
WP T4 Replication and Knowledge Transfer

Activity A.T 4.1 Recommendations for low carbon winter tourism regions

National recommendations consolidated report

Project acronym:	Smart Altitude
Project name:	Alpine winter tourism territories demonstrating an integrated framework for a low-carbon, high-impact and resilient future
Programme priority:	Priority 2 - Low Carbon Alpine Space
Programme specific objective:	SO2.1 - Establish transnationally integrated low carbon policy instruments

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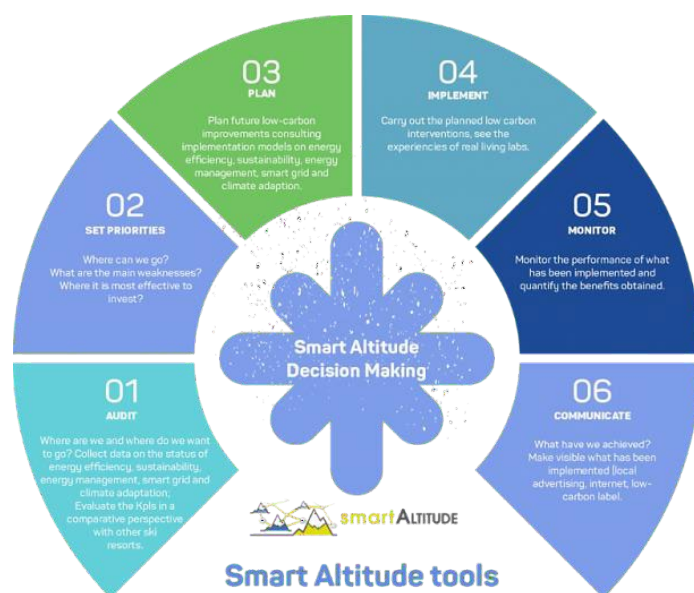
1. Global presentation

Introduction

Smart Altitude is an Interreg funded project that presents an integrated framework for a low carbon and resilient future in Alpine winter tourism regions.

The project developed a decision support toolkit providing a step-by-step approach to the energy transition of ski resorts, tested in four Living Labs across France, Italy, Slovenia and Switzerland and now used in 22 other ski resorts, called Smart Altitude replicators. Smart Altitude ended in May 2021, leaving available:

- A Web-based GIS application¹ development on energy infrastructure, uses and renewable potential.
- The online Toolkit² and a platform supporting ski resorts willing to adopt its approach.
- A series of implementation models³ providing guidance and examples for mitigation and adaptation in ski areas.
- A replication roadmap⁴.
- A network of low-carbon winter tourism regions⁵ committed to support the transition towards sustainable and resilient winter tourism destinations across the Alpine Space.



Throughout the project, numerous consultations were held with the observers and the local, regional and national authorities of the partners. These included the bi-annual project seminars held in Les Orres (France), Madonna di Campiglio and Ponte di Legno (Italy), Krvavec (Slovenia), as well as videoconferences organised by Innsbruck (Austria) and Verbier (Switzerland). Several other events need also to be taken into considerations, in particular the two "Intelligent Mountain of Tomorrow" OCOVA forums of 2019 and 2020, which brought together 200 participants at regional, national and European level with sessions dedicated to policies and actions in favour of the sustainable development and ecological transition of mountain territories and resorts. Also to be noted is the Smart

Altitude closing event on the sustainable and economically performing mountain resorts of tomorrow which gathered more than 1000 participants with a very important contribution of representatives from all Alpine Space Regions⁶. Finally, during the last part of the project, 18 individual interviews were conducted with local, regional, national and European decision-makers in the Alpine space. All these exchanges and consultations have enabled the project partners to draw up a set of recommendations for their respective regions and nations. These approaches were complemented by the work of the consultants commissioned to prepare the deliverables, who conducted 18 individual interviews at regional, national and European level.

