Strategy for ETH Domain institutions' associated locations, working with cantonal or international partners.

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F. Vigliotti	EPFL
S. Negovetic	ETH Zurich
C. Hegg	WSL
S. Moresi	ETH Board staff

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Executive summary

Over the past fifteen years, the ETH Domain - mainly EPFL and ETH Zurich - has developed long-term partnerships with several Cantons and with government authorities in Singapore and in the UAE. In this context, ETH Zurich and EPFL have established a durable and sizeable academic presence and activity at the respective sites. Although geographically remote, these associated cantonal or international locations are an integral part of the academic strategy of their parent institution and contribute to the strength and positioning of the ETH Domain.

A distinction is made between associated locations that have emerged in the past fifteen years and have a "campus-like" form and other locations not included in this mandate, which have been designed with specific missions. Under this mandate and unless specified differently in the text, an associated location (hereafter simply referred to as location - or locations) is a durable local presence of an institution outside of its headquarters that hosts academic units consisting of professors, scientists, doctoral students, technical and administrative staff. These units carry out research, education and innovation activities on site and in coordination with the parent institution. With its own local operational and financial management, each location acts under the name, academic supervision and administrative authority of its parent institution. Experience has shown that such a location should at least achieve the critical mass of an institute with 10 or more research laboratories (around 200 people or more) to enable a material and intellectual community on site. Achieving critical mass is a key-factor to ensure the long-term success of the location and to reduce the risk of isolation that might otherwise exist due to the geographical distance from the headquarters of the parent institution.

The rationale for the existence of a location is based on the alignment with the parent institution's academic missions and goals. It rests on expected and confirmed long-term opportunities for all the partners involved, with a research focus on global and national challenges that can be better addressed locally. There are currently seven main locations, all of which present academic complementarity within the ETH Domain activities at the national or international level respectively [1,2]. They play a key role in positioning the ETH Domain nationally and globally, in enhancing technology transfer, in attracting and nurturing talent and in the transfer of knowledge. These locations operate mainly in facilities provided by the local partners, which will represent over 61'000 m^2 by 2024. This enables the parent institutions to concentrate the use of federal resources efficiently on their core academic missions. Moreover, the two international locations operate predominantly or entirely with local

[1] Cantonal locations are: Basel (ETH Zurich, Basel Campus), Geneva (EPFL Geneva), Neuchâtel (EPFL Neuchâtel), Fribourg (EPFL Fribourg), Sion (EPFL Valais-Wallis, which includes Empa-Sion)
[2] International locations are: Singapore (ETH Zurich SEC), United Arab Emirates (EPFL Middle East)

resources including government and third-party funds, both in terms of infrastructure (3100 m^2) and operating costs (273 MCHF over the years 2009-2024).

Currently, the seven locations are home to more than 1200 researchers and staff from the ETH-Domain, soon to grow to nearly 1600, and have already produced a significant body of research outcomes and numerous technology transfers. They represent a global investment of about CHF 2.8 billion, with contributions from the respective local partners (22%), third-party competitive funds (23%) and the ETH Domain (55%). In general, the locations do not represent an additional investment for the parent institutions, rather a delocalization of activities that are amplified by local investments. Federal budget invested in the locations since their respective inceptions, between 2007 and 2024, amounts to CHF 1.55 Bn. This number is estimated to be on the order of 4% of the total ETH Domain funds (CHF 40 billion) for that same period. An input-output review of the locations shows that the impact of the locations is substantial in terms of scientific outcomes, innovation and economic development (see Annexes 1 and 2 for a synthetic overview, and section 1.4).

A location can be set up on the basis of a federal mandate or a decision by the parent institution based on an opportunity identified with the local partners and the ETH Domain. Based on the definition, a common set of criteria is put forward that qualifies a location and guides the assessment of the feasibility, viability and sustainability of a location. Thereby, cantonal and international locations are dealt within a single strategy as they are both constituted according to the same criteria, with adjustments where needed. These criteria cover all the aspects of the planned activity and include:

- academic strategy and complementarity;
- scope and opportunities;
- local environment and partners;
- intellectual property;
- structure;
- management principles;
- political, legal, financial and infrastructure conditions.

An opportunity-risk analysis is an integral part of the decision-making process at the institutional, ETH-Board and federal level. Three synthetic tables at the end of this executive summary present the definitions, governance processes and criteria that qualify a location.

The seven locations included in this mandate were examined alongside a review of previous proceedings of the ETH Board on locations. Although not always formalized at the level of the ETH Board, the criteria and good practices summarized in this document were generally found to be already

in place and implemented by the parent institutions when planning the creation of a new location. The review also shows that opportunities and challenges were appropriately identified prior to inception as the development of these locations has already started to produce the expected long-term benefits in strategic areas of national and global importance. Examples of such areas are energy, sustainability, smart living and urban environments, systems biology, neuro- and brain sciences, and microengineering.

The review further shows that the existing risk management plans are effective and that the financial and infrastructure risks at the locations are under control, a common scenario when the local partners are responsible for the infrastructure. The current locations have reached or will soon reach a mature stage, and their respective renewals are all supported by the local partners and by the respective parent institutions. This is a sign that their inceptions have seized relevant development opportunities for all parties involved and were not just opportunistic in nature. Finally, it should be noted that locations may take different forms, both in their organization and in their relationship with their respective parent institutions. For example, an entire institute or department (like ETH Zurich Basel campus, home to the D-BSSE), an extension of a department or school (like EPFL Fribourg or EPFL Neuchâtel), or a thematically coordinated or multidisciplinary emanation of several departments or schools (like EPFL Valais-Wallis, EPFL Geneva or the two international locations).

These different forms are governed by institutional strategy and build on the strengths of the parent institutions. They also offer the ETH Domain the agility needed to optimize the collaborations with the local partners.

This review also results in **three recommendations** for improving governance at the institutional and ETH-Board level:

- it is in the autonomy of the parent institutions to incept, renew or close locations, and lead the process. But they need to systematically provide advance information for strategic discussions at the ETH-Board level to ensure timely decisions;
- two to three formal evaluations should take place during the initial six years of existence of a location; after this initial phase, the ETH Board and the parent institution should decide on a regular evaluation schedule, commensurable with the size, scope and age of the location;
- the parent institutions and the ETH Board should enhance their internal, public and political communication with respect to the benefits and impact of the locations for the ETH Domain and for Switzerland.

Definition of a location

Definition (Chapter 2, see 2.1)

Within Switzerland, a location of the ETH Domain has these characteristics:

- a durable physical representation of the parent institution outside of its headquarters;
- the need (and existence) of a local operational management;
- full academic and administrative subordination to the parent institution;
- a separate financial management for reporting purposes, consolidated with that of the parent institution;
- the location operates under the name and brand of its parent institution.

Outside Switzerland, a location (international) also verifies the following:

- a legal structure compatible with the Swiss legislation and approved by the ETH Board;
- the possibility to enter contracts locally (employment, insurance, other).

Governance

Governance and decision-making process (Chapter 3, see 3.1)

The location can be established or maintained based on and/or as a result of

- a federal decision (SERI, other), in consultation with the parent institution and the ETH Board;
  -or-
  a decision by the parent institution, with the prior approval of the ETH Board;
- a necessary positive multidimensional opportunity/risk analysis;
- compliance with federal regulations (ETH Board, BBL) for real estate, where needed.

Formal contracts proposals and revisions for approvals by the ETH Board are

- submitted in their final form by the parent institution 3 months before the date of decision;
- reviewed by the Owner of the ETH Domain at the request of the ETH Board.

