhône-Alpes

RÉGION  
BOURGOGNE  
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le département

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# LIVING LAB KRVAVEC

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**LES ORRES**

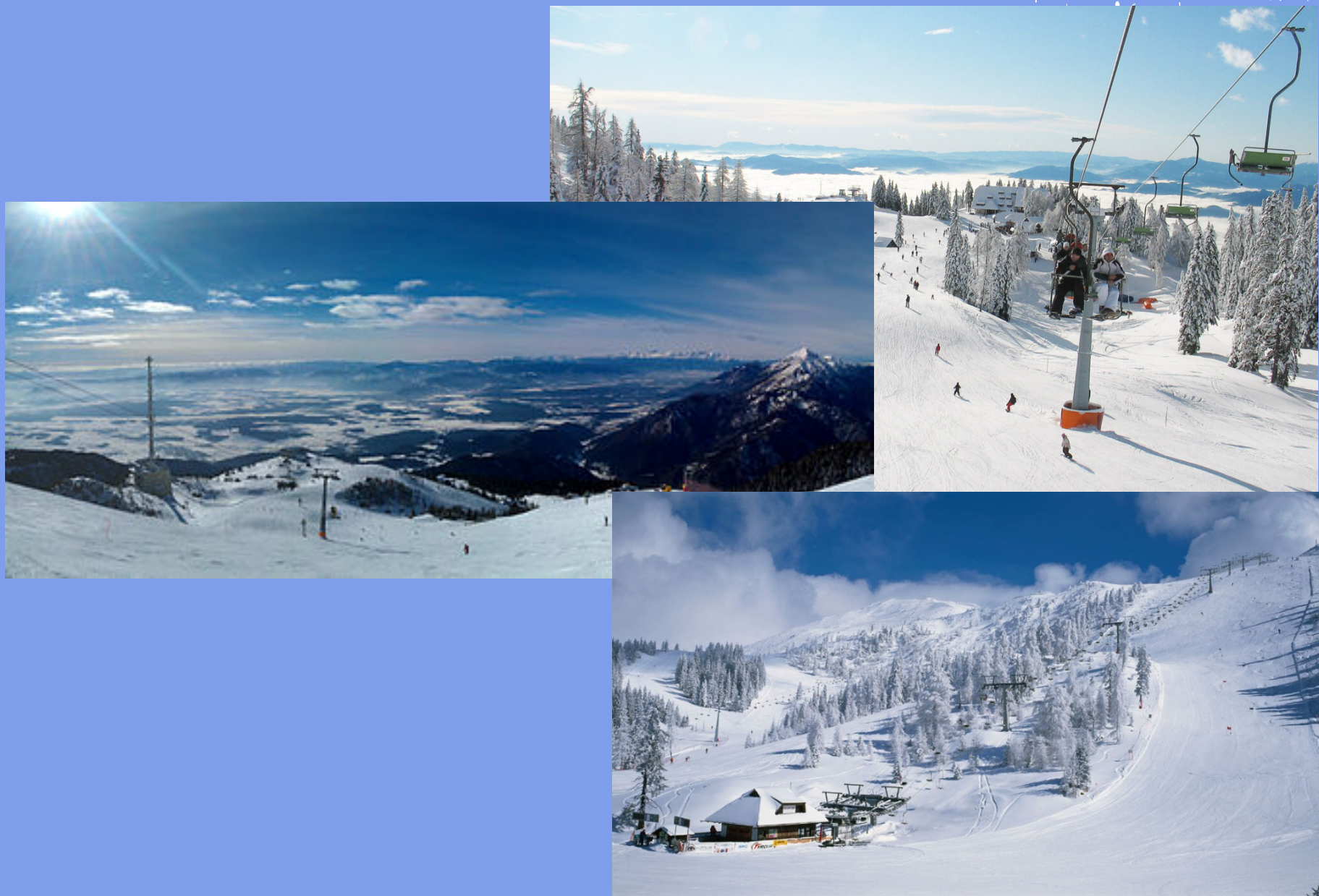
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# KRVAVEC SKI RESORT

Biggest and most popular ski resort in Slovenia: 33 km of ski slopes, closest to the capital with approx. 100 ski days a year.

MANY ADDITIONAL WINTER AND SUMMER SEASON CONTENTS: dinner at gondola, hiking trails, adrenalin park, bike park, wedding spots, events organisations, ...





