



# WSL Evaluation 2022

Report by the Peer Review Panel



Swiss Federal Institute for Forest, Snow  
and Landscape Research WSL

WSL Institute for Snow and Avalanche Research SLF



# Report of WSL Evaluation, Nov. 29 – Dec. 2, 2022

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## Executive Summary

The Review Committee recognizes that WSL conducts excellent research in its five core thematic areas (snow and ice, natural hazards, biodiversity, landscape, forest), and its research on snow is world leading. The institute is an independent, application-oriented research entity that addresses important environmental challenges for Switzerland from high pressure on the natural environment – including climate and land-use change – and the resultant needs to manage risks and lands sustainably. Based on this research there are strong stakeholder collaborations, transfer and outreach activities towards society, private actors and public authorities in Switzerland, and other institutions in the ETH domain. While WSL has a high profile for excellence internationally, there are opportunities for even greater scientific visibility and societal impact. The Review Committee acknowledges that there is productive exchange and a good equilibrium between high-quality research, transfer and outreach at WSL. The Institute presents an exemplar of how the highest standards can be met in both research and service to society.

The excellent performance of WSL calls for proactive steps to maintain this high standard, as well as to respond to societal and environmental changes that challenge Europe and beyond. The principle recommendations given by the Review Committee are to:

- Contribute further to theory and concept development across and within WSL Research Groups and disciplines.
- Promote further transition from multidisciplinary to transdisciplinary research through more formalized engagement of stakeholders in every step of the research process and by putting even more emphasis on the analysis of success factors and hindrances of societal change, and on the development of solutions. This transition will require a stronger emphasis on social sciences.
- Further work toward systemic landscape and risk management approaches by addressing certain gaps, notably with respect to water-related issues, agro-ecosystems and settlement patterns as integral parts of landscapes.
- Maintain the outstanding long-term monitoring programs and experiments and to expand them to include human behavior, social perceptions and human well-being.

WSL has an opportunity to employ its application-oriented research approach to more deeply consider transformational and sustainability issues regarding societal adaptation to climate change, biodiversity loss and urban population pressures. In order to increase societal impact and to support societal transformations in Switzerland, even more emphasis could be given to transfer and transformation, and to communication with influential decision makers. This should be a target of all research units at WSL. Impact could be further strengthened by involvement of a broader array of social science expertise within WSL to gain a better understanding of human-nature interactions. The upcoming retirement of several lead scientists offers a window-of-opportunity for this adjustment toward even greater societal impact. This re-orientation can be achieved by renewing and revisiting the current portfolio of research activities in light of social and environmental transformations, working closely with stakeholders, and furthering cooperation with other research institutions.

A reconstituted, independent international Scientific Advisory Board should play a major role in mapping opportunities for maintaining and further elevating the stature of WSL. The Review Committee also recommends establishment of a formal Stakeholder Advisory Panel, meeting regularly with the WSL Directorate, in order to extend contacts beyond individual researchers and to support the transdisciplinary approach.

## 1 Introduction

The institutions of the ETH Domain are evaluated regularly in an 8-year cycle. The WSL was last evaluated in 2013. The on-site visit of the Review Committee took place from Nov. 29 to Dec. 2, 2022, involving the following experts:

Volker Mosbrugger (Chair)	Germany	Senckenberg Gesellschaft für Naturforschung, Polytechnische Gesellschaft
Wolfgang Cramer	France	Institut Méditerranéen de Biodiversité et d'Écologie Marine et Continentale, CNRS
Lena Gustafsson	Sweden	Department of Ecology, Swedish University of Agricultural Sciences
Bernd Hansjürgens	Germany	UFZ Helmholtz Center for Environmental Research
Ueli Meier	Switzerland	Amt für Wald beider Basel
Joan Nassauer	USA	School for Environment & Sustainability, University of Michigan
John Pomeroy	Canada	Department of Geography & Planning, University of Saskatchewan
Julienne Stroeve	UK/Canada	University College London & Centre for Earth Observations Sciences, University of Manitoba

As a basis for the review process, the Review Committee had at its disposal the Self-Assessment Reports (SAR) volume 1 and 2 as well as various presentations, posters and discussions during the three-day on-site visit in Birmensdorf and Davos. The WSL Directorate and staff had prepared the review process professionally and supported it very openly and constructively. All supplementary information requested by the Review Committee was provided promptly.