The current report is the aggregation of seven papers on national recommendations that have been produced during the course of the Smart Altitude project, one per nation constituting the Alpine Space. It aims to give indications on which actions have been conducted in each territory, review the characteristics of each

¹ <http://webgis.smartaltitude.eu/>

² <https://smartaltitude.eu/>

³ <https://www.alpine-space.eu/projects/smart-altitude/results/wpt3/d.t3.2.1.pdf>

⁴ https://www.alpine-space.eu/projects/smart-altitude/results/wpt4/smart-altitude_d4-2-1-replication-roadmap.pdf

⁵ <https://www.alpine-space.eu/projects/smart-altitude/en/project-results/replication-and-knowledge-transfer/wpt4-description>

⁶ <https://www.ocova.eu>

territory's approach of the energy transition in areas of highly intensive winter tourism, evaluate possible improvements, and provide useful recommendations.

Smart Altitude Living Labs

Four ski resorts in four countries implemented several solutions to reduce energy and water consumption or increase integrated monitoring and management across their operations:

- ▶ **Krvavec (SI)** implemented a multi-energy reduction approach for the snow-making processes and hotel building, achieving a 30% water reduction and a 30% electrical power reduction for snow making and 20% less heating oil/gas consumption in the hotel. Krvavec's detailed report⁷ is available on the Smart Altitude website.
- ▶ **Verbier (CH)** worked across four different fields of intervention, including ski lifts, snow making, snow grooming and buildings, in order to reduce energy consumption and emissions. Results show an 8% decrease in fuel used for snow grooming and an average of 10% reduction of energy from the regulation of lifts speeds. Verbier's detailed report⁸ is available on the Smart Altitude website.
- ▶ **Madonna di Campiglio (IT)** installed an Integrated Energy Management System (EMS), monitoring and integrating data coming from ten different sources, including snow production, grooming, electric grid, operational buildings, weather forecasting, reservoir for snow production and ski infrastructures. Madonna di Campiglio's detailed report⁹ is available on the Smart Altitude website.
- ▶ **Le Orres (FR)** worked towards an integrated mountain smart grid, by including renewable energy production in the existing EMS, monitoring and controlling tourism housing energy consumption, setting up supervision systems for public buildings and infrastructures. Les Orres' detailed report¹⁰ is available on the Smart Altitude website.

2. Common operational recommendations

Based on Smart Altitude experience, for accelerating the transition towards sustainable and resilient winter tourism regions, partners highlight the need for:

- ▶ Financial levers at all levels (EU/country/Region) to facilitate investment by mountain resorts in efficient structural equipment for the ecological transition;
- ▶ Regulatory levers to remove barriers to deployment, e.g. with regard to the deployment of local energy communities, in particular concerning economic models for peer-to-peer energy exchanges;
- ▶ Development of a common policy promoting low carbon mobility at all levels of mountain territories: conurbations/stations, valley/stations, intra-stations, etc;
- ▶ Effective support for the creation of a network of mountain resorts and territories committed to ecological transition and the generation of models for the sustainable and high-performance mountain of tomorrow;
- ▶ Promoting a sustainability culture, training and opportunities for investments in sustainability. Partners and replicators in the project highlight the need to invest in a culture of transition that embraces all sectors and stakeholders, in operational training and financing of sustainable initiatives and programs. Best practices exist across ski resorts, but are often implemented in isolation, when resources arise and often not sufficiently communicated to the public and tourists. The introduction of renewable energy sources, GPS systems for monitoring snow grooming, reforestation of slope margins, integrated monitoring systems and more efficient technologies are only some examples of measures that are more and more implemented by ski resorts, but these are not often carried out in

⁷ https://www.alpine-space.eu/projects/smart-altitude/results/wpt2/rtc_krvavec_report.pdf

⁸ <https://www.alpine-space.eu/projects/smart-altitude/results/wpt2/d.t2.4.1-crem-verbier.pdf>

⁹ https://www.alpine-space.eu/projects/smart-altitude/results/wpt2/2021_04_06_d.t2.2.1-living-lab-madonna-di-campiglio.pdf

