Climate services in the operation & maintenance of skiing facilities

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CLIMATE SPRINT: ACCELERATING CLIMATE SOLUTIONS
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JOANNEUM RESEARCH LIFE

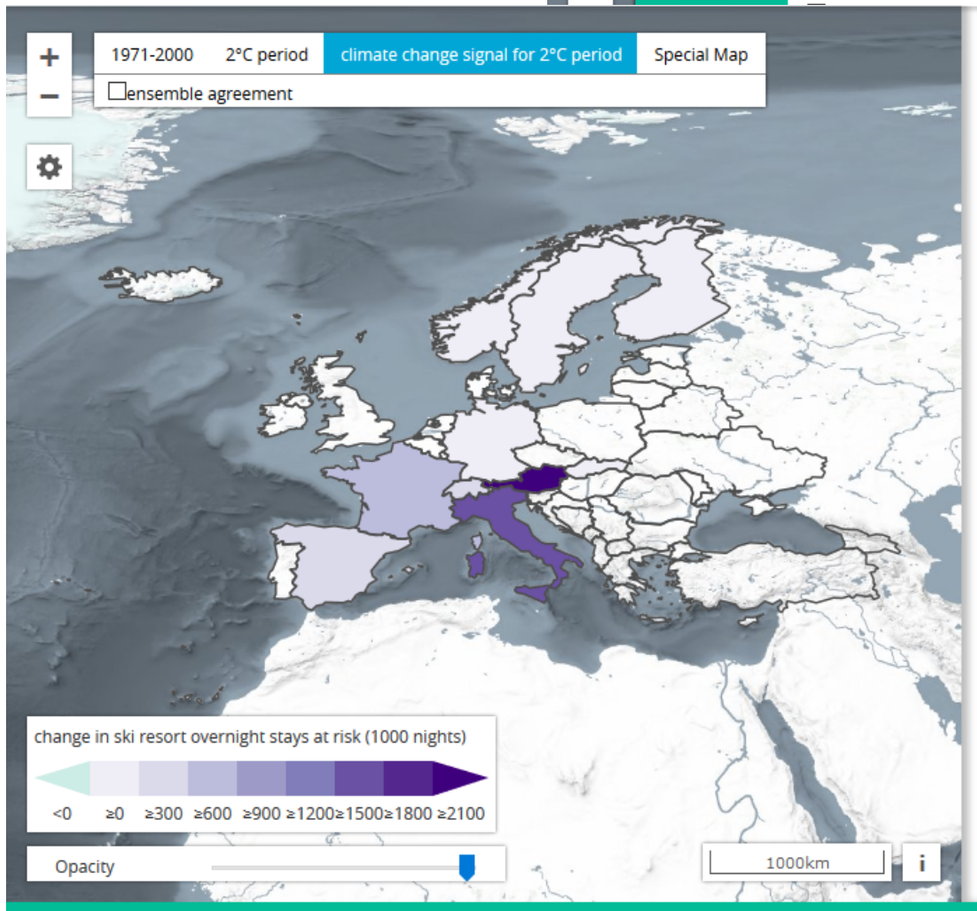
Why weather and climate services for ski resorts?

	Challenges for ski resorts	Decision support
SHORT-RUN	■ Temperature, relative humidity – **snowmaking conditions** ■ Snowfall – **snowmaking & grooming requirements**	■ **Snow management** Snowmaking & grooming
SHORT-RUN	■ Sunshine hours, precipitation, temperature, wind – **skiing demand** ■ Wind – **lift operations**	■ **Daily skiing operations** Planning of staff, deployment of goods and warehousing (e.g. in restaurants)
LONG-RUN	■ Decrease in natural snowfall & snowmaking potentials ■ Shorter ski seasons & decrease in skiing demand	■ **Strategic planning** Investment decisions, business strategies

A Typology of Climate Services

	Generic	Customised
Focused	**Maps & Apps:** • Generic climate services • For all users • Freely or cheaply available	**Expert Analysis:** • Mono- or multidisciplinary climate services • Tailored to specific decision-making situations • Offered commercially
Integrated	**Sharing Practices:** • Mutual climate- and climate policy services • Among knowledgeable peers • Freely or cheaply available	**Climate-inclusive Consulting:** • Interdisciplinary management, engineering, or policy services including climate data • Tailored to specific decision-making situations • Offered commercially

IMPACT2C Atlas



1971-2000 2°C period climate change signal for 2°C period climate change signal for 3°C period

Winter Tourism Demand

Key messages:

- **Overall, under a +2°C global warming up to 10 million overnight stays are at risk**
- **Austria and Italy are most affected**
- **+3°C global warming increases the risk of losses in overnight stays for additional 1.7 million nights**

Why is the content of this map important?