Communication

- Regular communication by the ETH Board and the parent institutions to the involved governments and to the general public on the benefits, impact and resources invested.

Evaluations (Chapter 3, see 3.2)

Ongoing evaluations of the location by the parent institution

- comprise 2-3 evaluations over the first 6-year initial phase, extendable by the ETH Board;
- follow a regular calendar and mode of evaluation after the initial phase, according to a schedule agreed upon between the ETH Board and the parent institution;
- are regularly communicated to the ETH Board for information.

Specific evaluations of the location (e.g., in the context of contract renewal)

- take place at the time of the review to decide on the renewing of a contract;
- take place as ad hoc evaluations, if necessary or as required by the contract;
- take the form of reports and peer-review evaluations;
- include an analysis of the value of the location to the parent institution, and of its management;
- include an analysis of the real estate when a new building is needed;
- present updated opportunity and risk analyses.

Criteria

Academics (Chapter 1, see 1.1 through 1.3)

The location presents

- a distinct contribution to the missions and goals of the parent institution;
- coherence with the parent institution's strategy;
- a focus on global and national challenges that are better addressed at the location;
- complementarity within the parent institution and the ETH Domain;
- complementarity in the local/regional context (academic, economic);
- improved positioning of the parent institution, the ETH Domain, and Switzerland;
- a critical mass that ensures success, national and international competitiveness.

Structure (Chapter 2, see 2.1 and 2.2)

The location exists

- under the parent institution's own name and brand;
- by means of a renewable long-term agreement if the location is in Switzerland;
- by an agreement of 5+ years, renewable if it is an international location;
- for a duration commensurable with the activity (e.g. full-chair lifetime in cantonal locations)

Management (Chapter 2, see 2.1 and 2.2)

The location operates

- within the autonomy and under the management authority of the parent institution;
- with full academic independence from local partners;
- with its own local management, organized and steered by the parent institution;
- with regular performance reviews by the parent institution, discussed at the ETH Board;
- with transparency and full disclosure (academic, financial, operational) to the ETH Board.

Finance and infrastructure (Chapter 2, see 2.3 and 2.4)

The parent institution must

- document the total cost of ownership over the planned lifetime of the location;
- provide a financial plan that includes all contributions over the lifetime of the location;
- preferably not carry the infrastructure costs at the location (CAPEX or OPEX);
- preserve the institutional budgets to fulfill its core mission;
- make commitments commensurate with the expected lifetime of the location;
- establish a contingency plan in the event that the location has to reduce or cease its activity;
- have a fold-back strategy that includes financial and infrastructure aspects.

Environment and partners (Chapter 1, see 1.1 through 1.3. Chapter 2, see 2.5)

In general, the environment at the location presents

- reputable local partners who participate operationally;
- positive long-term relationships with local government, academia and industry;
- standards for ethics, academic integrity and IP practices compatible with the ETH Domain's.

Particularly for international locations, the environment presents

- a general context of societal and human values compatible with those of Switzerland;
- the required stability (geopolitics, security and context, access to healthcare);
- a legal framework compatible with the operations of the parent institution at the location;
- an official representation of Switzerland in that country;
- a history of positive bilateral relations with Switzerland (political and economic).

Main observations and recommendations

Main observations (Chapter 1, see 1.4 and Annex 1 and 2)

The review of all the locations in the scope of this mandate indicates that

- the strategy of the institutions does drive the existence of their respective locations;
- opportunities identified earlier fulfill their expected potential;
- strategic decisions were well-guided;
- governance processes at institutional and ETH-Board levels were adequate in terms of criteria, planning, risk management, implementation;
- critical mass for a (campus-like) location is at least 10+ laboratories / 200+ people, to create a local intellectual and material community.

Recommendations (Chapter 3)

The document puts forward the following main recommendations:

- the parent institutions are autonomous and lead the process, but should systematically provide advance information to the ETH Board to ensure timely decisions;
- evaluations should follow the schedule defined under Governance (see above);
- enhanced communication is needed by the parent institutions and the ETH Board internally as well as to government(s) and to the general public, regarding resources, benefit and impact for society.

Introduction

Context

The ETH Domain is present in thirteen Cantons and currently operates twelve main external locations in Switzerland, outside the headquarters of their parent institutions. Five of them are less than fifteen years of age [3]. Of these five associated locations (hereafter locations), four were developed by EPFL and Empa [4,5], and one by ETH Zurich [6]. On the international scene, ETH Zurich and EPFL each have one associated location outside Switzerland, in Singapore [7] and in the UAE [8].

The development of these recent locations has been driven by the academic strategies and within the autonomy of the respective parent institutions. To date, these locations are perceived as a win-win situation by the national and by international partners. At the national level and between 2004 and 2016, cantonal investments were on the order of 390 MCHF. This significant amount speaks to the value Cantons see in their partnerships with the ETH Domain. Similarly, based on current agreements and until 2024, the two international locations will also have seen substantial investments by the host governments, in kind and in funding, in the order of 230 MCHF [9].

While these locations of the ETH Domain have been in operation for over ten years now, they represent a relatively recent development in the academic landscape of Switzerland. As the locations now enter a more mature state of their development, new opportunities and challenges arise. This is one of the reasons why the 2019 mid-term review of the ETH-Domain recommended that the ETH Board evaluate the opportunities, the governance and coordination, and to some extent also the development strategy for these and future locations (cantonal, regional or international). The ETH Board has therefore identified the need for a comprehensive Domain-level approach [10] and mandated a working group with the development of a strategy for ETH Domain institutions' locations.

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[3] Among the older locations and taking the three locations of Empa as one entity, except for EAWAG's Kastanienbaum location in Luzern (established in 1960), all other locations were established in 1989 and 1995; four by the WSL and one by ETH Zurich.

[4] EPFL Neuchâtel, EPFL Geneva (at Campus Biotech), EPFL Valais-Wallis and EPFL Fribourg.

[5] Empa's Laboratory for Materials for Renewable Energy, operated jointly with EPFL.

[6] ETH Zurich Basel Campus, home of the Department of Biosystems Science and Engineering in Basel, D-BSSE.

[7] Singapore-ETH Centre.

[8] EPFL Middle East.

[9] See Annex 1, Tables 7 and 8 for details.

[10] Decision of the ETH Board, 19-20 May 2021. Point 8: «Strategie für die Standorte der Institutionen des ETH-Bereichs. Vorgehensvorschlag zuhanden des ETH-Rats» (In German and in French).

The strategy, proposed in the present document, is based on prior decisions and guidelines rendered to date, and based on a retrospective view of fifteen years of experience at the seven locations mentioned above and detailed in footnotes 4-8.

The ETH Board has held regular discussions on select topics regarding locations over the past decade. It has also received several analyses (SWOTs; proposed academic, management, or structural criteria), both for Switzerland-based and international locations. Notably, the ETH Board adopted in 2015 [11] a set of structural criteria for the feasibility of international partnerships, based on the principle that they should strengthen the parent institution's global visibility, education, research and innovation capacity. These criteria include the following requirements:

- a contractual agreement between the parent institution and partner institution/country for at least five years, renewable;
- activities run under the name and brand of the parent institution (ETH Zurich, EPFL for example);
- the location is operationally independent and has its own management on site.

The Board also adopted a set of implementation guidelines:

- international partnerships are developed and established within the autonomy of the parent institutions;
- unless they are mandated by the Federal Government, parent institutions require the authorization of the ETH Board to set up a location;
- the ETH Board exercises general oversight;
- the research focuses on topics of global importance that can be better researched at the location;
- the location presents reputable local partners who participate operationally;
- the location is compatible with the physical presence and core values of Switzerland and the ETH Domain such as human rights, legal framework, research ethics, academic integrity, and intellectual property.