¹⁰ <https://www.alpine-space.eu/projects/smart-altitude/results/wpt2/smart-altitude-d.t2.3.1---smart-mountain-grid-v3.pdf>

a systematic way due to lack of political and economic support, especially in more marginal winter tourism areas. Creating a culture of sustainability across users, operators and investors is much needed to enhance both the demand and the support for sustainable and resilient winter tourism areas;

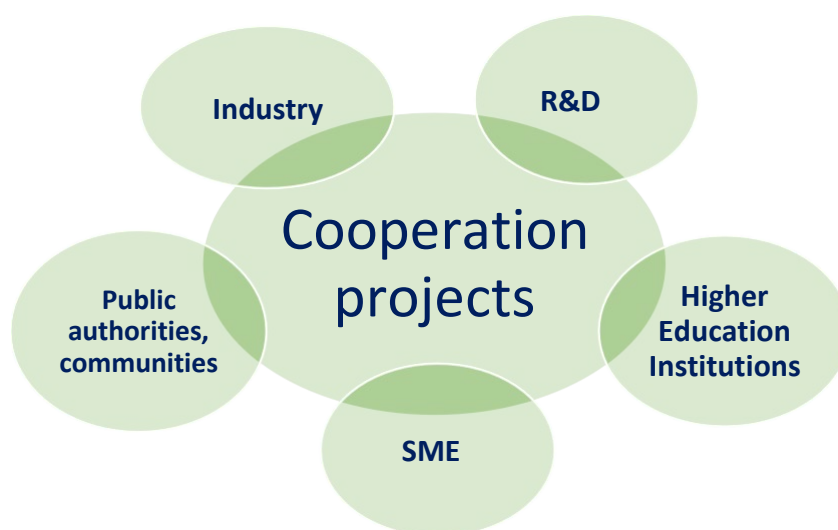
- ▶ Some measures, such as energy audit, monitoring and Integrated Energy Management Systems, have already short return of investment, due to the high energy costs of ski resorts, and thus represent a priority to consider in ski areas.

3. Common Economic recommendations

On the economic side, Smart Altitude partners highlight the need for a comprehensive and coordinated set of economic instruments directed at the sustainable transition of winter tourism areas, as support currently exist but is very fragmented and sometimes not specifically targeted at mountain regions. Specific interventions could include:

- ▶ Specific national and regional funding such as tax return to the owners of tourism housing when they engage into actions to reduce energy consumption;
- ▶ Co-financing of investments and/or financial incentives for ski resorts to develop renewable energy, smart mobility, and energy consumption reduction systems such as IEMs, microgrid, etc;
- ▶ Specific national/regional initiatives to foster the ecological transition in mountain territories;
- ▶ Cross sector /cross technology initiatives to facilitate the emergence of Smart Territories, not just smart cities, where advanced digital technologies combined with ecotechnologies serve territorial management, the development of services to people, territorial attractiveness and environmental efficiency.

Besides incentives and financial supporting mechanism, the diversification of business and revenue models should be a priority for winter tourism regions. Again, a culture of sustainability should be promoted and funded at all dimensions (economic, environmental and social), and among all stakeholders and sectors engaged in the economic development of winter tourism regions: due to the increasing impacts of climate change, winter tourism areas can no longer depend solely on the ski industry, so while this sector must be decarbonized as much as possible, the entire economic resilience of these territories in all seasons should be carefully planned and supported in a long term vision.