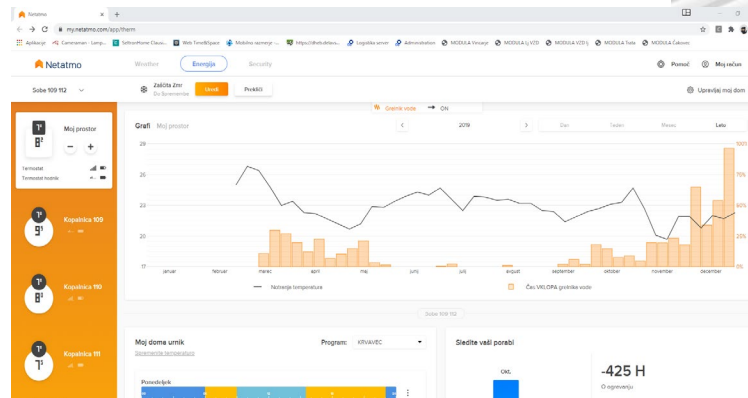
## SNOWMAKING SOFTWARE



Modern snowmaking systems are complex systems combining snow guns and smart infrastructure. We installed an intuitive data control system which supports the entire process of snowmaking, planning and management of ski resorts. It allows simple and automatic control of the systems and provides a clear display of complex data

We installed a thermostatic valve on each radiator, which is controlled via a computer or mobile application. Through the program, each room is heated according to a pre-set temperature. The system itself switches off the room heating via the hotel program, if the room is not reserved. In case of reservation, the room starts to be heated an hour before the arrival of the guest.

Thermostatic valves are controlled via the NETATMO application, which is connected to the hotel reservation system.



+ control of water in boiler room, in connection to the outside temperature  
+ app to manage and follow heating system in the ski resort buildings to detect flaws, overspending, ...





[www.alpine-space.eu/projects/smart-altitude/en/home](http://www.alpine-space.eu/projects/smart-altitude/en/home)  
[www.smartaltitude.eu](http://www.smartaltitude.eu)

THANK YOU

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<https://www.rtc-krvavec.si>



<https://www.bsc-kranj.si>

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# REVIEW OF SMART ALTITUDE'S LIVING LABS' ACHIEVEMENTS

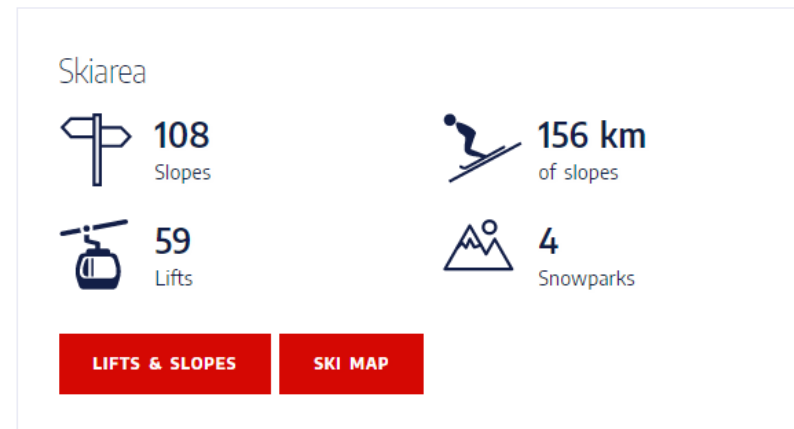
Madonna di Campiglio (Italy)