These recommendations and founding principles were already in place at the inception of the two existing international partnerships, which were approved by the ETH Board in 2008 for the UAE and in 2009 for Singapore [12].

[11] International Strategy for the ETH Domain. Position Paper on International Initiatives of ETH Domain Institutions, 2015, adopted by the ETH Board at the meeting of 4-5 March 2015.

[12] Decisions of the ETH Board, 11-12 December 2008 and 9-10 December 2009.

In a similar manner, the creation of cantonal partnerships has been the subject of discussions, both at the level of the parent institutions and at the level of the ETH Board. For all the locations included in this mandate, the parent institutions have held many formal discussions within their executive boards, where all aspects of the development of each location were debated and decided upon.

Although not formalized in the same way as the criteria for international locations, in 2013 [13] and in 2019 [14] the ETH Board also discussed a catalogue of criteria to support the development of cantonal locations. These cantonal criteria included academic coherence, critical mass, strengthening international competitiveness as well as financial contributions by the Cantons. At the same time, the ETH Board emphasized the need for its timely involvement. It also defined its regulatory role in the planning, implementation and development of cantonal locations.

Mandate and document structure

In this context, and following the mandate given by the ETH Board to develop a strategy for the locations of the ETH Domain institutions, the working group has evaluated

a) the documentation made available by the ETH Board on the discussions and decisions on this subject that have taken place at the level of ETH Board to date;
b) the information from the three institutions (Empa, EPFL, ETH Zurich) that have established the seven national and international locations reviewed in this document, provided in response to the survey of the working group (see section 1.4 and Annex 1 and 2).

Starting from the evaluation above, and as requested in the mandate, the present document includes:

1) a **definition of a location** – based on the qualifying elements derived from the present analysis (see section 2.1).
2) a **strategy for the development of a location** (cantonal, regional or international) with the necessary differentiation, and taking into consideration previous decisions of the ETH Board (see section 1.2);
3) an assessment of (former, current and expected) **opportunities and challenges** at the seven locations that were reviewed (see section 1.4 and Annex 1);
4) a proposal for the **periodic evaluation of locations**, based on this review (see section 3.2).

The document is organized in the same sequence as needed to plan, inform about and eventually reach a decision to establish, maintain or eventually close a location: the corresponding chapters are

[13] ETH Board meetings of 25-26 September 2013 and 4-5 December 2013, items 10 and 11.

[14] Intermediate Evaluation 2019: Self-Assessment Report of the ETH Board, pp 90-92.

Institutional strategy, *Boundary conditions and feasibility,* and finally the *Governance process* that leads to a decision.

Chapter 1, *Institutional strategy*, contains the value proposition and why an institution considers opening, maintaining or closing a location. Chapter 2, *Boundary conditions and feasibility*, addresses the necessary conditions, checks and balances as well as risk management requested for a successful implementation. Finally, Chapter 3, *Governance*, addresses the respective roles at the institutional and ETH-Domain levels in the decision to establish, maintain or close a location. Where relevant, a retrospective view on the existing locations is provided. Annex 1 presents the various locations that fall under this mandate, and Annex 2 gives a synthetic overview of the resources invested in the locations since their respective inceptions and their academic outcomes to date.

1 Institutional strategy

The fundamental motivation to establish a location is driven by the academic strategy of the institution that proposes the location. The opening of a new location is usually mentioned in the target agreement of the parent institution with the ETH Board in response to the Federal mandate given by the Swiss Government to the ETH Domain for a given four-year period and therefore supported by the Strategic Planning of the ETH Domain for the same period.

A proposed location entails complementarity with the parent institution's headquarters and other national existing locations. It strengthens complementarities within the ETH Domain and with the local, regional and international partners. In preparing the business plan for the location, the parent institution must look at the academic, political, legal and socioeconomic environment and optimal use of its funds. It evaluates both the opportunities (present and expected) and the desirable critical mass of the activity needed to seize these opportunities. The level of the activity at the location (critical mass) is designed to reach the strategic priorities and overall objectives for that location, while strengthening the parent institution, the network of the ETH Domain, and ultimately the national or regional academic landscape as well as international visibility and competitiveness. To illustrate these principles, Annex 1 and 2 provides a review of the current locations that have been established over the past 15 years.

1.1 Academic vision as the main driver, academic positioning and grand challenges

The rationale to consider opening a cantonal or international location stems first and foremost from the academic vision, which is expressed in terms of concrete objectives that relate to the core missions and tasks of the parent institution. Most opportunities for future collaborations arise from existing efforts at the institutional level, past projects and their outcomes; they grow from the ideas of

professors and researchers or from the initiatives of senior management to engage in long-term challenging and complex topics. Cutting-edge research lives from the exchange and from supplementing one's own competencies within the framework of cooperation with other researchers as illustrated by the vast majority of national and international collaborations that take place at the individual level. It is essential that the institutions maintain the autonomy and grass-root level at which partnerships are developed (including those that may lead to the establishment of a location). When designing their partnerships, the institutions focus on knowledge gain and systematically aim to promote talent development, knowledge and technology transfer. To this end, they benefit from the different cultures of the partner institutions, which enable diverse perspectives and offer substantial added value for the goals of the cooperation.

Establishing a location should support the long-term academic vision of the parent institution and of the ETH Domain. It should allow to acquire or develop a scientific expertise, an experience and exposure that would remain significantly more difficult to access (or outright inaccessible) without that location. The location should present several levels of complementarity with its parent institution, with the other institutions and locations of the ETH Domain, and with the local and national academic landscape. This complementarity ensures a balanced concentration of talents and maintains a favorable research environment where competition is still present but does not prevent collaboration. Avoiding unnecessary exacerbated competition also implies a more effective use of resources.

1.1.1 Strategic planning of the ETH Domain and institutional strategies

The academic vision, expressed at the level of the parent institution, aligns with and is an integral part of the strategy of the ETH Domain, in response to the Dispatch on the Promotion of Education, Research and Innovation (ERI Dispatch), where the Federal Government puts forth the strategic objectives for the ETH Domain every four years [15]. These objectives support the fundamental missions and the strategic plan of the ETH Domain for a given period, as provided in the ETH Act (notably Art. 2) that defines the purpose of the two Federal Institutes of Technology and the four Research Institutes as follows:

- To educate students and qualified staff in scientific and technical fields and to provide permanent continuing education.
- To expand scientific findings through research.
- To foster upcoming young scientists.
- To render scientific and technical services.

[15] Overview of the ETH Domain: https://www.ethrat.ch/en/eth-domain/overview.

- To perform public relations activities and to exploit research findings.

The intention to establish or maintain a location, whether in Switzerland or abroad, must ultimately contribute to fulfilling these overarching goals [16]. It should also bring a distinct contribution to the missions of the respective parent institution, with a strong focus on national and global contemporary challenges better addressed at the location than at the parent institution's headquarters.

1.1.2 Innovation ecosystems and complementarities, intra-ETH Domain and beyond

Institutions of the ETH Domain have their own collaboration strategies within Switzerland and at the international level [17,18]. Within Switzerland, federal laws generally provide similar conditions throughout the territory. However, individual cantons as well as other countries have specific academic landscapes and strengths, coupled with development agendas that may support establishing a significant presence of the ETH Domain. In planning the development of a new location, the parent institutions (and ultimately the ETH Board) evaluate the local innovation ecosystem and the positioning of the ETH Domain or the respective parent institution within that ecosystem. This would typically be multidimensional, to include:

- the academic strengths that already exist at the proposed location (e.g. cantonal university, university hospital, university of applied science);
- existing collaborations with the local academic institutions;
- the potential for collaborations with local actors (industry, government notably);
- the general environment to protect and potentially transfer IP.

