

Project Organisation for the Update of the Thematic Roadmaps in 2024

1. Context

1.1. Seven thematic roadmaps

The Swiss Academy of Sciences (SCNAT) published a series of seven thematic roadmaps for research infrastructures written by the scientific communities in biology, chemistry, geosciences, particle physics, astronomy, photon science and neutron science. These **thematic roadmaps** provide a vision by the scientists on the infrastructure needs in 2025–2028 and were released on 31st March 2021, respectively 2022 for astronomy. They are the result of a large consultation of the researchers in different fields that took place in 2019–2020. SCNAT coordinated this process on an official mandate by the State Secretariat for Education, Research and Innovation (SERI).

1.2. Purpose of these roadmaps

These thematic roadmaps were at the beginning (i.e., “Phase 0”) of the process leading to the **Swiss roadmap** for research infrastructures 2023, which is a planning document motivating the budget asked to the Federal Council in the ERI-Dispatch 2025-2028.

For *national* infrastructures, according to the guidelines of the Swiss roadmap for research infrastructures published in April 2021, the thematic roadmaps serve to the identification and selection of potential new infrastructures by swissuniversities and the ETH-Board together with the cantonal universities and institutions in the ETH-Domain (i.e., “Phase 1” in Spring-Summer 2021) and the scientific evaluation of submitted proposals for such new national research infrastructures by the Swiss National Science Foundation (SNSF) (i.e., “Phase 2” in the 1st semester of 2022).

The process towards a Swiss participation in an *international* organisation or infrastructure is different, but the community needs expressed in the thematic roadmaps are essential to motivate SERI to engage into the often-long process towards a full participation of Switzerland. Be it for national or international infrastructures, the thematic roadmaps add an important bottom-up component, expressing the needs of the communities, to the subsequent decision processes.

1.3. Evaluation of their use

The value and importance of the seven thematic roadmaps delivered by SCNAT was acknowledged by SERI, SNSF, swissuniversities and the ETH-Board. However, mainly due to insufficient communication, they were often not adequately taken into account in the planning of the institutions and only partially used for the identification and selection of new infrastructures, which turned out to be a rather chaotic process, in particular in some cantonal universities. In the end, only a few of the proposed infrastructures in the thematic roadmaps found their way through to be included in the Swiss roadmap of research infrastructures 2023.

1.4. No funding guarantees

It is to be reminded that there is no guarantee that the infrastructures described in the thematic roadmaps will finally be included in the Swiss roadmap for research infrastructures, and even the successful ones are not guaranteed to be (sufficiently) funded in the end. Indeed, the Swiss roadmap is only a planning document, which serves to motivate the budget needs and describes what is foreseen to be done in the next four-year period.

The actual building of new infrastructures depends on the will and means of the research institutions, who can however benefit from seed funding from the confederation. Indeed, in the process of the Swiss roadmap 2023, there was the possibility for cantonal universities to receive extra federal funding (via “Article 47”), but the allocated amounts are still uncertain and depend on the upcoming funding decisions on the ERI-Dispatch 2025-2028 by the Parliament. Whether this mechanism will be pursued for the Swiss roadmap 2027 is not yet decided.

1.5. Motivation to get involved

The absence of an immediate result and the funding uncertainties may appear discouraging for some scientists to get involved into this roadmap process. It is fair to say that an infrastructure project included in the thematic roadmap and thus having the support of the community gives an advantage, but no guarantee of success and even less of funding. It is only the first step of a long process with many hurdles to pass. It is also not a necessary condition, but certainly an asset that can turn out to be decisive.

The other way round, it is clearly a disadvantage for a community not to be willing or able to produce a roadmap with concerted priorities for the future needs in terms of infrastructures. It may weaken the discipline in comparison to others.

The feedback received from the involved scientists — mainly the Chairs and co-Chairs of the different roadmaps — was that independently of the actual outcome, the thematic roadmap process was very valuable in structuring the community, working together and outlining a common vision for the future of the discipline.