*D. Viesi (Fondazione Bruno Kessler) - viesi@fbk.eu*





# LIVING LAB MADONNA DI CAMPIGLIO



## MADONNA DI CAMPIGLIO

Ski slopes: 60 km

Altitudinal range: 1513-2501

Ski lifts: 35533 passengers/h

Technical snow: 1.1 Mm<sup>3</sup>/year

Snow groomers: 20

Skier-days: 1.2 M/year

Winter turnover: 25 M€

Winter energy consumption: 15.1 GWh

Winter electricity consumption: 10.5 GWh

Winter energy cost: 2.1 M€

Winter electricity cost: 1.8 M€





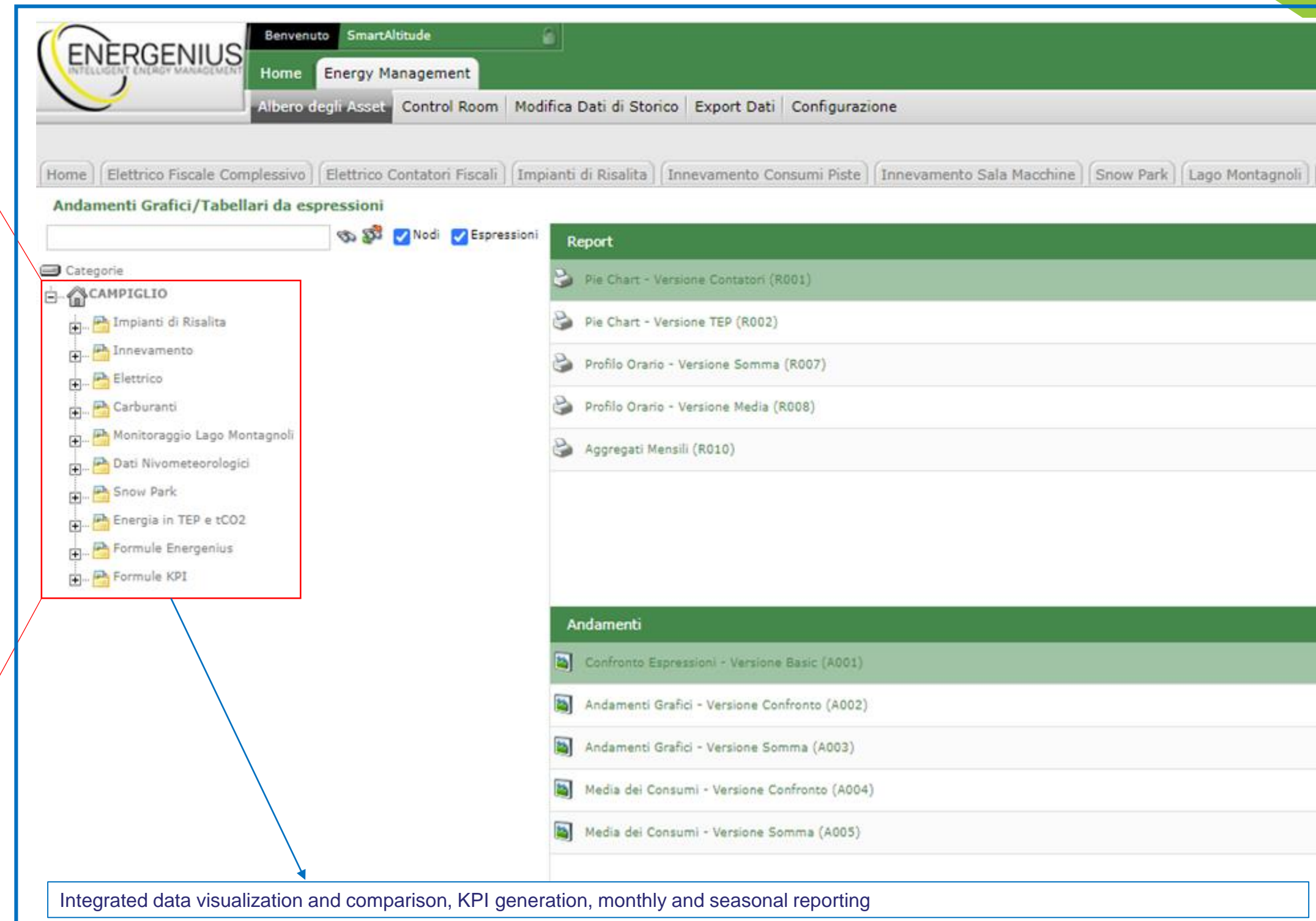
# THE DATA MANAGEMENT APPROACH

## Before Smart Altitude

Many data management platforms..

## After Smart Altitude

1 integrated data management platform





# IMPROVEMENT OF THE MONITORING SYSTEM

## MONITORING LAKE MONTAGNOLI



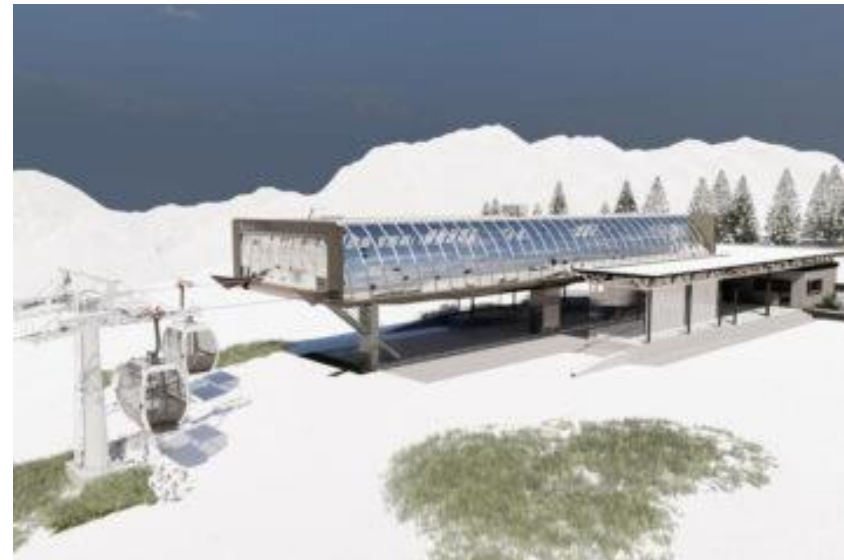
### MONITORED PARAMETERS:

- Water temperatures
- Water level
- Meteorological conditions

### GOAL:

- Optimize the lake management for an energy and water efficient snow production (lake filling, boulage, snow production times)

## MONITORING OF 4 SKI LIFTS



### MONITORED PARAMETERS:

- Engines electrical consumption

### GOALS:

- Compare different ski lift technologies (chair lift/cableway, Uni-G/D-Line)
- To be compared with the entrance monitoring system (Skidata)

## MONITORING OF 2 SNOW GROOMERS WAREHOUSES



### MONITORED PARAMETERS:

- Electrical consumption

### GOALS:

- Optimize consumption for heating of snow groomers warehouses
- Compare different heating technologies (existing electric convectors vs potential heat pumps)



## MONITORING PHOTOVOLTAIC POTENTIAL

### MONITORED PARAMETERS:

- PV production

### GOAL:

- Evaluate the on-site PV potential in a mountain environment at high altitudes



# INTEGRATED ENERGY MANAGEMENT SYSTEM



## TESTING AN INTEGRATED ENERGY MANAGEMENT SYSTEM



MONITORS



WARNS



FORESEES



[www.ski.it/en/zeroemission2026](http://www.ski.it/en/zeroemission2026)