The exploration of new cooperation opportunities necessitates the evaluation of the local innovation instruments. The presence of reputable partners is a prerequisite to consider opening a new location. These partners could be academic, industrial, clinical - and importantly, government.

In the context of international locations, it should be noted that countries entering into academic partnerships (transnational education, research clusters of excellence by invitation, innovation platforms) generally also have their own innovation agenda. This agenda manifests itself in various ways, or a combination thereof:

[16] The current locations in the scope of this proposal all fulfill the overarching objectives of the ETH Act.

[17] See for example the Appendices 3.5.1 – 3.5.6 to the discussion of the *national presence and networks of the institutions in Switzerland, and their international networks*, retreat of the ETH Board, 5-6 July 2017.

[18] International Strategy for the ETH Domain: Position Paper on International Initiatives of ETH Domain Institutions, adopted by the ETH Board on 4-5 March 2015.

- the existence of a well-supported local academic system (schools, higher education, research culture);
- innovation instruments (established framework for IP management, seed funding, networks of venture capital);
- the existence or the embryo of a technology-based spin-off environment around research centers.

Beyond the academic benefits, synergies and the positioning that result from a carefully designed program for a location, complementarity within the parent institution and the ETH Domain is crucial. Without exception, all locations in Switzerland entail an outlay of financial resources of the ETH Domain's global budget. Designing complementarity and coordination with the other institutions in the ETH Domain and the cantonal universities is therefore essential to avoid duplications and parallel investments (between cantons, and at the federal level). The assessment of complementarities may become even more important in the future, in the context of an efficient use of resources allocated by the Confederation to the ETH Domain, and by the Cantons to the locations.

Complementarity and coordination at the national level (including the ETH Domain) will also gain in importance in the scientific context of the relations between Switzerland and partners in Europe and beyond. This is already the case today: most locations established in Switzerland entail a close collaboration with cantonal entities. For example, in Basel, Sion, Fribourg and Geneva, EPFL and ETH Zurich are collocated with cantonal universities (BS, GE, FR) and with universities of applied sciences (GE, FR, VS). In Sion, Empa shares a laboratory with EPFL. These regional points of collaboration and concentration in Switzerland have gained significant international visibility. An example of such international visibility is Geneva in the field of neuroscience and brain research with the Human Brain Project.

In general, opening a new location should be considered only if it is absolutely necessary to achieve the academic objectives and no other model of distributed collaboration works better. This is particularly true for most cantonal locations, where local partners (governments, institutions, donors, industry) and the ETH Domain tend to make long-term commitments (decades long, renewable). This means that resources remain committed for a long time, with an impact on the ability of the parent institution to redirect research or open new fields. A good example of a collaboration model with high complementarity and coordination - without establishing a location - is the Swiss Data Science Center, founded within one of the three Strategic Focus Areas of the ETH Domain for 2021-2024.

1.1.3 Socioeconomic and political criteria

The opportunities and ambitions of the local authorities must flow into the pre-inception analysis. This would include the creation of a cluster of excellence in a focus area in which an institution or the ETH Domain is a leader, and in which the local authority is striving for a better positioning and therefore allocates significant resources in a long-term program. At the national level, socioeconomic changes and political decisions may also give rise to significant strategic projects at the cantonal level.

A good example is climate change and the implementation of the 2050 energy strategy of the Federal Council. This political decision necessitates accelerating and improving Switzerland's use of renewable energies, advancing energy management and efficiency as well as sustainability; reducing carbon emissions drastically and developing smarter urban systems built around more sustainable living. Four of the locations in the scope of this proposed strategy have focused their activities precisely on these grand challenges [19]. The activities developed at these locations, with partners and additional (local) resources, with access to infrastructure and research fields, altogether multiply the impact of the parent institutions and of the ETH Domain. Another example of strengthening research and innovation is the targeted collaboration by an institution of the ETH Domain in a region with unique competencies. This includes pools of academic and industrial expertise in life science or in microengineering in Basel and in Neuchâtel, respectively [20].

At the international level, socioeconomic and political criteria may also contribute to the rationale for the exploration of new cooperation opportunities. Such criteria could include leading house mandates given by the SERI, the ambition to strengthen the ties with other universities in existing alliances and networks, or a strategic plan to further economic and cultural ties between Switzerland and another country through scientific cooperation.

1.2 Strategy for cantonal and international locations

Although there are cantonal, regional, and international specificities, locations at any of those three levels should form integral parts of the academic vision of the parent institution. While the boundary conditions (duration, nature of the engagement, sources of funding, form of the presence) differ among them, the rationale and value proposition for creating a location should follow similar patterns and objectives.

[19] EPFL Valais-Wallis (Energypolis), EPFL Fribourg (Smart Living Lab), SEC (smart cities), EPFL Middle East (energy management and sustainability).

[20] ETH Zurich Basel campus, and EPFL Neuchâtel.

At the cantonal or regional level within Switzerland, value propositions for a location may differ, matched to the various missions of the ETH Domain. These include, for example:

- give scientists of the ETH Domain a local anchoring and access to complementary research competencies at a cantonal university, for example in life sciences, medicine, other fundamental natural sciences, or at the interface with human sciences; an example of such a collaboration is EPFL Geneva at Campus Biotech where engineering, fundamental neurosciences and access to patients allow remarkable progress in brain science and neuro-prosthetics, a major global challenge in aging societies;
- stimulate technology transfer and entrepreneurship at the local and national level; the existence of an ETH-Domain location in a canton ultimately creates a privileged channel to the parent institution and to other institutions of the Domain – on which further national initiatives can be built, such as the Swiss Innovation Park with its multiple points of anchoring throughout Switzerland.

If a location reaches critical mass (see section 1.3 below), significant advances can be made along these two value propositions, so that the location becomes a center of reference both nationally and internationally. This in turn supports local or regional intentions to enhance the presence of highly qualified scientists and engineers. The parent institution involved, the ETH Domain and the local partners then experience an enhancement in visibility, reputation, and positioning.

At the international level, the decision to establish a location should be guided by corresponding motivations: access to research questions and environments that pertain to global and regional challenges, and access to regions where technologies and scientific advances onsite can be delivered to society, either in the form of technology transfer agreements or entrepreneurial ventures.

In both national and international ventures, the parent institution must carry out a thorough analysis of the opportunities that arise or are likely to be expected at the location in the future. Financial support at the location, even in abundance, should not be sufficient motivation to decide to open a location. The many dimensions presented in this first chapter should be considered jointly when proposing a new location, to ensure its long-term success and pertinence. The review of the existing locations as part of this mandate (Annex 1 and 2) shows that both for cantonal and international partnerships, such an evaluation did take place before their respective inceptions.

1.3 Critical mass

Critical mass is central to the formation of a local intellectual and material community, which is the first attribute of a location. The local commitment needs to be strong enough to achieve the objectives

of the location. It should strengthen the parent institution's academic structures (schools, departments or institutes), both through a careful selection of the research areas pursued at the location and through the resources allocated to these activities.