The tourism sector plays an important role in many economies all over the world. Tourism is one of the most weather-sensitive sectors. The maps allow a comparison of the impacts of +2°C global warming on winter tourism demand in Europe.

Which sectors are affected by this result?

Tourism covers several industries, mainly accommodation and food services. Transportation, entertainment and recreation, and retail trade are also going to be affected with the tourism sector.

What is shown on the maps?

The maps show the accumulated weather-induced risk of losses in winter overnight stays (Weather-Value at Risk 95%) in Europe's ski-tourism-related regions. This result is shown for both the reference period and the +2°C period (2036-2065, RCP4.5). The special map shows the difference in Weather-Value at Risk (95%) between +2°C and +3°C global warming.

Details and further information:

Weather-VaR (95%) represents the weather-induced loss which will not be exceeded with a probability of 95% within the considered time horizon, i.e. the weather-induced loss that has to be expected once in 20 winter seasons.

Additional information:

overview (for this story) | more topics (for this story) | more stories

Snow Season Length

…e snow season length is projected to be

…altitudes, may lose the whole snow season
…show one to two months less snow cover

…nt?

…days with snow. Snow season length is an …ities. Changes in snow cover also pose a …cle and fresh water availability.

…lt?

…n having enough snow to maintain the slopes for …s already relatively short, which means that the …conditions to keep resorts open. Additionally, the …e affected.

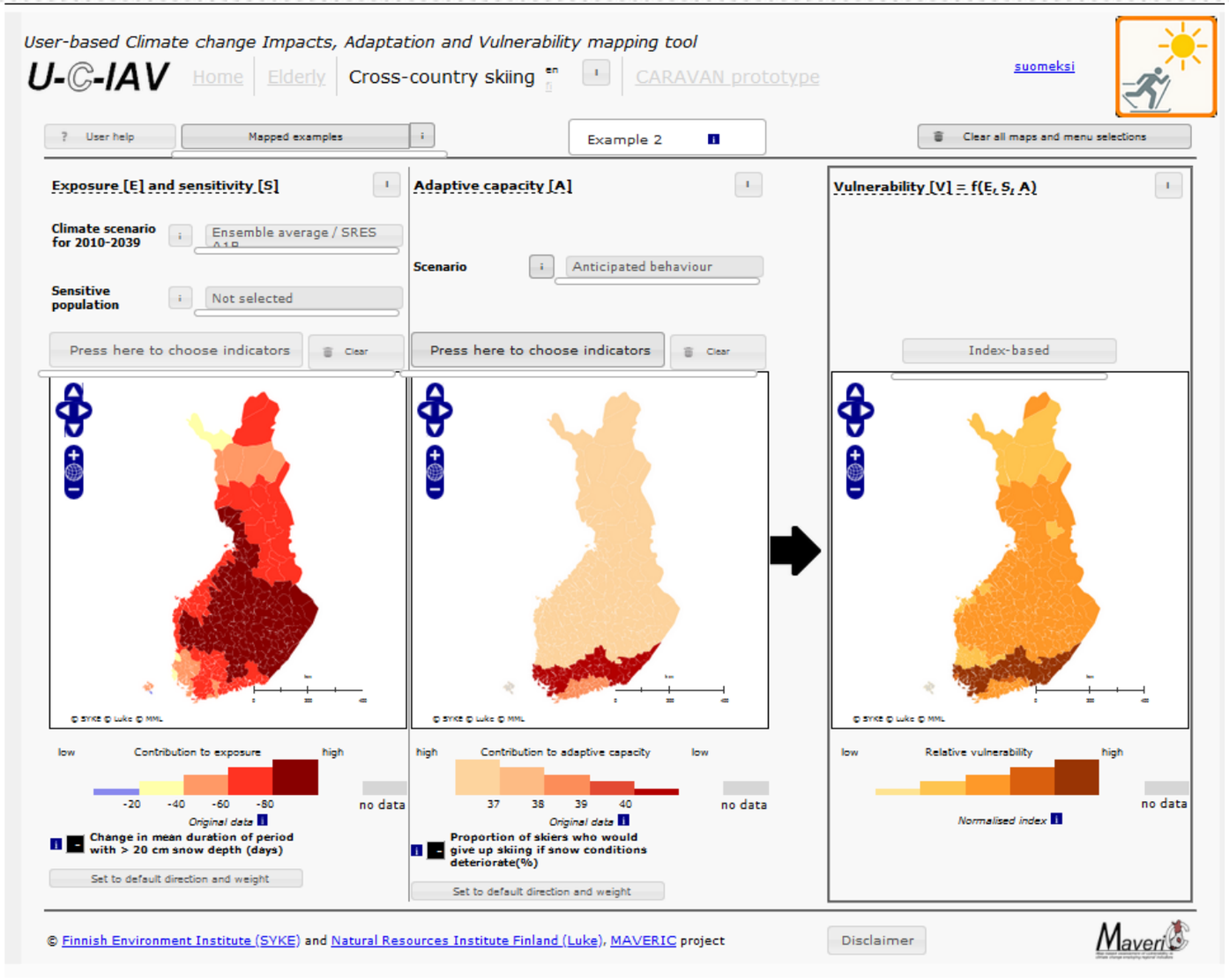
…ar with more than 30 cm snow pack (120 mm …1-2000 reference period and the +2°C global …e climate change signal, the relative change of the …C and +3°C global warming periods. For example, a …eriod is projected to have 40% less days with more …areas are going to lose a considerable part of the …s different at different altitudes. Lowland areas are …now days disappear, but even the highest Alpine