1.6. Next iteration

Since the ERI-Dispatch and the associated Swiss roadmap for research infrastructures repeat every four-years, the whole process needs to start again for the period 2029–2032. In order to be properly taken into account, the thematic roadmaps need to be available by the end of 2024. SCNAT therefore hoped for an early mandate from SERI to start the process in Spring 2023. The mandate was foreseen to be extended also to the Swiss Academy of Humanities and Social Sciences (SAGW) and was planned to be signed on the 10th of May 2023. The process was, however, interrupted by State Secretary Martina Hirayama who called a top-level meeting on 26 June 2023 with the Presidents/Directors of the Swiss institutions (swissuniversities, SNSF, ETHs, Swiss Academies, etc.). It was not just about clarifying the role of the thematic community roadmaps, but the whole process leading to the Swiss roadmap for research infrastructures 2027 was put on hold until further clarification. SCNAT therefore had to cancel the roadmap kick-off meetings in Biology and Chemistry planned in June, while the kick-off in Geosciences was held on May 10th without knowing about the issue. A SERI working group was set-up over the summer with representatives of the various involved institutions to rethink the roadmap process and provide possible alternatives for improving the process. This was done in September-October in time for a second top-level meeting held on November 2nd. Three possible avenues have been discussed:

- Avenue 1: Strengthening the roadmap for research infrastructures as a strategic instrument;
- Avenue 2: Improving the current roadmap process by addressing the most pressing issues;
- Avenue 3: Refocusing the roadmap process on international research infrastructures.

Avenue 3 was excluded, but there was no consensus among the institutions to follow Avenue 1 rather than Avenue 2 until the implications and the process of this more ambitious change is better clarified. It was

however clear that whatever the avenue for the next iteration, the needs of the community remain an important input. It was thus decided to finally give the mandate to SCNAT for an update of the existing roadmaps, without expanding this to SAGW given the tight schedule (see Section 2). The way forward for the next iteration is getting discussed and shall be decided in March 2024 at the earliest. According to current discussions, it is very likely that the next iteration will be similar to the previous one with only minor improvements (i.e. Avenue 2), thus postponing a more fundamental change (i.e. Avenue 1) to the next but one iteration.

2. SERI Mandate

The President of Swiss Academies (a+), Marcel Tanner, received shortly before Christmas a letter from SERI. This long-awaited letter is the actual **mandate** to SCNAT for an **update** of the seven roadmaps for research infrastructures delivered in 2021 (2022 for astronomy). This letter in German can be made publicly available and there is no further document to be expected.

The mandate is relatively general and does not give strong constraints on what exactly is to be delivered by the end of 2024. This is likely on purpose given the short time left and leaves some freedom on the content and scope of these updates. In these circumstances, it is only realistic to aim at a short additional document to complement the existing roadmaps, which would continue to serve as basis documents for the upcoming four-year period. Specifically, the mandate asks to address two things:

- an update on existing infrastructures;
- an update of the prioritised needs for existing and new infrastructures under consideration of the national and international contexts.

The mandate also mentions that the term of “thematic roadmaps” led to some misunderstanding (likely a confusion with respect to the different aims of the thematic roadmaps and the Swiss Roadmap 2023) such that it would be better to call them “*white papers*” in the future. This is however written as to be kept open until further clarification. We will see in due time how to cope with this in formulating the title and subtitle of the documents to be delivered. For the sake of clarity, the term “thematic roadmap” is kept throughout this document.

3. Organisation

The project is to be seen as a collaboration of researchers and staff of the SCNAT office offering the necessary support. The overall project is coordinated by Lukas Baumgartner (SCNAT Executive Board) offering his expertise and the researchers/institutions perspective and Marc Türler (Head of Science Division) for the SCNAT-office processes. For each roadmap update, there are one or two leading scientists, the Chair and/or co-Chairs, a person from the SCNAT office for the support, and a member of the SCNAT Executive Board in charge of the quality assurance (QA) of the document elaboration process. The foreseen persons in charge, to be ideally complemented by a co-Chair, are as follows.