The Terms of Reference (ToR) for the review process provided by the Directorate and the ETH Board are reproduced in SAR vol. 1 on page 8 and 9 and are summarized as follows:

*“The ToRs take into account WSL’s main fields of activity: excellent research, knowledge transfer and application in practice, and outreach to society and politics. According to the provisions for evaluations within the ETH Domain, the ToRs include a set of five overarching questions on WSL’s: (1) relevance, (2) quality, (3) productivity, (4) dynamics, and (5) opportunities. In addition, they comprise a set of nine specific questions in the following five categories: (1) institutional level, (2) strategic focus, (3) long-term research and monitoring, (4) education, and (5) stakeholder involvement and role in society.”*

Additional information about the ETH Domain, the review process and the ToR was provided to the Review Committee by the President of the ETH Board on the eve of the first day of the on-site review.

Based on this information, the Review Committee decided to organize its report according to the structure of the ToR to make sure that all questions of the ToR (see Appendix) are addressed. This implies that some redundancies may occur.

## 2 Overarching Topics

### 2.1 Relevance

Overall, the WSL is an excellent research institution covering multidisciplinary research, knowledge transfer, outreach and teaching, focusing on significant parts of the terrestrial environment in Switzerland.

Its direction and role as an independent institute is especially timely and important in the current era of climate and biodiversity crisis. Among its strengths are:

- The research, transfer, outreach and teaching of WSL have high relevance to science and (Switzerland's) society in a situation with accelerating changes in climate and land-use, with marked associated impacts on natural resources, biodiversity, human health and well-being.
- WSL's snow, snow hydrology and avalanche research is extremely relevant nationally and renowned globally.
- There are clear linkages between research and national/cantonal priorities in environmental policy, including forest protection, snow and avalanche risk management, biodiversity and ecological adaptations, energy transformations, planning and land use for human well-being.
- WSL conducts unparalleled long-term research within Switzerland. The large number of high-value, long-term data-sets, experiments and monitoring programs are invaluable for research and applications in current times of rapid global change and constitute a globally significant long-term monitoring program.
- WSL has built up a large research and stakeholder network in Switzerland on all levels, which is of fundamental importance to transdisciplinary opportunities, knowledge transfer and outreach activities. Thus, WSL is a strong example of how excellent research can be linked to relevant applications.

Overall, the Review Committee considers the research, transfer and outreach activities of WSL to be excellent and well-balanced.

*Recommendations:*

1. The Review Committee recommends that WSL accelerates and promotes the transition from multidisciplinary to transdisciplinary research by expanding its research focus to more directly include developing transformative solutions for society. This would allow a greater emphasis on transformative, integrated sustainability science, notably related to economic change, governance and risk management of forests, biodiversity, water, snow and landscapes. This development would help WSL strengthen its influence and impact in science and society. More specific suggestions in this context are:
  - a) Since integrated landscape management will become increasingly essential in the future, cooperation with Agroscope and Eawag (and other institutions) should be made more coherent. One possible cross-cutting theme could integrate the landscape components that WSL has emphasized most: forests, snow and alpine environments with agricultural land, water and settlement patterns. A perspective could be a comprehensive view (shared across institutions) of landscapes, involving mountains, forests, croplands and pastures, water bodies, and settlement patterns including urban and peri-urban spaces, possibly using a cumulative effects approach on basin-level assessments and further emphasizing human interactions with the environment.
  - b) Similarly, the role of landscape composition and properties for human well-being necessitates WSL to continue their efforts to fully integrate societal dimensions such as landscape perception, health, and quality of life. Studies of human preferences, landscape perception and behavioral change could be more fully integrated with study of biodiversity, forest structure, snow and alpine environments as well as the effects of human action on those environments.
  - c) The successful long-term monitoring programs and experiments need to be maintained, and equally well managed in the future. The Review Committee recommends that long-term monitoring of human behavior, social perceptions and human well-being be considered as

spatially integrated elements of an expanded long-term monitoring effort (see recommendation section “Long-term Research and Monitoring”).

2. Despite much research on climate change impacts on various sectors, WSL needs to develop a coherent view on issues related to adaptation to and mitigation of climate change for all its Research Groups, Units and Programs, including interactions with settlement patterns and mountain water resources, flooding and drought impacts of climate change.