more stories

https://www.atlas.impact2c.eu/

U-C-IAV:

User-based Climate change Impacts, Adaptation and Vulnerability mapping tool



http://www.iav-mapping.net/U-C-IAV/skiing/

WEDDA®:
Forecasting and monitoring system for (recreation) businesses

FORECASTING

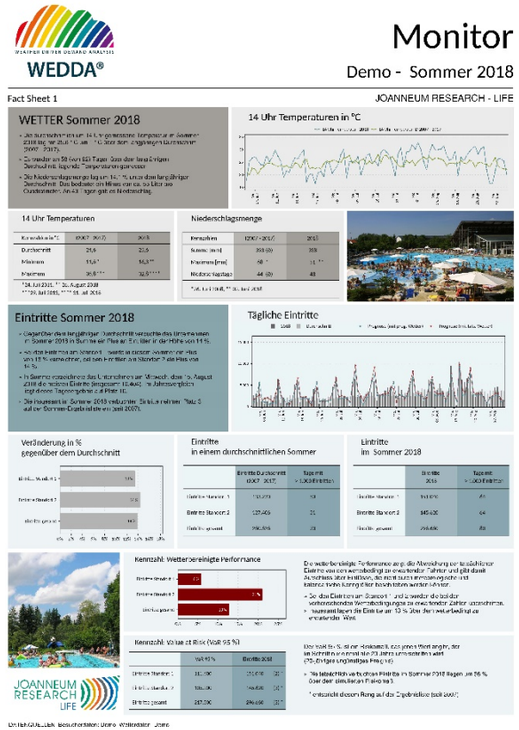
10-day forecasts of weather-dependent company figures updated daily

MONITORING

Monthly or seasonal statistics, incl. weather-adjusted performance indicators

RISK EVALUATION

Quantification of company-specific weather and climate risks



https://www.wedda.at/

Assessment of investment options for an Austrian ski area in the light of CC

Background

- **Small, family-oriented ski area**
  (eastern Alps, 860-1260m, 16ha, 2 drag & 1 double-chair lift)
- **Pending investment decisions**
  (outdated parts of snowmaking & lift infrastructure)
- **High climate risk awareness of owners**
  (local authority)

Needs

- **Are investment options likely to pay off despite CC?**
  1. Optimizing snowmaking infrastructure
  2. Extending lift infrastructure
  3. Allowing for all-year-around usage (bike park)