The metrics used to define critical mass should depend on the location itself, the nature of the activities and the geographic distance between the location and the parent institution. The choice of these metrics and criteria, the planning of the volume of activity and its implementation should ultimately be the responsibility of the parent institution. They are likely to differ for cantonal and international locations, both in nature and in volume. They may also differ between cantonal locations with different goals or missions. For example, a non "campus-like" location might be designed for outreach in a specific region or to benefit from special circumstances. Its critical mass will be defined differently to that of a location designed to set up a mainly decentralized and research-driven campus (e.g. all five current Swiss locations of EPFL and ETH Zurich that host entire research teams). The respective sizes of these locations vary between just a few teams and about 50 people in Fribourg, to over 12 units and 200 people in Neuchâtel, to over 20 labs and more than 300 people in Basel and in Geneva (and soon in Sion). Critical mass is also manifest in the form of the setup: the mix of faculty present on site (assistant professors and tenured), the presence of a dedicated building, and a financial commitment commensurate with the academic ambitions at the location. These factors all play an important role for the locations considered as part of this mandate.

In general, experience so far suggests that smaller locations that include both research and teaching employees such as EPFL Fribourg need further growth (in size and in tenured activity) to fully establish their strength and the value of the location in the long run. A set up like Neuchâtel, with its institute-like size, appears to be just beyond the threshold of critical mass, which enables collaborations and scientific enrichment at the location: in addition to the research activities and the collaborations with CSEM [21], this includes seminars, events with partners, substantial interfaces with industry and the local economy as well as the promotion of science and innovation for the general public. Experience shows that larger operations [22], well beyond that threshold, have reached activity levels onsite that warrant startup creation or even the construction of new infrastructure, in most cases in collaboration with the Cantons or third parties [23].

[21] Swiss Center for Electronics and Microtechnology

[22] This includes ETH Zurich Basel campus, EPFL Valais-Wallis or EPFL Geneva.

[23] With the exception of its D-BSSE, where ETH Zurich will be the owner of a building, all other locations are hosted in infrastructures owned by Cantons, or private entities.

When planning the level of research activities at a location, where the establishment of assistant professors is envisioned, the parent institution should consider the ratio of actively engaged, tenured professors on site. This serves three central purposes:

- offer junior faculty the mentoring they would normally get at the parent institution for their success;
- leverage established activities for academic collaboration with academic partners onsite;
- accelerate knowledge dissemination, technology transfer and innovation with existing activities.

For international locations, where parent institutions generally do not have entire research laboratories in residence full-time, the definition of critical mass relies even more heavily on the purpose of the location, the ambitions of the partnership, and on the focus of the activity. Hence, critical mass at the location may be defined in different ways [24]. These include research or other academic outcomes, academic presence or residency on site as well as talent attraction, industry network, spin-off and startup activities, large-scale projects, outreach or (international) visibility. Critical mass may also include the existence of a dedicated infrastructure and finally, the level of funding.

As noted by the ETH Board in its meeting of December 2018 [25], the geographical distance that separates a location from its parent institution can pose several challenges already at the cantonal level. These challenges can be academic and operational, and are likely to be exacerbated by a lack of critical mass on site. From a research and education perspective, the distance can lead to fewer or poorer academic interactions with peers and less participation in teaching activities (or a loss of quality due to hybrid and digital modes of interaction, or frequent and strenuous commuting). In general, associated locations must be integrated in the teaching effort of the institutions as a whole. However, their size will generally not be conducive for local undergraduate education, such as a bachelor program fully on site.

From an operational point of view, the location may be subcritical in providing the same level of service available at the parent institution. Practical examples include catering facilities and tariffs, functions and facilities connected with the information systems such as payments, access controls and security, and interventions in the event of incidents. At the international level, the experience of such gaps and a potential feeling of detachment can be amplified by cultural and societal differences. While remote

[24] This also applies to national locations not included in this mandate that have specific goals or mandates that do not necessarily entail a full teaching and basic research mandate; e.g. a research institute.
[25] Meeting of the ETH Board, 12-13 December 2018, item 7; see also meeting of 4-5 July 2018, item 9.

digital connections and shared platforms, as well as travel between the location and the parent institution promote integration, reaching a critical mass at the location remains essential to create a material and intellectual community that can bring achievement and success. However, the need for integration of the associated locations with the parent institution remains. This has to be balanced with commitments the ETH Domain institutions make with respect to sustainability, notably professional travel. This balance needs to be carefully addressed for each associated location.

1.4 Analysis of the opportunities and challenges at the current locations

Annex 1 presents the opportunities and challenges observed at the existing locations listed in the introduction [26]. For each location, the parent institutions provided the following elements of information, through a short survey related to this mandate:

- the academic vision and expected opportunities at the time of inception of the location, as well as current and future opportunities;
- the challenges that have emerged at and since inception, and those that may still arise;
- the resources provided by the partners and by the parent institution;
- the current volume of the local activity and a possible target critical mass.

The review confirms that the institutions have adequately calibrated the opportunities, risks, resources and efforts over the past fifteen years. It also converges with the analysis presented in section 1.3 on critical mass. Locations considered in this mandate that reach at least the size of ten to twelve laboratories on site tend to achieve a better critical mass.

At the international level, partnerships have been fruitful. They are largely or entirely funded locally and have either been renewed [27] or are currently the object of discussions towards their renewal [28]. Long-term developments underway at the cantonal locations also show that the opportunities identified previously have materialized, and that future ones are arising as a result of the existing activities. For example, the Canton Valais and EPFL are tentatively discussing possible new directions of research such as hydropower and energy integration. These developments would present a significant complement to the existing activities at the location in the fields of renewable energies, green chemistry and carbon cycle, and energy storage. The Canton has already signaled the ambition

[26] EPFL Neuchâtel, EPFL Geneva at Campus Biotech, EPFL Valais-Wallis, EPFL Fribourg, ETH Zurich Basel campus (home of the D-BSSE), Empa's Laboratory for Materials for Renewable Energy in Sion, operated jointly with EPFL, Singapore-ETH Center, and EPFL Middle East.

[27] ETH Zurich renewed its legal agreement in Singapore in 2019.

[28] EPFL is in discussions with UAE Government for a long-term partnership as a follow-up to EPFL Middle East.

to maintain (and increase) its financial investment in the activities in Sion, alongside the development of an innovation park to enable technology transfer and a startup ecosystem.

Of similar size, the campus of EPFL Geneva is also coming to an important junction. With the completion of the Blue Brain Project (BBP) in sight, a redeployment of resources is under consideration to set up a new human brain initiative, in partnership with the University of Geneva and the University Hospital (HUG). ETH Zurich is realizing a new building for its Basel campus, where all of D-BSSE research groups will be united under one roof as of 2022, in the immediate vicinity of the University of Basel on the Schällemätteli campus.

The opportunity-challenge analysis of Annex 1 is complemented by an input-output analysis: Annex 2 presents an aggregated summary of the resources invested and of the academic outcomes. The financial indicators show that locations attract substantial investments from third parties and local governments, which attests to their local importance. They also show that academic outcomes are of high level (nearly 1200 doctoral students and over 8000 publications), and are accompanied by the creation of significant economic value: technology transfers (over 217 priority patents and 80 licensing agreements), spin-off companies (45) and job creation (an estimated 680 globally, of which over 400 in Switzerland). On average, locations currently generate 4 to 5 spin-off companies a year, out of 55 at the level of the ETH Domain; roughly one in ten spin-off companies of the ETH Domain is born at the locations. This relatively strong innovation output is enabled by the leverage provided by the parent institutions and by the local context. Accordingly, these spin-off companies attract a significant volume of venture capital (over 600 MCHF to date).

2 Boundary conditions and feasibility

Chapter 1 has examined the motives for the creation of locations and placed their existence in the context of institutional strategy (parent institution, ETH-Domain, Federal Government), as backed up by the review of the existing locations in Annex 1. This chapter addresses the boundary conditions conducive to a successful operation at a location, which should be reviewed by the ETH Board at the time of deciding on the creation or continuation of a location.