Biology: Chair: Carmen Faso, SCNAT office: Sandra Hofmann, QA: Barbara König

Chemistry: Chair: Rebecca Buller, SCNAT office: Sandra Hofmann, QA: Marcel Mayor

Geosciences: Chair: Olivier Bachmann, SCNAT office: Caroline Reymond, QA: Lukas Baumgartner

CHIPP: Chair: Ben Kilminster, SCNAT office: Marc Türler, QA: Philippe Jetzer

Astronomy: Chair: Philippe Jetzer, SCNAT office: Marc Türler, QA: Lukas Baumgartner

Photon Science: Chair: Lukas Gallmann, SCNAT office: Marc Türler, QA: Philippe Jetzer

Neutron Science: Chair: Marc Janoschek, SCNAT office: Marc Türler, QA: Philippe Jetzer

It needs to be noted that the four roadmap updates in physics are assumed to be prepared very independently by the different societies (CHIPP, SSPH, and SNSS) and the SCFA commission for astronomy. The expected work of the SCNAT office is therefore much lower compared to what is involved in biology, chemistry and geosciences. Punctual support for the finalisation of the four physics roadmap could come from Anina Steinlin

(e.g. for the layout and proof reading). Claudia Rutte, Leo Merz, and Pierre Dèzes, as Head of the Platforms Biology, Chemistry and Geosciences, respectively, will also offer punctual support and advice, as needed.

The actual layout work will be done by the SCNAT communication team. Depending on the workload, some documents could be outsourced, but the responsibility and final touch remains at the SCNAT.

4. Implementation plan

In order to be the most effective for each roadmap, it makes sense to start the work in sub-groups, each having common scientific interests or common interest in a given type of infrastructure. Setting these groups was to be done at the kick-off meetings, which took place for geosciences, but were cancelled for biology and chemistry. It would make sense to soon hold these meetings as foreseen. In the MAP disciplines a simple online poll could be proposed to have scientists choosing their field of interest. These groups of scientists should then identify/designate a leader responsible to follow this up and make sure to meet the deadlines (see Section 5). The role of these groups is to advance the reflection and to gather information on the two specific points asked in the mandate.

4.1. Update on existing infrastructures

As the mandate is not very explicit on the extent of this “update on existing infrastructures”, it was clarified with SERI that it is not at all expected to provide a landscape analysis of existing infrastructures, nor an inventory of them and their current use. Both would be beyond the scope of this update and are foreseen for the reform of the overall roadmap process to be separate, additional inputs. It should also not be an update on the infrastructures proposed in the previous set of thematic roadmaps, because they are not yet implemented. At best, for only some of them, they are in the Swiss roadmap 2023 for implementation in 2025–2028 and their pertinence should therefore be reassessed in the second part of the mandate on the “prioritized needs”.

It was agreed with SERI that this update on existing infrastructures is to be understood as an overview of the field with emphasis on what has fundamentally changed since the publication of the thematic roadmaps 2021. Have new national or international infrastructures been implemented? Are there recent scientific, technologic, computational, financial, institutional, or political developments that would change the findings and recommendations of 2021?

4.2. Update of the prioritized needs

Based on the overview outlined above, the goal of this second part of the mandate is to reassess the pertinence of the infrastructures in use, in development, or proposed in the thematic roadmap 2021. Did the needs increase or decrease recently? Which community benefits or will benefit from the infrastructure and how large is this community of users? What are the main scientific questions that can be addressed with the infrastructure? How urgent is the infrastructure? Is it improving a strength of the Swiss research or filling a gap? Does it also address a societal need (i.e. is it important for the challenges of the 21st century: biodiversity, climate change, energy, health, security, etc.)? The answers to these questions can help to prioritize the needs of the different infrastructures.