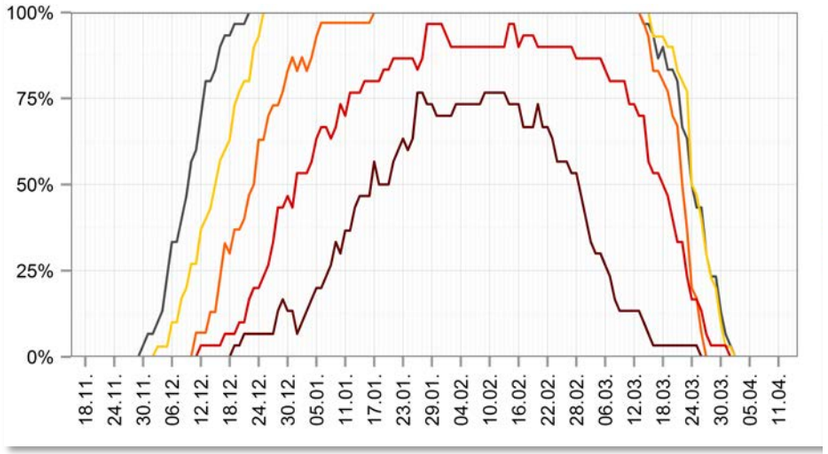
Climate Service

- **2 reports & 2 workshops**
  1. Ski area's importance for regional economy
  2. Ski area's risks towards CC
  3. Opportunities & challenges of a bike park
  4. Economic feasibility of investment options (incl. outcomes 1.-3.)

Assessment of investment options for an Austrian ski area in the light of CC

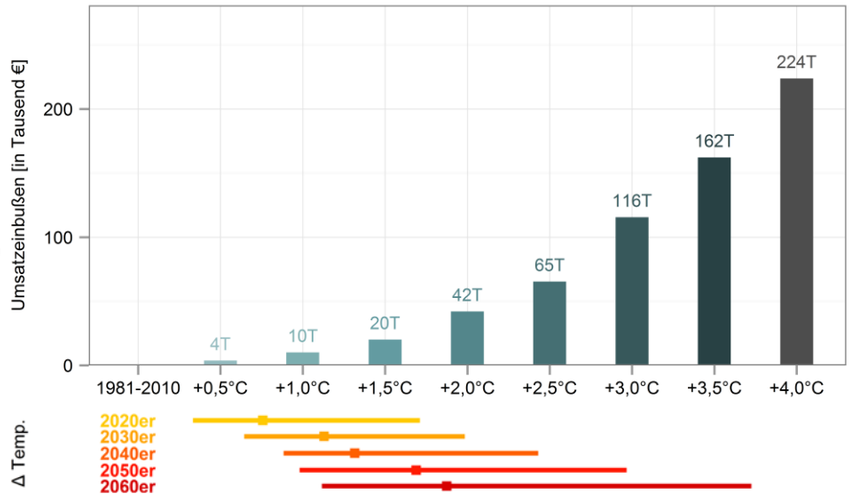
SNOW SIMULATIONS

Fig.: *Probability of skiing operations (snow depth min. 30 cm)*



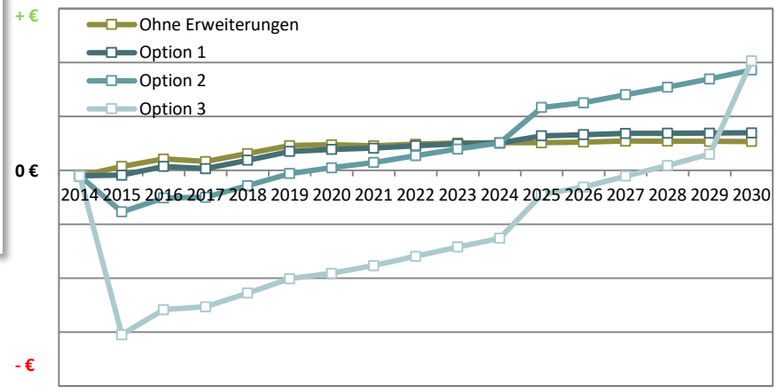
SIMULATION OF REVENUES

Fig.: *Average loss of revenues per season due to shorter ski seasons*



ASSESSMENT OF INVESTMENT OPTIONS

Fig.: *P&L for different investment options (incl. CC effects)*



EMERGING

PROSNOW®
Prediction system for snow management in ski areas

WHAT?