### Electric grid

Energy consumption from the medium voltage grid

### Snow production

Water, compressed air and energy consumption

### Lake monitoring

Water temperatures and water surface

### Snow grooming

Operational data, diesel consumption and snow-depth

### Meteo

Meteorological conditions and weather forecasts

### Ski lifts

Energy usage, n° of entrances, photovoltaic integration

### Skiers data

Analysis of skier days

OUR MISSION ZERO EMISSION



## INTEGRATED ENERGY MANAGEMENT SYSTEM FOR THE SKI RESORT MADONNA DI CAMPIGLIO

### WHAT IS IT?

- **A digital platform** for the mountain environment and ski infrastructures.

### WHAT DOES IT DO?

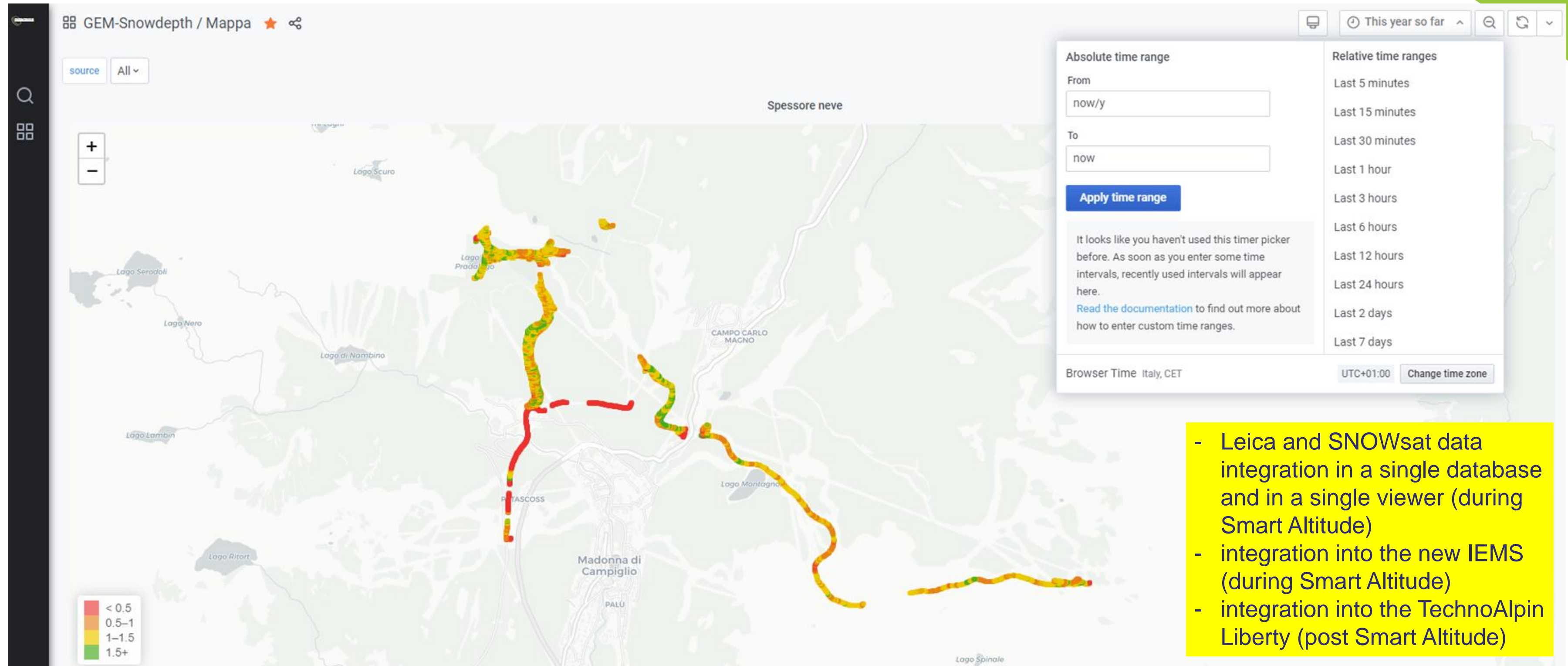
- **It monitors** plants' operations and the consumption of energy and water.  
**Generate report, send notifications, make forecasts.**