Cross-sectoral cooperation approach

4. Smart Altitude Living labs' REX

Krvavec

Contact Information	SLOVENIAN LIVING LAB: KRVAVEC SKI AREA Project Partners: Rekreatijsko turistični center Krvavec, d.d., BSC Kranj Contact: jelena.vidovic@bsc-kranj.si
Aim	Implementing a multi-energy consumption reduction approach on snow-making processes and hotel building, to become an environmentally friendly ski resort supporting a low-carbon and sustainable local economy.
Key Actions	Krvavec tackled two main challenges: <ul style="list-style-type: none"> ✓ The Hotel energy consumption through the installation of energy efficiency solutions such as thermostatic valves, mobile monitoring applications, SELTRON WDC20 system for the boiler room to control temperature and water flow in relation to the outside temperature, GWD communication module and Clausius application for hotel management and maintenance staff. ✓ Snowmaking: installation of ATASSplus software to efficiently manage data and snow production (temperature, humidity, wind, snow depth, snow gun condition, water flow).
Results	Resort hotel: 20% lower heating oil/gas consumption and higher comfort of the guests; Snowmaking: 30% less water needed to cover the slopes with technical snow, 40% less working hours and safe management, 30% electrical power reduction, optimal snow depth on the slopes and less snow groomers hours.
Stakeholders	Mainly ski infrastructure operator, ski resort manager, energy company/utility. Other SHs include: municipality, business support organisation, public and private service providers, research institute, residents, SMEs, tourism promotion organisations, funding bodies, regional and national authorities, tourists.

Madonna di Campiglio

Contact Information	ITALIAN LIVING LAB: MADONNA DI CAMPIGLIO Project Partners: Trentino Sviluppo, Fondazione Bruno Kessler (FBK) Contact: viesi@fbk.eu
Aim	Achieve zero CO2 emission by 2026, the year of the XXV Winter Olympic Games hosted by Italy and move towards an Integrated Energy Management System, improving energy efficiency, optimizing the use of water, integrating renewable energy sources.
Key Actions	The IEMS monitors and integrates data coming from ten different sources, and main actions are:

	<ul style="list-style-type: none"> ✓ Monitoring meteorological conditions, photovoltaic potential, snow thickness, skier data, electricity consumption, number of entrances of ski lifts, Lake Montagnoli hi-tech sensors and floating buoys; ✓ Snow production and grooming; ✓ Use of electric grid; ✓ Operational buildings: electricity consumption for heating two snow groomer warehouses. <p>These technical actions are also followed by several communication activities that have been developed: web page, posters, videos, brochures, TV recordings.</p>
Results	Implementation of the IEMS described above
Stakeholders	Ski infrastructure operator, research institute, business support organisation, SMEs. Other SHs are: Ski resort manager, municipality, regional and national authority, energy company, public and private service providers, tourism promotion organisations, funding bodies, tourists..

Les Orres

Contact Information	<p>FRENCH LIVING LAB: LES ORRES SKI RESORT & MUNICIPALITY</p> <p>Project Partners: Les Orres, EDF</p> <p>Contact: yann@ybsolution.com</p>
Aim	<p>Become a self-sufficient mountain area based on a smart grid model integrating major sources of energy consumption and local renewable energy production, creating a network among public and private power grid operators, the tourism sector and citizens.</p>
Key Actions	<p>Les Orres has implemented a full diagnostic of the ski operations energy consumption and an integrated energy management system (IEMS) in 2012-2014, at the occasion of the ALPSTAR Alpine Space Project. In 2014, measures showed that the system had resulted in a 20% reduction of energy consumption, 100 t_{eq}CO₂ reduction of GHG emissions, and 25% reduction of the energy costs. With the Smart Altitude, Les Orres worked on several directions towards a mountain smart grid :</p> <ol style="list-style-type: none"> 1) The capacity of Les Orres EMS has been expanded by several means: <ul style="list-style-type: none"> ✓ Enhancing the ability of the EMS to interpret the snowmaking data that the system has been collecting since 2018, but which was not used by the EMS until now; ✓ Implementation of the calculation of the energy performance indexes by ski lifts (KWH per transported customer). This requires the completion of the installation of metering for each lift (ski and chairlift); ✓ Implementation of the calculation of energy performance indices per heated building and ice rinks: electricity consumption for heating two snow groomer warehouses. 2) In the field of energy consumption reduction of the ski resort operations (Semlore), the improvements made are: making the data collection systems of the electrical transformers autonomous by adding photovoltaic systems so that these transformers can be disconnected from the grid during off-season periods. This limits iron losses and saves several MWh of annual consumption 3) In the field of tourism housing: implementing an energy consumption piloting system for a pilot tourism housing building (UCPA). The energy gains expected are of 20% minimum and will be measured in coming years. 4) In the field of Public lighting and services: Implementation of a public lighting control system coupled with the switch to LED lighting. The expected energy gain from the switch to LEDs is 30%. The additional gain expected from the control system is 20%. These construction figures will be checked in the course of 2021; Implementation of a pilot control system of public building energy and air quality control. 5) In the field of smart grid implementation: study by the partner EDF on the integration of all the elements mentioned above in a global smart grid vision with regard to the integration of consumption (operations, housing, utilities) and production (hydro, solar) components. The conclusions are the following: the energy balance shows that the renewable production would theoretically cover