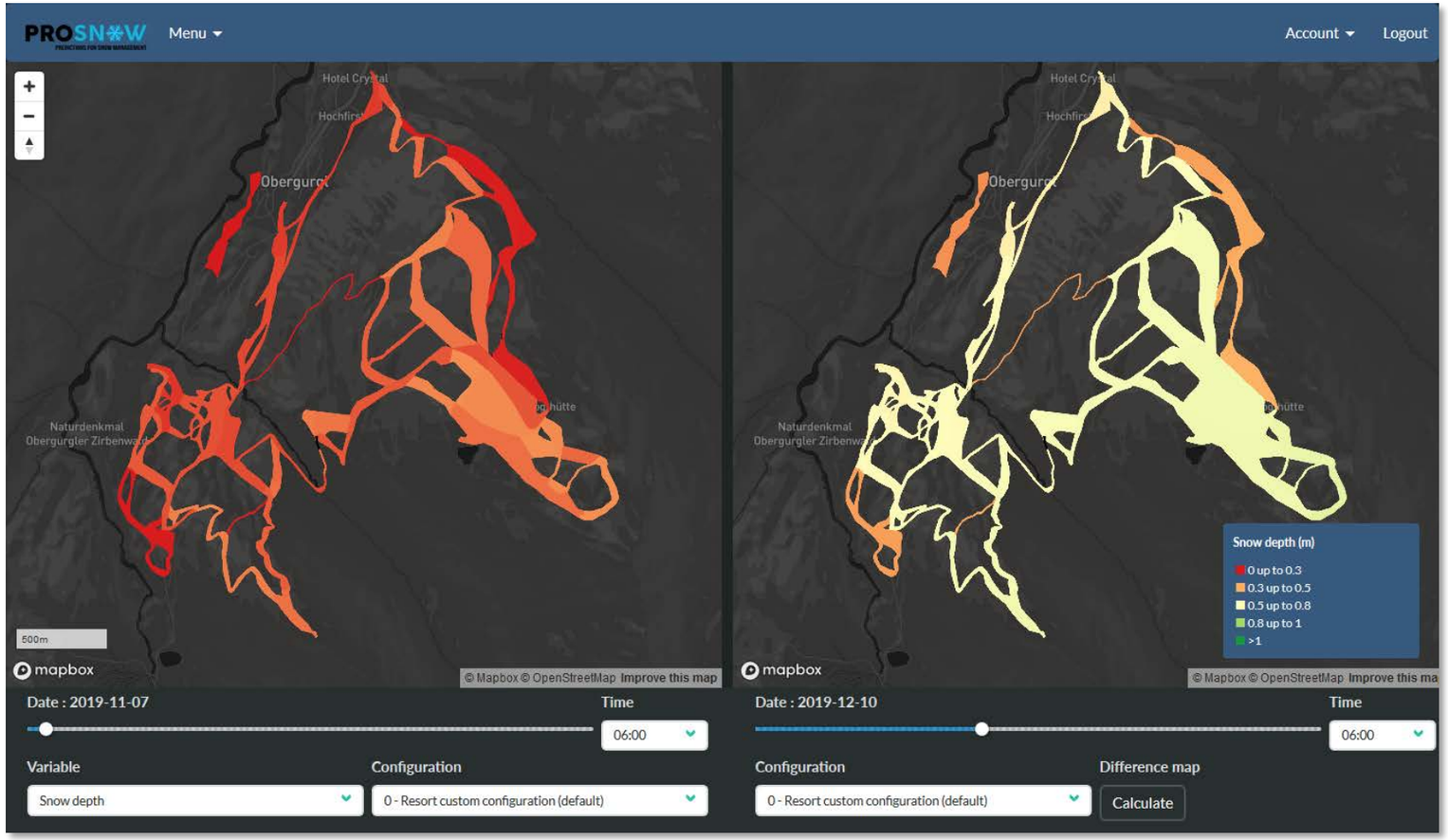
Prediction of snowpack evolutions on slopes (from days to several months)

PURPOSE?

Support decisions in snow management (snow-making, grooming, etc.)

AIM?