## **2.2 Quality and Productivity**

The overall research quality and productivity at WSL is excellent, although with some variability across the Research Units. The Review Committee especially notes WSL’s high international and national visibility in the fields of “snow” and “forests”. It appreciates that many WSL staff members do an impressive job in teaching and knowledge transfer activities resulting in high stakeholder satisfaction. This is made possible by the many individual contacts of WSL researchers and stakeholders, many of which have been established for a long time. The outreach activities have a high quality in traditional formats (events, books, policy briefs, working groups, advisory groups, committees, etc.).

### *Recommendations:*

1. WSL’s outreach activities are dynamic, and efforts are made to more fully employ new, changing ways to communicate with the public. Further efforts are needed to engage in mainstream and popular means of communication, and to diversify them depending on type of stakeholder and target group, including youth. To support key policy-makers and more effectively reach current stakeholders, short web-summaries of studies, conveying the most important conclusions, would be helpful. There is ample potential to employ popular social media to reach an even larger share of the public.
2. The Review Committee recommends developing a more regular stakeholder management platform in order to promote coordination, synergies, make stakeholder contacts extend beyond individual researchers, and assess “lessons learned” (see section “Stakeholder Involvement and Role in Society”). This might take the form of a Stakeholder Advisory Panel that meets regularly with the Directorate (see recommendations section “Stakeholder Involvement and Role in Society”).

## **2.3 Dynamics**

The Research Groups, administered by Research Units, are the fundamental intellectual and operational units of WSL. Since bottom-up thinking and action appears to be supported and promoted by the Directorate, Research Groups represent a key-element of WSL’s dynamics. An important structure fostering collaboration across Research Groups is the Programs, which are particularly successful if they receive support by external funding (e.g. BGB). The Review Committee appreciates that in some cases new directions of research and infrastructure are initiated bottom-up (e.g. the DROUGHT-CH initiative, eDNAlab). To promote the agility of WSL’s research, the Directorate announces calls for support of particularly relevant research, for which collaborators from different Research Groups can apply. The Review Committee supports this approach and encourages continuation of such internal calls. The Research Centers as joint ventures between WSL and other institutions or stakeholders represent another successful structure and draw on members of different Research Units, further ensuring multi-disciplinary collaborations and permitting transdisciplinarity. PhD students and post-doctoral fellows, typically co-supervised with university faculty, and often pursuing new directions related to WSL expertise, are essential to the intellectual dynamics of WSL.

### *Recommendations:*

1. The Review Committee encourages the Directorate to include ambitious strategic and transformational thinking and concepts when steering the implementation of the next WSL strategic plan (see section “Strategic Focus”). The Review Committee appreciates that innovative ideas can be developed in bottom-up processes, including stakeholder involvement, which iteratively evolve in conversation with the Directorate, and ultimately may lead to the Directorate’s top-down support through seed money for programs and technical equipment.
2. To strengthen the strategic component and the link of WSL’s activities to global concepts and discussions concerning sustainability, transdisciplinary and landscape research, the Review Committee recommends that WSL reconstitutes its Scientific Advisory Board in order to more actively support the Directorate and staff in shaping WSL’s future and elevating its international prominence.
3. To further promote collaboration within WSL and to allow identification of immediately achievable research synergies, new formats of interactions (e.g. regular retreats involving all Research Units and staff from all WSL locations) may prove useful. Easily accessible workspaces/meeting places to complement the existing regular informal conversations in the cafeteria may further strengthen internal cooperation.

## **2.4 Opportunities**

Overall, the WSL Directorate and its scientists appear to respond appropriately to new scientific challenges. Considering the necessity to mitigate and adapt to the complex (global) environmental crisis, the Review Committee sees the following opportunities (partly already addressed under section “Relevance”) that should now be pursued further in a well-structured strategic process:

- Transformation/transformational research needs to be addressed within a transdisciplinary approach: this is a task for all WSL Units. It could be fostered by an expansion of the types and availability of social science disciplines to be engaged in conception, conduct, and implementation of transformational research.
- The challenges of sustainability (i.e. harmonizing people, planet, prosperity) and One Health (human and environment) need to be addressed more systematically. This will also contribute to internal coherence, improve the opportunities for interdisciplinary collaboration among the different WSL units as well as the links to the international discourse.
- As mentioned previously (see recommendations section “Relevance”) linkages to agriculture/Agroscope and water/EAWAG should be reviewed systematically: programs like the Blue-Green Biodiversity, which is based on collaborations with EAWAG, may serve as a blueprint. To achieve this, an integrated landscape-oriented and river basin-scale approach must be more fully and pervasively pursued. This cannot fully be realized if agro-ecosystems or water-related landscape issues – across land use types – are not addressed. Specifically, a gap in mountain groundwater studies is identified in Swiss research – since groundwater connects hydrological processes during low flows from high mountains to populated valleys, this is something that WSL should consider filling.
- WSL scientists should be encouraged to write syntheses/reviews. This could also point to synergies between Research Units as a means to strengthen internal and international cooperation. Such compilations are of particular value to stakeholders since they can reduce uncertainty of major findings compared to individual studies.



- The Review Committee encourages further discussion to develop theoretical frameworks for current and future research projects. This may be especially important for PhD-students and junior scientists, but also essential for more experienced researchers, and a way of strengthening exchange of ideas between various groups.
- WSL considers aspects of climate change, urbanization, water and biodiversity crisis in many of its project and monitoring activities – however a deeper and more coherent approach to the needs of stakeholders for information on adaptation to these trends, as well as to their mitigation should be developed.

A considerable number of the senior scientists at WSL will retire during the next few years. This transition is both a challenge to the continuity of work at WSL and an opportunity to adapt WSL to a changing society, with new research requirements. Here also a well-structured strategic process needs to be implemented where a reconstituted Scientific Advisory Board may be of considerable help.

### **3 Specific Questions**

#### **3.1 Institutional Level**

WSL's organization and management correspond to a multi-layer matrix with bottom-up and top-down elements. It is correspondingly highly complex and difficult for outsiders to understand. The Review Committee found that this works well in practice because of its flexibility and appreciation by those involved.

The infrastructure, as far as visited by the Review Committee, is excellent and appreciated by both scientists and stakeholders. A clear decentralization is noticeable. The possibility to initiate new infrastructures through internal calls for support is an important way to uphold the high standard, exemplified by the upcoming eDNA lab.

WSL's strategies to promote equity, diversity, inclusion, and scientific integrity appear appropriate. Overall, job satisfaction is very high, according to a recent survey.

#### *Recommendations:*

1. Notwithstanding the fact that the organizational and management structure appears to be working well, the Review Committee recommends that consideration be given to how the structure might be adjusted to foster synergies, improve manageability and make WSL more transparent.
2. The Review Committee recommends developing a strategic concept for the further development of the technological infrastructure in order to generate further scientific and economic added value.
3. The Review Committee supports continued internal calls for project support as a way to support further, innovative infrastructure development.

#### **3.2 Strategic Focus**

The WSL included in its assessment initial thoughts about planned future activities (section 8 of SAR vol 1). The Review Committee appreciates these thoughts and sees a particular relevance for the strengthening of future activities oriented toward societal transformations. Such activities already exist in several Research Units (the research on biodiversity-damaging subsidies in Switzerland or on de-growth may be seen as examples). However, when considering the huge challenges of humanity - climate change, urbanization, biodiversity loss and resource scarcity, an even stronger orientation towards co-developing knowledge with society may be necessary. WSL should consider how these issues of socio-environmental

transformation can be taken up across the Institute and what the role of WSL in energizing societal processes could be.

*Recommendations:*

1. The planned future activities presented in SAR vol. 1 are sufficiently specific to provide direction and at the same time sufficiently generic to allow WSL to respond to new developments. To develop a thorough analysis of the research needs of a rapidly changing world and in view of the upcoming retirement of several Research Unit leaders, the Review Committee recommends that a strategic concept be developed early on for filling new positions.
2. A reconstituted Scientific Advisory Board should be an integral part of this process to identify international opportunities, gaps and continuity needs. The Scientific Advisory Board could also help improve follow-up and assessment of the success of the strategic plans. Currently many research projects and groups evolve from the success in acquiring grants of individual researchers, and this success should be considered in assessing and preparing strategic plans.
3. Further recommendations concerning the “Strategic Focus” can be found under the section “Opportunities”.

### **3.3 Long-term Research and Monitoring**

Long-term experiments and the associated infrastructure contribute decisively to WSL's outstanding research. The Review Committee recognizes that these components are of uniquely great value not only as an integral part of WSL research, but also for serving interests of stakeholders and in the international public domain.