In a second step, likely during the redaction of the document (see Section 4.3), the biggest challenge will be the prioritization of the inputs received from different groups. Experience in particle physics and astrophysics has shown that the community cannot make by itself a ranked prioritization list, because of the conflicting interests of the different researchers. What can nevertheless be attempted is to put the infrastructures into some broad categories based on the size of the community of users, the urgency of the needs, etc. It is advised that each discipline defines criteria for prioritization suitable for their communities early in the process.

The particle physicists and now also the astrophysicists for example distinguish flagship infrastructures from fair-share infrastructures and others. Flagship infrastructures often require the biggest investments, but are

also serving the broadest community in Switzerland and have a strong strategic importance (e.g. LHC experiments at CERN). Fair-share infrastructures are important for a smaller community (typically only a few research groups), and should get a fair-share of resources to be able to set-up or continue their activities. The research fields served by these infrastructures are generally recognized as being promising, relevant and contributing to the diversity of the Swiss community. The final category could include more prospective and nice-to-have infrastructures, which are not too critical in case they cannot be supported. Rather than just ignoring them, it can be strategically interesting to mention things that are not yet mature enough for getting funded, but are interesting ideas that could become more relevant in the future.

4.3. Redaction of the document

Based on the provided inputs, the roadmap Chair should take the lead of a redaction team to harmonize the inputs and write an understandable, balanced, and convincing document. The redaction team would typically include (some of) the group leaders and possibly additional persons. The redaction team shall think at adding an introductory part explaining the process of consultation, of redaction, and the fact that this is just a complement to the more exhaustive roadmap of 2021. The document should also include an executive summary, findings and recommendations, and possibly a conclusion and a list of acronyms. The structure of the document could be as follows:

- Executive summary (0.5-1 page)
- Findings and Recommendations (1-3 pages)
- Introduction (1 page)
- Update on existing infrastructures or e.g. “Recent developments” (3-5 pages, cf. Section 4.1)
- Update of the prioritized needs or e.g. “Future needs” (3-5 pages, cf. Section 4.2)
- Conclusion (0.5-1 page)
- References and Acronyms (1-2 pages, references to be kept to the minimum, if at all needed)

The proposed timeline for the redaction process is part of the overall timeline in Section 5. There are several consultation steps to take into account in the schedule. They take time, but bring transparency and confidence in the process and ensure that the final document is approved by the (involved) community.

4.4. Layout work

Once the text is final, it shall be sent to the SCNAT layout team together with a set of vectorial figures and high-resolution images with associated caption and source/copyright information. The layout is done with InDesign, a specialized tool, by copy-pasting the text of each section into the new document. This means that there is no need to pay much attention to the layout before this phase. Any simple Word document or a PDF generated with another text editor is enough. After 2-3 weeks, the processed document will come back for checking for completeness, adequacy of position and size of the images and figures, typos, etc. Comments are then be provided directly at the right location in the provided low-resolution PDF document using Adobe Acrobat Reader and sent back for further edition. The text itself is in principle no more to be substantially changed at this stage. This process can be repeated again until final acceptance of the proofs by the roadmap Chair.

4.5. Communication with the institutions

A weakness of the previous process was the lack of communication between the involved scientists and the institutions of higher education. There was a wish to remain independent in the elaboration of the thematic roadmaps, but it was underestimated that in the end the institutions need to propose the ideas for national infrastructures and engage to support at least part of the costs. It is therefore essential to make the institutions aware of the community needs early enough to have the foreseen infrastructures also included in their own strategic planning. Some discussion, if not some lobbying, between potential future PIs of an SNSF proposal for

a new national infrastructure and the vice-rector of research of the host institution is likely essential for success.