Reduce operating costs & environmental impacts



https://www.prosnow.org/

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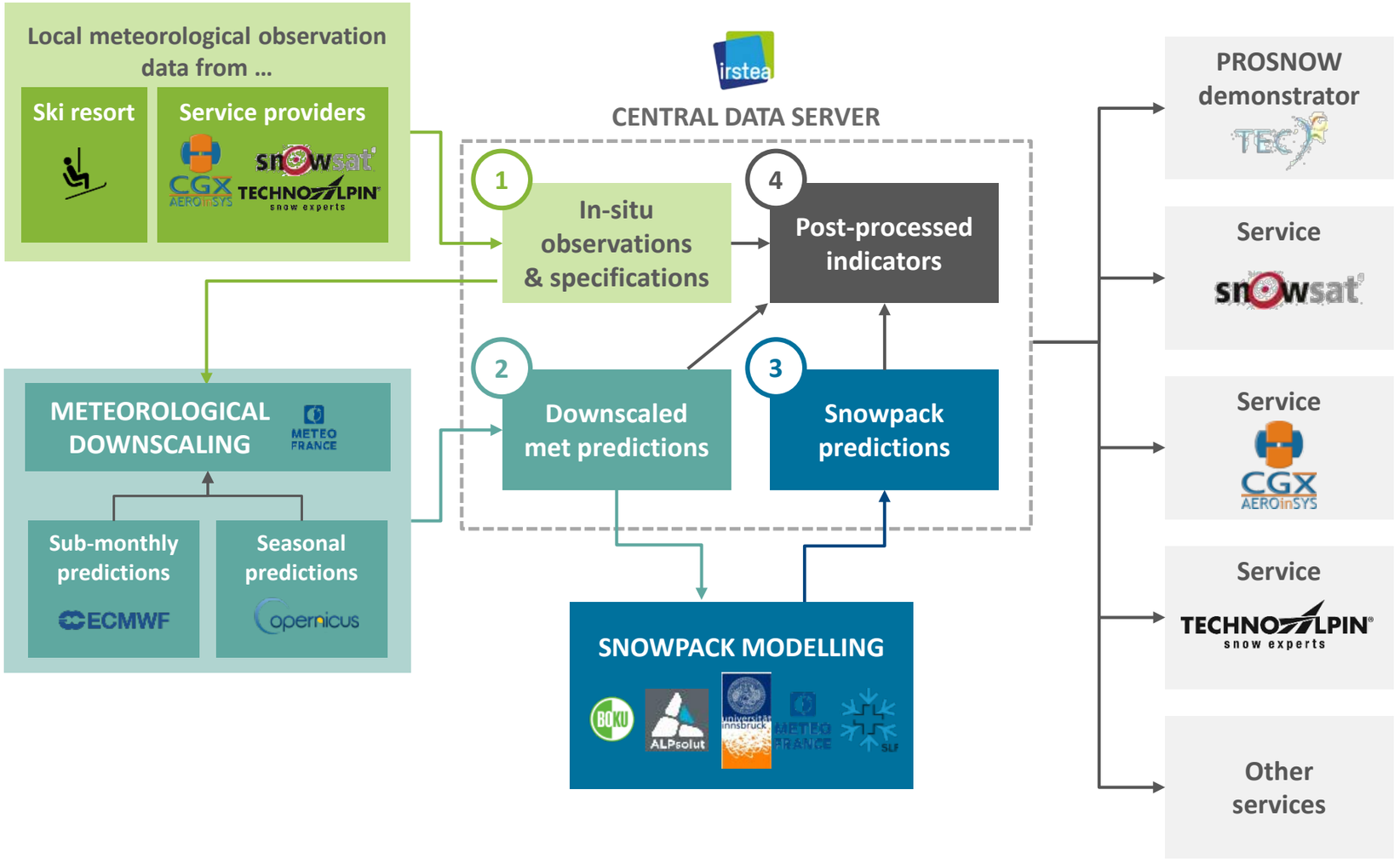

[1]
Use of in-situ data from ski resorts

[2]
Downscaling of meteorological & seasonal forecasts

[3]
Snowpack simulation with and without snowmaking

[4]
Provision of post-processed information to service providers in ski resorts

Key Messages –
Conclusions from CS market research studies

Current use	■ Good practice examples, but no widespread use of CS ■ The use of weather services (forecasts) quite common
User needs	■ Customized services – high spatial resolution ■ Simple & compact – easily understandable ■ Improved weather and seasonal forecasts
Uptake	■ More emphasis on product development & design, sales & marketing, consulting ■ Increased integration of climate information into tools & services already in use

Thanks for your attention!

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