*Recommendation:*

- The Review Committee recommends that long-term monitoring of societal perceptions and human well-being be considered as spatially integrated elements of an expanded long-term monitoring effort (see recommendation 1c section “Relevance”).

### **3.4 Education**

WSL is highly engaged in teaching at ETH Zürich, EPFL, and other universities and in the training of Masters and PhD students. The young scientists the Review Committee met at the poster session were all enthusiastic, competent and highly motivated, and they rated their research environment and supervision at the WSL as very good. The senior scientists appear to be free to find their personal balance between research and teaching and to respond to the teaching requirements of the universities. The balance between their science responsibilities and the work load that is associated with teaching, even considering the advantages of getting involved in exchange with other university colleagues, students and PhD candidates, may need consideration.

*Recommendations:*

1. While all research staff indicated that they found teaching rewarding, greater recognition of their important intellectual contributions by the institutions where they are teaching is desirable, for example by awarding more adjunct professorships.
2. Not all PhD students have access to a structured PhD-program at their respective universities. The Review Committee recommends developing a separate, WSL-based PhD program to compensate for this deficiency, if needed, and to incorporate this component in the PhD guidelines developed a few years ago.


### 3.5 Stakeholder Involvement and Role in Society

As noted previously, the Review Committee considers WSL's large, long-established stakeholder network in Switzerland to be one of its great strengths. Currently, user engagement seems to work very well and is proactive and responsive at the project level and also at the Director level when resources are requested so that projects can develop a specific solution. This functionality must be preserved. Since the current stakeholder networks depend on research scientists that are expected to retire during the next few years, the potential loss of institutional memory of stakeholder linkages is a real concern. Further, existing long established networks between researchers and stakeholders may need to adjust to respond to the needs of new stakeholder groups and societal actors.

#### *Recommendation:*

- As mentioned previously, stakeholder engagement should be coordinated and regularized as part of the WSL research process through a formal Stakeholder Advisory Panel that reports to the Director and Directorate and has accountability from the Director for responding to requests for solutions. This may also strengthen policy advice from WSL to governments. Mechanisms need to be implemented to ensure relevance of stakeholder engagement, capturing new stakeholders and actors.

For the Review Committee:



Volker Mosbrugger  
Frankfurt, 2023/02/17

## **4 Appendix**

### **Terms of reference (ToRs)**

#### **I. Overarching questions**

- (1) Relevance: Are WSL's research, knowledge transfer/application, and outreach activities relevant to science, practice and society/policy, and are they overall well balanced?
- (2) Quality: Are WSL's research, knowledge transfer/application, and outreach activities well recognized internationally and nationally?
- (3) Productivity: How substantial are the amount and diversity of WSL's research, knowledge transfer/application, and outreach activities at the national and international levels?
- (4) Dynamics: Is WSL flexible enough to respond to emerging issues of scientific and societal relevance and to pursue promising opportunities? Are WSL's collaborative programs an agile tool to achieve the goals stated in its mission statement?
- (5) Opportunities: Does the Peer Review Committee see emerging topics of scientific or societal relevance in WSL's core research, knowledge transfer/application, and outreach themes that should be added to WSL's portfolio?

#### **II. Specific questions**

##### **Institutional level**

- (a) Do WSL's organizational and management structures best serve the topics and crosscutting issues that need to be addressed to fulfill its mandate?
- (b) Does WSL's physical and digital infrastructure provide the necessary support for research, knowledge transfer/application, and outreach?
- (c) How successful/adequate are WSL's efforts to promote diversity, an inclusive environment, and scientific integrity?

##### **Strategic focus**

- (d) How relevant are the strategic topics and corresponding activities that WSL would like to address in the future? Does the Peer Review Committee identify further key aspects that should be considered?
- (e) Are WSL's collaborations across its research units, with partners in the ETH Domain, and with partners at the cantonal, national and international levels appropriate and well balanced to address its strategic topics?

##### **Long-term research and monitoring**

- (f) Does WSL put its long-term monitoring activities and infrastructure appropriately in value in its research, knowledge transfer/application, and outreach?
- (g) Are the long-term research and monitoring activities well positioned to address current and future challenges?

##### **Education**

- (h) Does WSL adequately contribute its specific knowledge and expertise to teaching activities at universities?

##### **Stakeholder involvement and role in society**

- (i) How balanced, interconnected and adequately responsive to stakeholder needs are WSL's research, knowledge transfer/application, and outreach activities?