2.1 Definition of a location

Based on previous decisions of the ETH Board, notably the 2015 strategy for international locations, and based on the form of the existing locations both in cantons and abroad, this document puts forward a definition of a location.

A location of the ETH Domain within Switzerland is characterized by the sum of the following attributes:

1) it has a durable representation of the parent institution with full academic units onsite;
2) it requires a local operational management;
3) it maintains a full academic and administrative subordination to the parent institution;
4) it has a separate financial management for reporting purposes, consolidated with that of the parent institution;
5) it operates under the name and brand of the parent institution.

In addition to the elements above, an international location also verifies the following aspects:

- it has a legal structure approved by the ETH Board;
- it has the ability to enter contracts locally (employment, insurance, banking, other);
- if an independent corporate entity needs to be created with a local partner, the parent institution verifies with the ETH Board that the proposed structure is compatible with the laws and regulation that apply to the ETH Domain.

2.2 Principles of independence and academic governance

In order for an institution to consider opening or maintaining a location, the following fundamental management principles must be guaranteed by the hosting authority or partner (canton or foreign country):

- academic freedom;
- absence of political interference or unilateral influence;
- transparency toward the ETH Board and Switzerland;
- management autonomy;
- regulations conducive to trans-cantonal or -national research (e.g., data transfer and use);
- rules on authorship, ownership, and IP management aligned with those of the ETH Domain;
- verified local scientific integrity;
- evident absence of corruption;
- context of human rights and equality of opportunities similar to the one of Switzerland;
- inclusion of sustainability considerations.

These are prerequisites for enabling the location to function and interact with researchers at the parent institution or in the ETH Domain. As far as possible and especially in the case of international partnerships to which Swiss legislation may not apply, such requirements must be checked by the parent institution and should be part of the contract. In order to maintain the academic and financial management standards expected by the ETH Domain, it is of crucial importance that the location has the latitude to apply Swiss standards under the supervision of its parent institution.

2.3 Infrastructure and hosting conditions

The infrastructure at the location should be well suited to host the proposed academic activities. The infrastructure plan should cover the proposed lifetime of the location and be commensurate with the parent institution's academic commitments to the location. At locations where research laboratories are envisioned and the infrastructure is provided by the partners, the parent institution needs a contingency plan to reintegrate the teams at the parent institution's headquarters if the location has to cease its activities at the end of the contractual period. In general, partnerships with cantons extend over longer time periods, typically several decades [29]. This ensures that a canton's investment (infrastructure, operation or both) is based on a long-term development plan and a durable partnership with the ETH Domain.

Visibility over several decades is also crucial to create academic plans that integrate the location in the development strategy of the parent institution's schools, departments or institutes (turnover plans for research laboratories and new hires) and in its real estate planning. Preferably, the infrastructure at the location should be provided by the hosting government or partner, to allow for a more efficient use of ETH Domain resources to fulfill its core missions.

2.4 Financial principles: total cost of ownership over time

As part of the preparation to open a new location or extend its existence, the total cost of ownership and all the financial contributions over the planned lifetime must be evaluated. These elements should be part of the plan submitted to the ETH Board. This ensures that the commitments made by the parent institution to the location are commensurate with the resources available and with the infrastructure needed for the project.

If the contractual term of the partnership is shorter than the duration of the parent institution's commitment to the location, a specific fold-back plan must be in place to ensure the financial integration of the activities back into the parent institution's budget including eventual infrastructure needs, or to phase out these activities. If sufficient infrastructure is not available elsewhere in the parent institution's perimeter (at its headquarters or at another potential location), the parent institution must incorporate infrastructure budgets in its financial plans in order to either expand its own capacities or to procure rental space.

[29] For example, the partnership of EPFL with Neuchâtel and Fribourg are open-ended, the one with the Canton Valais extends over 40 years (first phase). The partnership Fribourg is for at least 20 years (first phase).

2.5 Positive multidimensional risk analysis

A multidimensional risk analysis and management plan constitutes an important part of the evaluation of a potential location, both at the inception and at the time of renewal. It is beyond the scope of this document to enumerate all possible risks or the methods used to asses them; this falls to the parent institution and to the ETH Board on a case by case basis. Nonetheless, the next two paragraphs address some of the risks that the institutions need to assess before opening, expanding or maintaining a location.

2.5.1 Cantonal locations: political and financial considerations

At the national level, the Cantons and the Confederation work together and have sustainable and constructive common interests – notably in the ERI domain. Mutual obligations of the Cantons and the institutions of the ETH Domain at the various locations have been honored to date, and development plans for the future attest of the value of the partnerships. Cantons usually invest substantially in locations, but also achieve a unique return, particularly for the locations that have reached a critical mass and where results are visible. In these cases, it is unlikely that commitments will be curtailed or terminated by the cantonal authorities, or that their value will be called into question. Cantonal funds and resources tied up to the location could, however, be viewed as financial competition with the cantonal universities (if any) or other cantonal education and research institutions. This challenge could come from the cantonal institutions or from a popular vote [30].

The institutions of the ETH Domain, notwithstanding their federal missions and role, cannot establish locations that would reach critical mass in every Canton. When planning a new location, the parent institution should carefully develop a strategy that includes the local academic partners (universities and universities of applied sciences, possibly other institutions of vocational training). This ensures academic complementarity and political stability. It also helps to avert the risk that faculty in residence at the location fails to establish collaborations with local academics and researchers. The parent institution (and the ETH Board) must also carefully manage the expectations of other Cantons where a location does not exist, but where local authorities aspire to establish one. For this purpose, the criteria pertaining to this strategy document and the limitations imposed by available resources must be put forward transparently, and institutional strategy should be the main driver for the development of a location.

[30] This was the case in Fribourg, where the initial commitment of the local authorities in favor of the location was seen by some political constituents as a direct threat to the university's budget; subsequently, a popular vote in 2021 was narrowly in favor of an increase in capital of BFF SA, a company owned by the Canton and by the City of Fribourg, for the purpose of the construction of the site of Blue Factory, including the SLL building.

Finally, an important question that the institutions and the ETH Board have to consider is the long-term balance of mutual commitments at each location, between the federal and local level. Equilibrated commitments across the locations also need to be maintained so that the ETH Domain is perceived as fair in its involvement in the various regional locations and balanced in its use of federal resources. Since the locations are not identical in their setup and the respective framework conditions, it is all the more essential that institutional strategy drives the development of each location and that the resources invested by the parent institution guarantee the principle of complementarity. An important corollary is that parent institutions can significantly reduce their structural and financial risks if they are not responsible for the infrastructure at the location, unless the nature of the onsite activities requires the Confederation as the owner. In this case, the evaluation of this necessity should be documented and approved by the ETH Board.

2.5.2 Further considerations for international locations

As discussed earlier in this document, international locations offer largely similar opportunities and challenges to cantonal locations. However, there are additional risks that need careful attention when establishing a location abroad. These risks are highlighted below with references to basic principles and conditions that an institution should consider when preparing a plan for a location.