	the electrical consumption on average over a year (92%) but cannot cover the power needs in real time without any energy management system.
Results	The results of these actions in terms of additional gains on energy consumption and GHG reduction will be measured in the years to come.
Stakeholders	Ski infrastructure operator, municipality, local, regional and national authority, energy and infrastructure management companies, mountain sports and mountain resort promotion national organizations, public and private service providers, tourism promotion organisations, business support organisation, research institutes and innovation clusters, funding bodies, tourists, permanent residents.

Verbier

Contact Information	SWISS LIVING LAB: LES ORRES SKI RESORT & MUNICIPALITY Project Partners: CREM Contact: xavier.tabin@crem.ch
Aim	Téléverbier, the operator of Verbier ski resort, supported by CREM, worked to achieve a performing and sustainable ski resort, based on energy efficiency, low-carbon economy, renewable energy and GHG emissions reduction, towards the ISO 50001 certification and the European Energy Award GOLD for Val de Bagnes municipality.
Key Actions	The action plan identifies four fields of intervention: <ul style="list-style-type: none"> ✓ Ski lifts: speed variator, speed function passage, low consumption energy engine; ✓ Snow making: low energy consumption-snow cannon and pumping stations; ✓ Snow grooming: radar, engine optimisation, hybrid technology; ✓ Buildings: replacement of fossil fuel heating, insulation and window replacement, room temperature regulation, valorisation of heat release from ski lift engines.
Results	95% reduction in GHG emissions from a large consumer building on the ski resort, by replacing its oil-fired boiler with a pellet system and specific actions to reduce energy consumption. Estimated 8% of decrease in the consumption of fuel used by the snow grooming machines and a 10% reduction of energy from the regulation of lifts speeds, depending on the crowd.
Stakeholders	Mainly ski infrastructure operator, ski resort manager, energy company, regional and national authority, funding bodies. Other stakeholders are: municipality, business support org., public and private service providers, research institute, residents, SMEs, tourism promotion organisations, tourists.