### WHY?

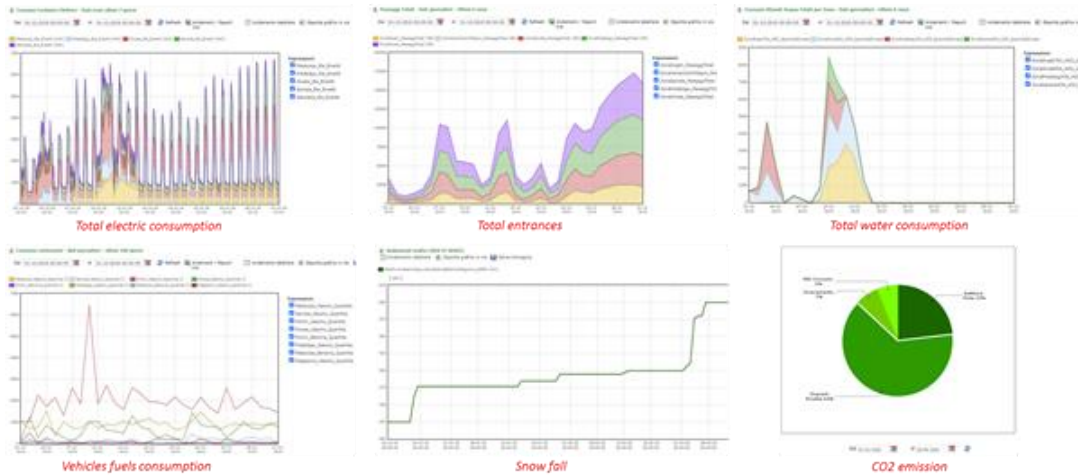
- **To have an integrated decision support system** for eco-sustainable choices.



# A NEW PLATFORM FOR THE INTEGRATION AND VISUALIZATION OF SNOW THICKNESS DATA

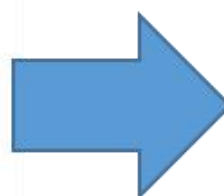
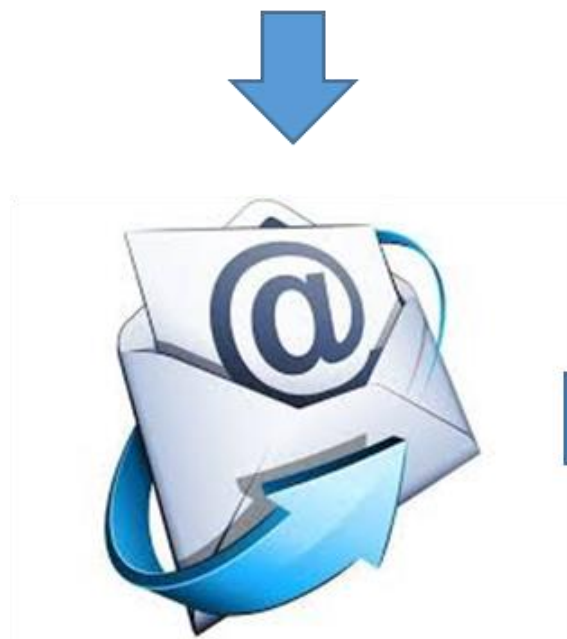
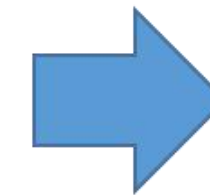


# TOWARDS AN EFFICIENT AND SUSTAINABLE SKI RESORT



Identification of:

- energy efficiency measures
- reduction of CO2 emissions
- economic savings



TOWARDS AN EFFICIENT AND SUSTAINABLE SKI RESORT



SMART ALTITUDE  
OUR MISSION ZERO EMISSION

<https://www.ski.it/en/zeroemission2026>





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# LIVING LAB VERBIER

Low-carbon energy systems







**EUSALP**  
EU STRATEGY FOR  
THE ALPINE REGION



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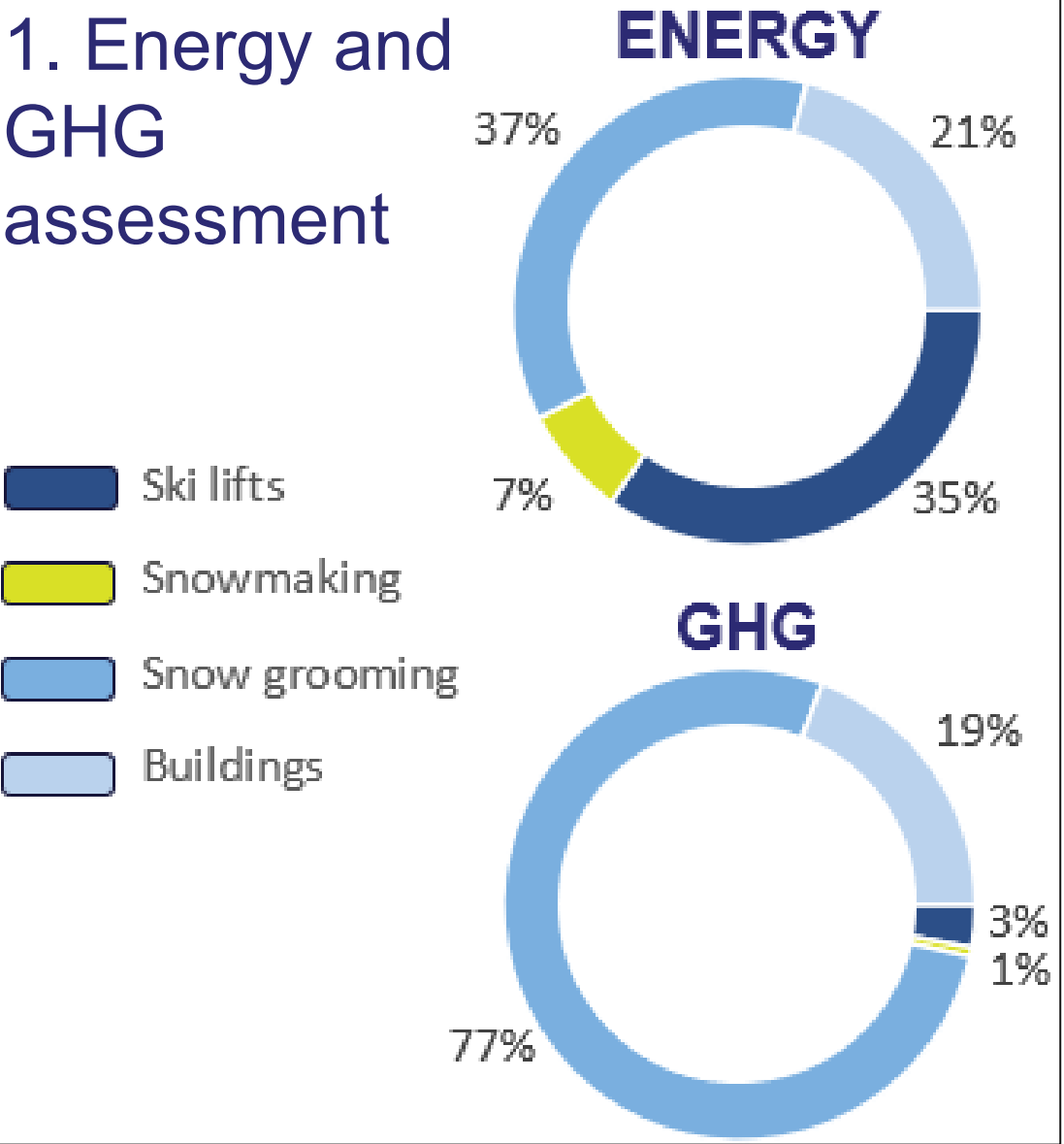