- **Political**: the local government is stable; Switzerland has long-lasting bilateral political and commercial relations with this country and maintains an official representation on-site (EDA).
- **Geopolitical**: the greater region around the country is of strategic interest to Switzerland; the country's political relations with its neighbors are conducive to the establishment of a location.
- **Legal and governance**: the laws and regulations are compatible with those of Switzerland, in particular with respect to conducting academic activities, according to the boundary conditions defined in chapter 2; contractual clauses for the settlement of potential differences and litigations take into account the local conditions to protect the interests of the parent institution, the ETH Domain and Switzerland (for example, when choosing an independent place of jurisdiction and the applicable law, if Switzerland and Swiss laws cannot be the reference).
- **Human and societal:** the location's environment guarantees a system of basic human and societal core values that is compatible with Switzerland; these include human rights, equality, the rule of law, access to adequate healthcare and education.
- **Operational and financial**: the location is the result of an invitation from reputable local partners, preferably by or with the support of local authorities; the partners are proven to be free of corruption and there is transparency about the origin and use of all funds that go towards the operation of the location; all the financial risks associated with the activities of

the institution are covered by the contract; academic and managerial independence from the local partners is guaranteed as well as transparency and full disclosure to the ETH Board and Swiss authorities; the operation of the location is mostly funded by local sources in order to preserve the resources of the ETH Domain.

- **Reputational:** the institution works with local Swiss authorities to understand the environment before establishing or maintaining the location; the institution carefully reviews the faculty involved in the local collaboration, the international accreditations and positioning of the local universities or companies involved; in doing so, the institution weighs potential reputational risks against the objectives of the location and has a risk management plan.

An engagement abroad requires additional care compared to a cantonal location, because sustainability issues are more pronounced, and transnational and local conditions can change beyond the power or influence of the parent institution or Switzerland. Therefore, contractual terms should remain commensurate with the context and visibility of the location's country and should be considered as part of the risk management plan. The parent institution should also maintain an updated exit strategy at the time of contract renewal, which should be discussed with the ETH Board.

It is important to note that the preparatory work for the two international locations of the ETH Domain in Singapore and in the UAE included a detailed risk analysis. The inceptions both of EPFL Middle East and of the Singapore-ETH Centre were approved by the ETH Board, after conclusive risk analyses and contracts had been presented [31]. As it turned out, some of the risks identified prior to the inception of EPFL Middle East materialized during the partnership, but the ongoing risk management proved entirely appropriate, and the location continued to fulfill its missions and objectives. Other current or future initiatives should continue to abide by the same principle [32].

3 Governance – at the institutional, ETH Board, and Federal level

This last chapter addresses the role of the various governance levels in the decision-making processes as well as the mode and frequency of evaluation of the locations. Parent institutions engage directly in discussions with cantonal and international partners, plan the development of existing locations and the possible creation of future locations. After discussion in the Domain meeting to ensure coordination among the institutions, the ETH Board is responsible for validating the plan for a new

[31] Decisions of the ETH Board, 11-12 December 2008 and 9-10 December 2009.

[32] A recent initiative of the Hong Kong Government, although fully funded locally and ready from the academic perspective, was declined by the Board of EPFL due to regional concerns around stability and security.

location. The same applies for the renewal of an existing one, opening the way for the parent institution to make the final decision.

In exercising its validation power, the ETH Board confirms that complementarity exists and warrants the existence of the future location (intra-ETH Domain and at the national level for cantonal locations). When validating the institution's plan for the future location, the ETH Board also verifies that the value proposition and the boundary conditions for the location are met, as described in this document. Even if a new location is created through the involvement of another Federal Office or Department, the respective roles of the parent institution (preparation, final decision) and of the ETH Board (validation) are retained.

3.1 Attributions and decision process

This section describes the federal part of the decision-making processes pertaining to the existence of a location. Leaving aside the parallel decision-making processes at the level of the Cantons or international partners, three governance levels are pertinent for this mandate: the parent institution itself, the ETH Board, and the SERI acting on behalf of the Swiss Government.

3.1.1 The parent institution

Due to their academic activities, institutions are generally the first point of contact for opportunities that arise to consider the creation or the continuation of a location. Only the institutions have the necessary agility and academic space to explore opportunities and discuss them with local partners on the basis of the framework conditions applicable to the ETH Domain. It is therefore natural that the parent institution draws up the complete business plan for a location, negotiates its terms and conditions with the partners, and submits all necessary information and contract proposals to the ETH Board for validation.

After the ETH Board has validated the plan, the parent institution can decide to enter into the collaboration and to sign the contract as the legal entity involved in the partnership according to the rules valid in the ETH Domain. Retaining the decision at the institutional level enables the parent institution to exercise its autonomy while safeguarding the interests of the other institutions of the ETH Domain, in the unlikely event that the location faces difficulties that entail a financial risk.

3.1.2 The ETH Board

The creation or renewal of a location is a decision of strategic importance. The ETH Board must validate the plan for a new location (or a renewal) before the parent institution decides on the opening (respectively the renewal) of that location, regardless of the funding sources and even if the parent

institution does not contribute to the funding for the new location (i.e., if funding is entirely borne by the local partners). This ensures that the complementarity between the location and the other stakeholders of the ETH Domain has been verified (other institutions and their respective locations, existing or planned). It also allows for a wider discussion about cantonal options and complementarity at the national level. Plans and contracts in their final form should be submitted to the ETH Board at least 3 months before the parent institution expects the approval of the ETH Board [33].

3.1.3 The SERI (SEFRI/SBFI) for and on behalf of the Federal Government

If a location is being considered for inception or continuation by the SERI on behalf of the Federal Government, the institution(s) and the ETH Board will jointly discuss the scope and framework conditions and ensure that the ETH Domain and the institution(s) are provided with the necessary resources for the implementation. The ETH Board must still validate the proposal and the decision on the implementation must be made by the institution(s). Contracts are signed jointly by the institution(s) and the ETH Board. For any real estate decision in relation with a location, the specific regulations for the ETH Domain apply [34].

3.2 Information, evaluation and review process

The parent institutions continuously monitor their respective locations as part of their internal academic, business and financial controls. This includes the following:

- Financial reviews of the activities of the locations take place within the framework of the accounting of the parent institutions. For an international location, financial reviews should be performed by a local auditor in coordination with the local government, and these verifications, including bank confirmations and management reports, should be provided by the location to the parent institution.
- The academic evaluation of a location follows the regular calendar and evaluation mode of the parent institution, except for the first six years after its inception. At a location commissioned by the SERI, the ETH Board decides on the calendar and the form of the academic evaluation.

Each location should be presented to the ETH Board at least twice within the first six years of its existence, then it should follow the regular evaluation and reporting patterns of the parent institution.

[33] Decision of the ETH Board, 4-5 December 2013.

[34] Weisung über das Immobilienmanagement im Bereich der Eidgenössischen Technischen Hochschulen (Immobilienweisung ETH-Bereich); Verordnung über das Immobilienmanagement und die Logistik des Bundes, SR 172.010.21; Bundesgesetz über die Eidgenössischen Technischen Hochschulen (ETH-Gesetz), SR 414.110.

If necessary, the ETH Board can extend the initial reporting period beyond six years. For each formal presentation, the parent institution presents:

- the latest academic evaluation, key indicators of academic and innovation activity (either internal or peer-reviewed) and an update on current and future development plans.
- a full disclosure of all financial elements, including
    - expenditures by type: infrastructure, operations and academic expenses, capital and operating expenditures;
    - sources of funding or in-kind contributions: from own budget, cantonal or international partners, and other third parties.

After this initial phase, a regular evaluation of the location, commensurable with its size, scope and age, is scheduled by the ETH Board and the parent institution. The ETH Board also receives specific evaluations of the location (e.g. when negotiating a contract renewal, or as provided for in the contract). These specific evaluations include an analysis of the value of the location for the parent institution, past and future opportunities and risks as well as an analysis of the management.

In addition to these formal reviews by the ETH Board, the parent institutions include in their annual reports an executive summary and update on their respective locations. The President of the ETH Board can then decide to request a discussion or presentation to the ETH Board.