5. Country-specific or additional recommendations given per partners

FRANCE	<p>1) Policy framework & governance recommendations</p> <p>Several efforts towards a low carbon and resilient mountain areas exist and should be in regular dialogue:</p> <ul style="list-style-type: none"> ✓ At the EU/Alpine Space level the EUSALP working groups and initiatives, the Smart Altitude Network of Stakeholders; ✓ At a cross regional / European /international level: the OCOVA annual forum, the French Alps commission and its initiatives and policy, the Alpine Convention (taking into account the Climate Action Plan 2.0 – Pathway to Climate Neutral and Climate Resilient Alps); ✓ At the regional level, working groups of the smart grid initiative, which facilitate the emergence of innovation projects in the environmental field, even if not specifically focused on mountain areas. <p>These dialogues dynamics could be completed by:</p> <ul style="list-style-type: none"> ✓ Ensuring a better coherence of the regulation and incentive systems between the different public policies which can contradict each other and create difficulties for local implementation (e.g., incentive for the development of renewable energy and corresponding infrastructures VS rigidity of the regulations concerning landscape protection); ✓ Ensuring that the specific characteristics of mountain territories are taken into account in the national digital strategy. In particular, the rapid access to optical fibre and mobile networks (4G, 5G) are prerequisite for the optimal deployment of energy management tools. <p>2) Operational recommendations</p> <p>Based on Smart Altitude experience in Les Orres, French partners highlight the need for:</p> <ul style="list-style-type: none"> ✓ Financial levers at all levels (EU/country/Region) to facilitate investment by mountain resorts in efficient structural equipment for the ecological transition; ✓ Regulatory levers to remove barriers to deployment, e.g. with regard to the deployment of local energy communities, in particular concerning economic models for peer-to-peer energy exchanges; ✓ Development of a common policy promoting low carbon mobility at all levels of mountain territories: conurbations/stations, valley/stations, intra-stations, etc; ✓ Effective support for the creation of a network of mountain resorts and territories committed to ecological transition and the generation of models for the sustainable and high-performance mountain of tomorrow; ✓ Definition, in all planification tools at national (National energy and climate plan, Programmmations pluriannuelles de l'énergie, Stratégie nationale bas-carbone et budgets carbone) and regional levels (Schémas régionaux traitant du climat, de l'air et de l'énergie) mountains-territories specific objectives of reduction of greenhouse gases to articulate clearly local, regional, national and European objectives. <p>These would complete and enhance the several good practices already available to support the low carbon transition of winter tourism areas, such as the Energy innovation clusters at Regional level, world-class R&D canter dedicated to energy and ecological transition (INES/CEA-Liten/CEA-Tech in Auvergne-Rhône-Alpes & Provence, Alpes, INRAE; etc), national committees (commissariats de massif) in charge of the development policy of mountain spaces, professional and public organizations involved in mountain sustainable development (DSF - Domaine Skiable de France; ANEM - Association des élus de la montagne; ANMSM - Association des Maires de Stations de Montagne), as well as laws</p>
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	<p>(mountain law) and regulations developed by inter-ministerial initiatives in consultation with professional and land organisations.</p> <p>3) Economic recommendations</p> <p>On the economic side, French partners highlights the need for:</p> <ul style="list-style-type: none"> ✓ Specific national and regional funding such as tax return to the owners of tourism housing condominiums when they engage into actions to reduce energy consumption; ✓ Investment co-financing and/or financial incentives directed to ski resorts to develop renewable energy, smart mobility, and energy consumption reduction systems such as IEMs, microgrid, etc. This could in particular consist in the reinforcement of specific economic support tools that are longer term than subsidies for resorts committed to the energy transition (e.g. investment by public banks in the capital of local resort operating companies conditional on achieving energy performance objectives over time). As an example, the Caisse des Dépôts owns 20% of local exploitation company of Les Orres; ✓ Specific national/regional initiatives to foster the ecological transition in mountain territories; ✓ Cross sector /cross technology initiatives to facilitate the emergence of Smart Territories, not just smart cities, where advanced digital technologies, combined with ecotechnologies, are at the service of territorial management, the development of services to people, territorial attractiveness and environmental efficiency. <p>A comprehensive and coordinated set of economic instruments is needed for the sustainable transition of winter tourism areas, as at the moment support exists but is very fragmented. Examples include regional agencies in charge of applying the Smart Specialization Strategies and deploying them within the territories: for instance, in Provence Alpes Côte d'Azur, you may find the Air, Climate and Environment agency, the Flexgrid initiative conducted by Capenergies, the deployment of the public EV charging network, the digital agency in charge of deploying digital infrastructure (fibre optic, 4G, etc.).</p> <p>It would be advisable to use the current window of opportunity offered by the simultaneous preparations of plans at different levels on touristic and energy transition in the Alps and the political cycle at regional level (upcoming elections in 2021) to articulate the different support (financial and non-financial) instruments to come (European programming period 2021 2027 and notably Alpine space program, the “plan d’investissement pour le tourisme de montagne” and “programme d’appui pour les territoires de montagne” of the “Agence nationale de la cohésion des territoires” at national level, “plan montagne” of the Région Rhone Alpes, “contrat stations” of the Région Sud). This would allow both targeted investments with a limited risk of overlap and the necessary expertise providing to resorts to launch the transformation dynamics.</p>
GERMANY	<p>1) Policy framework & governance recommendations</p> <p>Several efforts towards a governance for low carbon and resilient mountain areas exist, these should be joint by creating alliances and cooperation structures, examples include:</p> <ul style="list-style-type: none"> ✓ National policies/plan that are not specific for mountain territories but in which mountain territories are included, such as the National Sustainability Strategy of the Federal Government, Climate Action Plan 2050, German Resource Efficiency Program.
ITALY	<p>1) Policy framework & governance recommendations</p> <p>Several efforts towards a governance for low carbon and resilient mountain areas exist, these should be joint by creating alliances and cooperation structures, examples include:</p> <ul style="list-style-type: none"> ✓ National policies/plan that are not specific for mountain territories but in which mountain territories are included, such as the PNIEC – 2030 National Energy and Climate Plan issued by the Ministry of Ecological Transition.