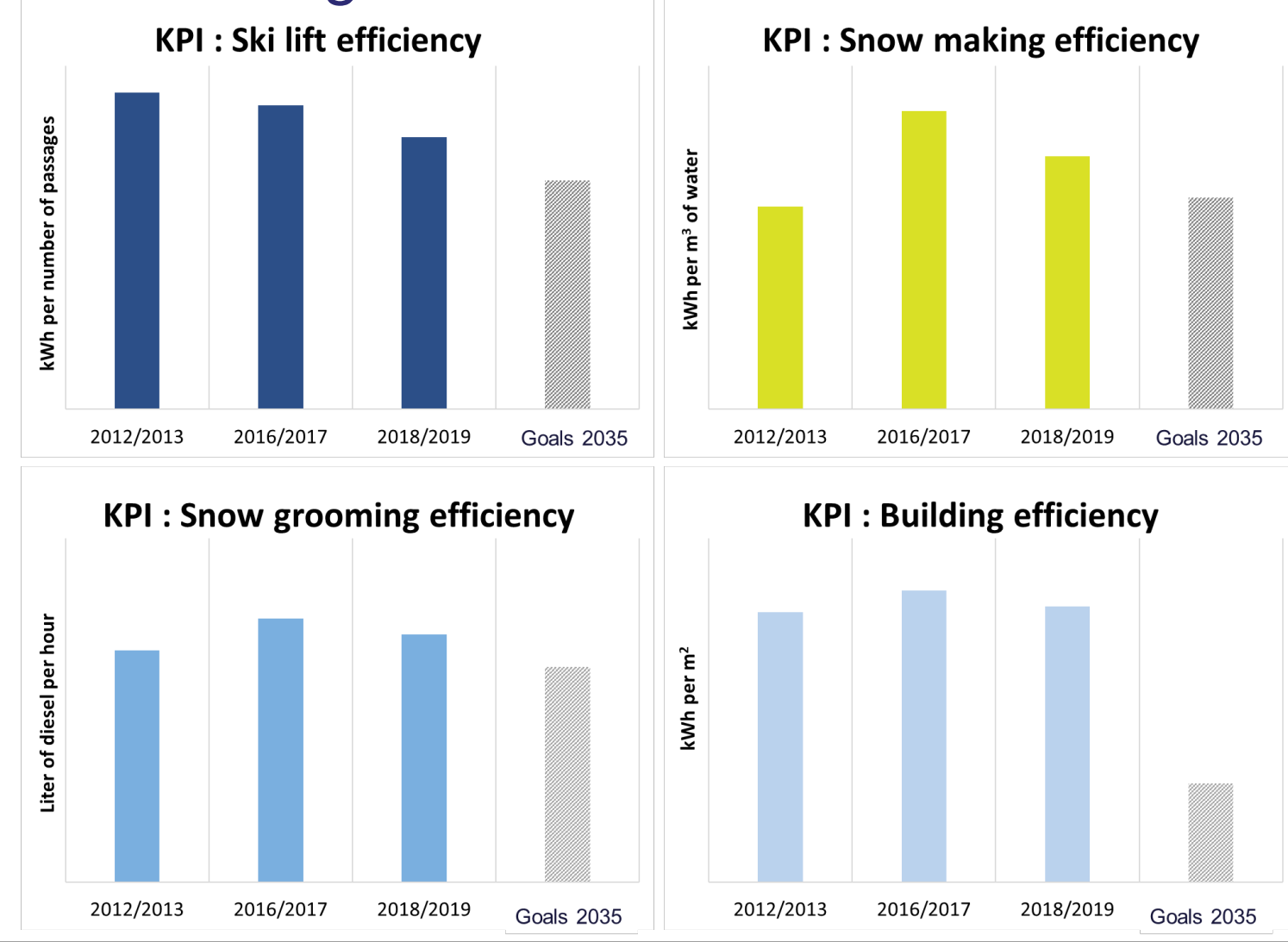


# FROM ASSESSMENT TO ACTION PLAN

## 1. Energy and GHG assessment



## 2. KPI and goals



## 3. Action plan



Ski lifts  
Action plan



Snow making  
Action plan



Snow grooming  
Action plan

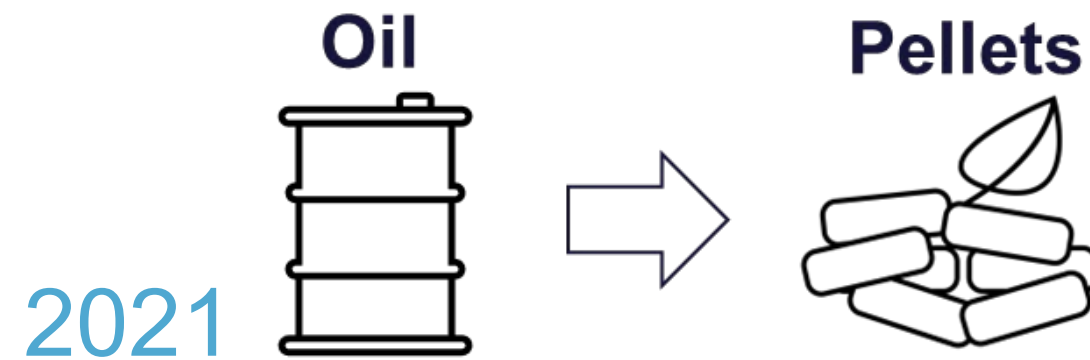


Building  
Action plan

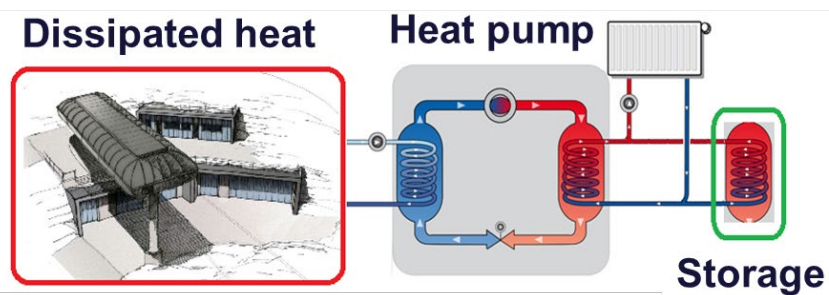


# FROM ACTION PLAN TO IMPLEMENTATION

Going fossil free



2013



Energy concept for Bruson ski lift's building

2014



OBSERV, Téléverbier's energy monitoring platform

For more info

<https://smartaltitude.eu/tools/implement/verbier-living-lab/>