During the roadmap elaboration phase, it would already make sense to communicate with the vice-rectors of research on three occasions. Once early on to inform them about the new mandate and the start of the work. Then in May or June to communicate on involved scientists in their respective institutions. This would allow them to get in informal contact with scientists and get some news on what is coming up. It would also allow the scientists to sound whether there is potential interest by the institution to engage into a new infrastructure project. Finally, it would be important to have a meeting similar to the meeting organized on 20 January 2021 (then held per video due to the Covid pandemic) to present the main findings and recommendations of the roadmap updates. As September and October will be quite busy to finalize everything and have also figures ready to be shown, this would likely only make sense to be held in November during the layout work (see Section 5). This one-afternoon meeting is intended for the vice-rectors of research of the different institutions of higher education and also representatives of SERI, the ETH-Board, swissuniversities and the SNSF. It allows all actors of the subsequent process to have early-on information on the thematic roadmaps to then take this into account in their own strategic planning. The date shall be fixed rapidly such that the invitations can be sent out as soon as possible. We envisage a fruitful event with significant standing at a nice location.

5. Timeline

The following timeline is to be roughly followed to make sure the documents are ready in time at the end of 2024. This mainly concerns the work in the Platforms Biology, Chemistry and Geosciences. In the Platform MAP, it serves as a guideline, but the work may be organised differently by the three different societies (CHIPP, SSPh, and SNSS) and the SCFA commission of astronomy.

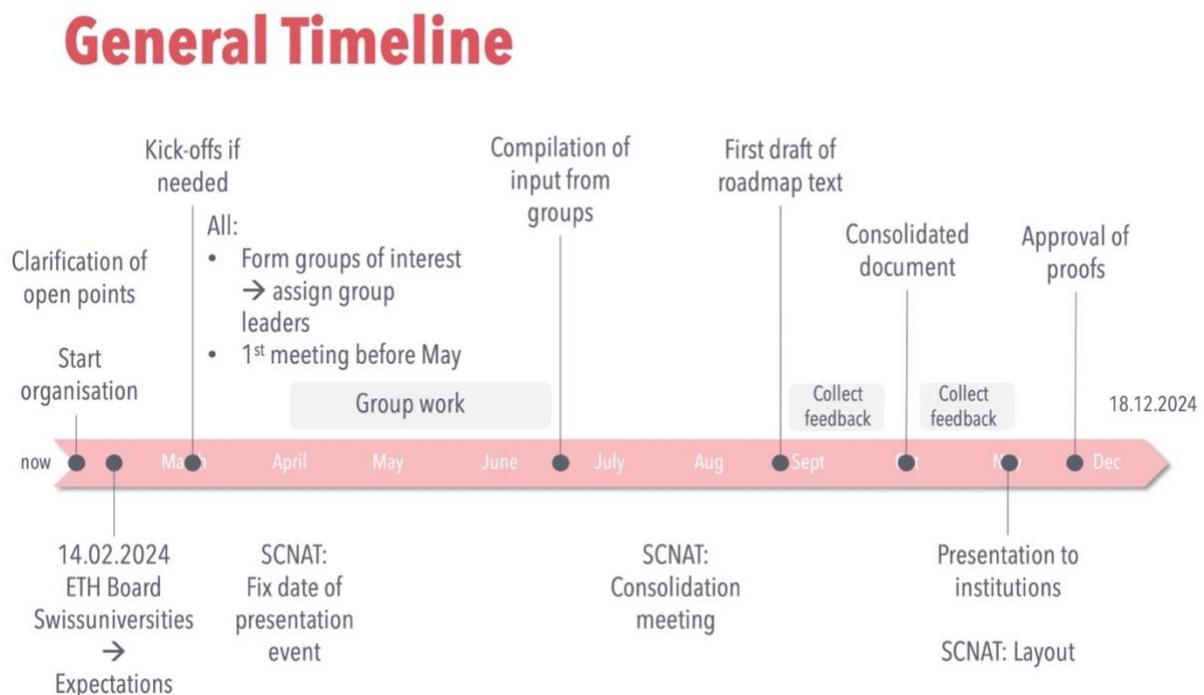


Figure 1: Proposed timeline for the update of the thematic roadmaps.