SWITZERLAND	<p>1) Policy framework & governance recommendations</p> <p>Several efforts towards a governance for low carbon and resilient mountain areas exist, these should be joint by creating alliances and cooperation structures, examples include:</p> <ul style="list-style-type: none"> ✓ Cross regional / European /international level initiatives such as the project “Adapt Mont-Blanc”, the project PITER PARCOURS “Parcours I-tinérants autour du Mont-Blanc”, the Alpine Convention (taking into account the Climate Action Plan 2.0 – Pathway to Climate Neutral and Climate Resilient Alps); ✓ At the cantonal/regional level associations and working groups (such as “Aide Suisse à la Montagne”, “Groupement Suisse pour les régions de montagnes” (SAB), and « Fondation pour le développement durable des régions de montagnes”). <p>2) Operational recommendations</p> <p>Based on Smart Altitude experience, for accelerating the transition towards sustainable and resilient winter tourism regions, partners highlight the need for:</p> <ul style="list-style-type: none"> ✓ Definition, in all planification tools at Federal (Swiss Federal 2050 Energy Strategy; 2050 Climate Neutral Switzerland; AggloPol - Politique des agglomérations; PERM – Politique pour les espaces ruraux et les régions de montagne) and Cantonal level (NPR – Nouvelle Politique Régionale), of mountains-territories’ specific objectives able to reduce greenhouse gases’ emissions and to capitalise sustainable actions and or projects already implemented at the local, regional, national and European level.
Stakeholders	<p>Mainly ski infrastructure operator, ski resort manager, energy company/utility. Other SHs include: municipality, business support organisation, public and private service providers, research institute, residents, SMEs, tourism promotion organisations, funding bodies, regional and national authorities, tourists.</p>

6. Conclusion

Throughout the project, numerous consultations were held with the observers and the local, regional and national authorities of the partners. These included the bi-annual project seminars held in Les Orres (France), Madonna di Campiglio and Ponte di Legno (Italy), Krvavec (Slovenia), as well as videoconferences organised by Innsbrück (Austria) and Verbier (Switzerland). We will also take into account the 2 "Intelligent Mountain of Tomorrow" OCOVA forums of 2019 and 2020, which brought together 200 participants at regional, national and European level with sessions dedicated to policies and actions in favor of the sustainable development and ecological transition of mountain territories and resorts. The final event, for its part, gathered more than 1000 participants with a very important contribution of representatives from all Alpine Space Regions on the same themes (see access to the video recordings on the homepage of this website and on www.ocova.eu). Finally, during the last part of the project, 18 individual interviews were conducted with local, regional, national and European decision-makers in the Alpine space.

All these exchanges and consultations have enabled the project partners to draw up a set of recommendations for their respective regions and nations. The high interest and level of participation at the final event confirmed that both outputs of the project have been reached, with high potential for continuation. For instance, Smart Altitude has been included as an application and REX field for AlpGov2’s Mainstreaming replication process, and project partners have entered discussions to apply for a new project raising deeper and wider objectives for conducting the ecological transition in high-tourism mountain areas.