<https://www.klik.ch/actualites/publications/le-domaine-skiable-de-verbier-passe-du-mazout-au-bois>

<https://www.televerbier.ch/fr/televerbier/entreprise.html>

Energy concept for multifonction building



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# THANK YOU FOR YOUR ATTENTION

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# LIVING LAB LES ORRES

Building a Smart Grid model

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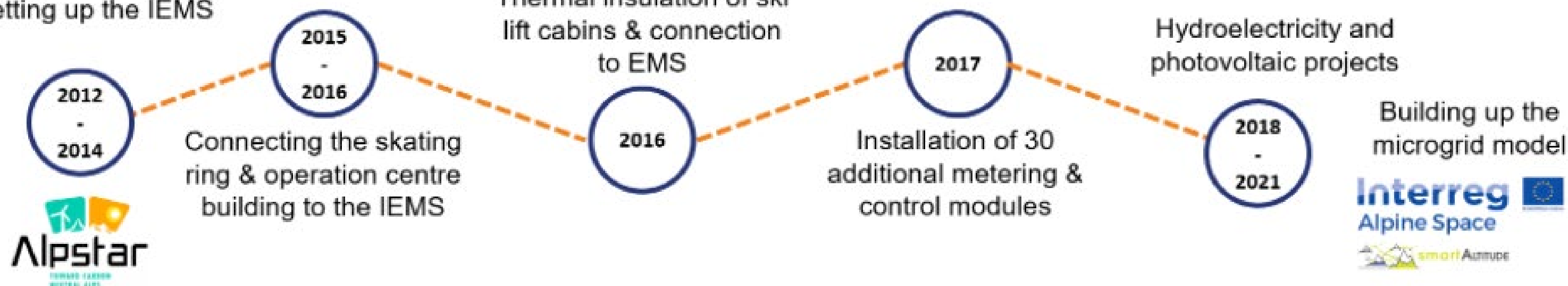
An environmental and business strategy coupling technology and management... based on a digitally operated management