- January: Definition of the project organisation (draft of the present document) and general approval by the SCNAT Board (26. January).

- Early-February (7 February): Discussion of this organisation with the Chairs and clarification of open points. A representative of SERI, Maarten Lupker, is present to clarify the goals and future use of the thematic roadmaps.
- Mid-February (14 February): Hold a video meeting with representatives of swissuniversities and ETH-Board to further clarify their expectations on the content of the roadmaps to maximize their use and to discuss the communication between the involved researchers and the institutions.
- Mid-March: Hold the kick-off meetings in Biology and Chemistry. In Geosciences remobilise the scientists having expressed interest to be involved. In MAP disciplines inform the community and organise the work. If not yet done, the Chair should identify possible groups of interest and ask the scientists to manifest interest to be involved into one of them via a simple on-line (e.g., Nuudel) poll.
- End-March: The groups are formed and a leader is identified for each of them. Each group leader convenes a first virtual group meeting not later than end of April. The roadmap Chair with the support of the SCNAT office briefs the group leader on what is expected from him/her.
- March/April: A date is fixed and a place is booked for the presentation event of November. An invitation is sent out by SCNAT Secretary General Jürg Pfister to all institutions.
- April: Individual group meetings are held with the possible support of the SCNAT office. The leader of each group clarifies what is expected to be done and distributes the work among the group members. He/she could possibly provide a template or a list of questions to be answered. The roadmap Chair could be involved in the meetings, as appropriate.
- May: The group members work individually or in small subgroups on their parts and send their inputs to the group leader.
- Early-June: The group leader compiles the inputs of its group and provides its document to the whole group for information and comments. In parallel he/she transmits this information to the roadmap (co-)Chair(s).
- End-June: The roadmap Chair convenes a meeting with the group leaders (and possibly additional members forming the redaction team), discusses the final inputs, the priorities and organises the collaborative writing of the document during the summer.
- Early-September: A first draft of the roadmap text is finalised by the redaction team, which holds a meeting to make sure that the text is mature for being distributed to the contributors in the various groups.
- Mid-September: The draft document is circulated inside the community (likely limited to the persons who engaged into the different groups) for comments on the content and the structure.
- End-September: The collected comments are discussed by the redaction team and taken into account as appropriate.
- Early-October: A consolidated document is sent to the community for final comments on formulation and for corrections. Illustration material (pictures, figures) is gathered or prepared.
- End-October: The final text stands and it is sent in for layout together with vectorial figures and high-resolution images and associated captions and source/copyright information.
- Mid-November: A meeting is organised with the institutions to present the main messages of the roadmaps (cf. meeting of 20 January 2021). The vice-rectors for research are invited, as well as representatives from SERI, SNSF, swissuniversities, and the ETH-Board.
- November: The layout work is done by the SCNAT communication team and iterated with the roadmap (co-)Chair(s), the redaction team and the SCNAT office.
- Early-December: The roadmap Chair approves the proofs for publication and the quality assurance statement is written by the SCNAT Board members in charge. The documents receive a DOI number and are uploaded on the SCNAT server. They are also ready to be uploaded, as last time, on the

Zenodo Open Access platform. The documents are simultaneously released on **Wednesday, 18 December**. The high-resolution PDF documents are subsequently sent to print (baseline: 200 copies).

- January 2025: The printed roadmaps are distributed to a list of addresses together with a cover letter. The lists are updated on the basis of the distribution lists of the previous roadmap. This includes all participants to the presentation event of November, the authors, etc.
- Foreseen for April 2027: publication of the Swiss Roadmap

From this timeline, it appears that the most intense period for the group leaders will be in April and June, while the roadmap (co-)Chair(s) should be able to devote significant time mainly from June to November with a peak expected in September to finalise the text and implement comments.