A real time monitoring and control allowing:

- To reduce anergy consumption
- To eliminate energy waste
- To reduce GHG emissions
- To reduce energy costs



Auditing the ski domain  
Setting up the IEMS



### ➡ Savings

**20%**

Energy consumption  
(electricity + fuel)

**25%**

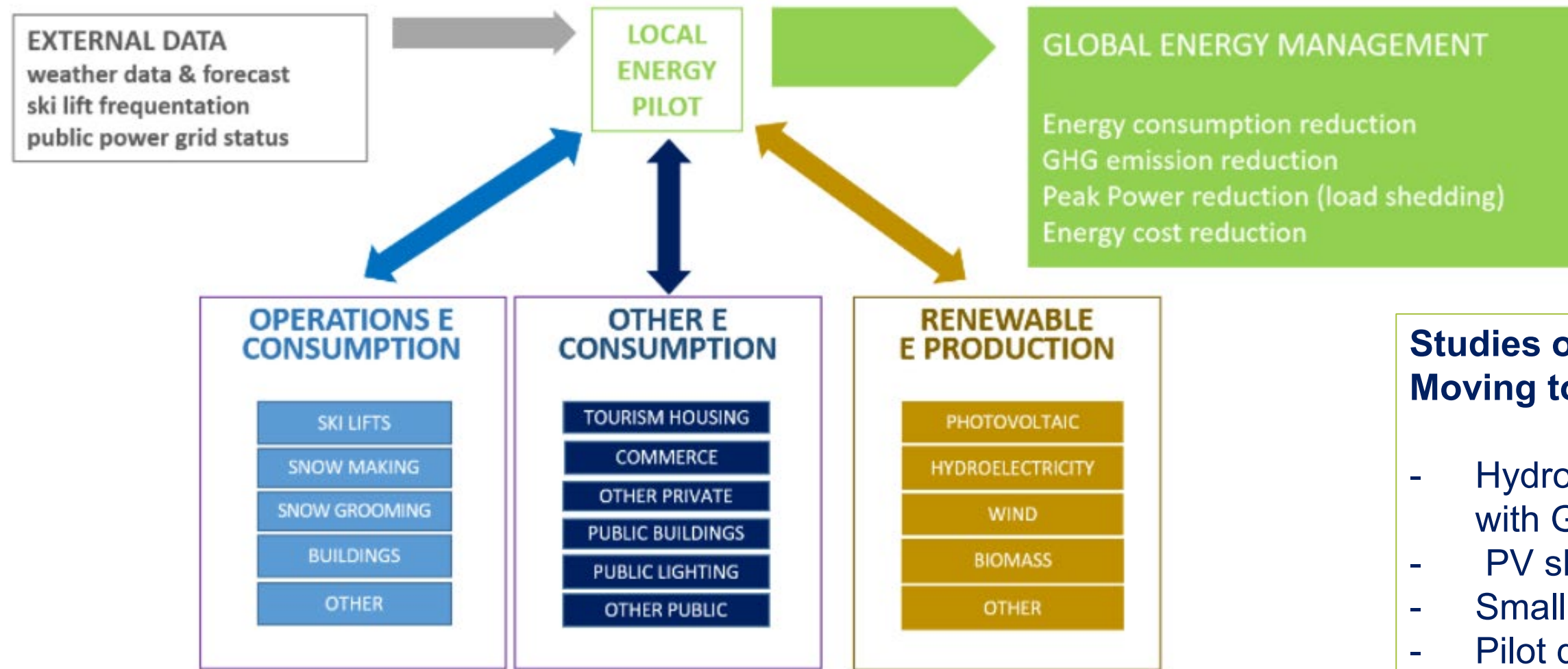
Energy cost

**100t** CO<sub>2</sub>eq/year

**=7%**

GHG Emissions

## FROM INTEGRATED ENERGY MANAGEMENT SYSTEM TO SMARTGRID



### Studies on renewable energy production projects: Moving toward territorial energy autonomy

- Hydroelectricity (23 GWh/year total production capacity with GEG & SyMEnergie05)
- PV shading system (380 kWp, 450 MWh/year)
- Small hydroelectricity study with EDF/Hydrostadium
- Pilot deployment of bifacial PV panels with CEA-Tech & Total Quadran

### Main achievements during the Smart Altitude Project

- Improving the EMS (user interface, programming capacity, new data integration (frequentation – skidata, weather data))
- Additional measurements endpoints (ERC, Tourism office, Administrative building)
- Disconnecting energy transformers by autonomizing automata and data collection systems
- Tourism accommodation monitoring with EDF/Vesta System (UCPA building)
- Public lighting monitoring platform
- LoRaWAN deployment for multiple data type supervision (water, air quality, others)



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# MERCI POUR VOTRE ATTENTION

Pierre Vollaire, Mayor of Les Orres

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