At the end of a contractual duration, when renewal is being considered, the conditions may no longer exist to renew the partnership. Applying the same criteria considered for a new location (presented in chapters 1 and 2), the parent institution may then decide to wind down the activity and close the associated location. In such case, the application of the fold-back plan and its accompanying measures, will be communicated by the parent institution to the ETH Board, alongside a risk analysis, followed within a year by a final report. The parent institution should complete all projects by the time of closure, in alignment with the principle that local commitments should be commensurate with the duration of the contract (see sections 2.3, 2.4, 2.5.2). In planning and executing the closure, the parent institution ensures that no exposure and collateral effects exist for the other institutions of the ETH Domain, for the ETH Domain itself, or for the Swiss Government. These elements, alongside a list of potential commitments or liabilities foreseen to remain active beyond the closure, are all part of the information of the parent institution to the ETH Board.

3.3 Communications (local, internal, Swiss level, global)

With the current number of existing locations and the size of their activities, it is becoming increasingly important to communicate their development in order to maintain transparency, trust with our

Federal and Cantonal governments and goodwill with academic partners. The same holds true at the international level. More importantly, a regular communication by the parent institutions supported by the ETH Board, which highlights the complementarity and the advances made possible at the locations, will improve their visibility. It will bring the synergies with the Cantons or international partners closer to the Swiss federal constituencies and safeguard the interests of these partners and of the ETH Domain. This visibility will in turn benefit professors and researchers of the ETH Domain at the locations and help identify future opportunities.

Internal communication within the institutions is important for cohesion and the integration of the locations. It is just as important to improve regular communication to the general public about the impact of research and innovation on our regional economy and society, which is brought about by investing in the locations. While this is of crucial importance for the cantonal authorities, who need to justify their financial commitments to the ETH locations towards their population, it is equally important for the ETH Domain, since federal funds from the ETH Board's budget flow into these locations.

Finally, both visibility for the international locations and the corresponding communication tend to be less pronounced in Switzerland and more directed towards the international. Positive communications should also be provided to the Swiss general public more frequently. This would show where resources come from, where they are invested, for whose benefit and with what impact. It would also help to raise more awareness of Switzerland's international positioning through its ERI activities and of the role of the ETH Domain.

4 Reference List

A) ETH Board: Discussions and Decisions

Discussion. Strategie für die Standorte der Institutionen des ETH-Bereichs. Vorgehensvorschlag zuhanden des ETH-Rats (ETH Meeting of **19/20 May 2021**, item 8, in German and in French).

Decision. Intermediate Evaluation 2019: Response of the ETH Board (2nd Reading) (ETH Meeting of **25/26 September 2019**, item 7).

Written Communication. Singapore – ETH Centre SEC (ETH Meeting of 10/11 July 2019, item 4.2).

Decision. Intermediate Evaluation 2019 of the ETH Domain: Self-Assessment Report, 2nd reading and adoption (ETH Meeting of **12/13 December 2018**, item 7).

Decision. Monitoring external locations ETH Domain (ETH Meeting of **4/5 July 2018**, item 9), in particular Annex 1, Monitoring external locations ETH Domain.

Discussion. International competitiveness and positioning of the institutions of the ETH Domain (ETH Domain Retreat Meeting of **5/6 July 2017**, Module 1. C., Documents available in original language, without translation):

- Annex 3.5.1 ETH Zurich: Nationale Präsenz und internationale Vernetzung der ETH Zürich.
- Annex 3.5.2 EPFL: Présence nationale et internationale des deux EPF et relations entre elles.
- Annex 3.5.3 PSI: Nationale und internationale Präsenz und Vernetzung des PSI. Das PSI – ein nationales Institut mit regionaler, nationaler und internationaler Wirkung.
- Annex 3.5.4 WSL: Standortpolitik der WSL - Nationale Präsenz und internationale Vernetzung.
- Annex 3.5.5 Empa: Empa – nationale Präsenz und internationale Vernetzung.
- Annex 3.5.6 Eawag: Eawag – nationale Präsenz und internationale Vernetzung.

Written Communication. Vollzogene Immobiliengeschäfte. Projekt BSS der ETH Zürich auf dem Areal Schällemätteli in Basel: Baurechtsvertrag unterzeichnet (ETH Meeting of **17/18 May 2017**, item 4.5).

Decision. Standort Empa Thun - Finanzierungsbeitrag und langfristige Verpflichtung. Antrag des Direktors der Empa (ETH Meeting of **7/8 December 2016**, item 9, in German).

Decision. International Strategy for the ETH Domain. Internationale Strategie für den ETH-Bereich (ETH Meeting of **4/5 March 2015**, item 8, internal document).

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Decision. Entwicklung des Areals Neuenburg (Satellitenstandort Mikrotechnik) (ETH Meeting of **5/6 March 2014**, item 11, in German and in French).

Decision. Wahrnehmung der Strategiefunktion des ETH-Rats bei strategischen Initiativen mit Fokus auf Standortentwicklungen (ETH Meeting of **4/5 December 2013**, item 10, in German and French), in particular Annex: Domaine des EPF: Création d'antennes régionales. Principes et critères de collaboration avec les Cantons (in French).

Decision. Finanzielle Beiträge der Kantone an die Institutionen des ETH-Bereichs: Datenerhebung, (ETH Meeting of **25/26 September 2013**, item 8, in German and in French).

Speaking Note President ETH Board. **13 October 2013**, Mietgeschäft Campus Biotech Genf.

Decision. Singapore-ETH Centre, Future Cities Laboratory: Agreement between the Government of the Republic of Singapore and the ETH Zurich (ETH Meeting of **9/10 December 2009**, item 63).

Decision. EPFL off-shoring à RAK, (ETH Meeting of **11/12 December 2008,** item 26).

Decision. «Systems X». Projekt für eine neue biologische Wissenschaft in der Schweiz und Initiierung des C-BSSE (Center of Bio-Systems and Systems Engineering) in Basel. Antrag des Präsidenten der ETH Zürich (ETH Meeting of **24/25 March 2004**, item 27, in German).

B) Documents of reference

Strategic Planning 2021–2024 of the ETH Board for the ETH Domain.

Strategic objectives of the Federal Council for the ETH Domain 2021–2024 (in German, French or Italian), **2021**, BBI 2021 1038.

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Intermediate Evaluation of the ETH Domain **2019**. Self-Assessment Report of the ETH Board. Adopted by the ETH Board at the meeting of 12/13 December 2018.

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- A Basic Mandate of the ETH Domain and Coordination of the Entire Swiss Higher Education Sector.
- A.5 Cooperation with Cantons; Cooperation Agreement between the Confederation and Cantons.

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5 Annex 1 – Location profiles

This annex contains a review of the locations in the ETH Domain under 15 years of age since inception, based on a survey of the respective locations by the working group in September 2021. The main conclusions regarding opportunities, challenges and the anticipation by the institutions are presented in section 1.4.

The survey contained the following elements:

A. Institutional strategy: opportunities and risks

1. A summary of the academic vision that presided at the decision to engage in the partnership and to open the location.
2. A retrospective analysis of the opportunities that existed at the time of inception, and to what extent those opportunities have materialized since.
3. A prospective analysis of the opportunities that still exist today or the new ones, resulting from the development of the activities at the location.
4. The identification of the challenges that have emerged at and since inception, and a prospective view to the potential challenges that may still arise within a 10-year horizon, and beyond.

B. Resources and critical mass

1. The resources provided by the partners (be it a Canton or another country, a local authority or government – or its institutional arm, or any other private interest), and the resources provided by the ETH-Domain institution.
2. The current volume of the local activity already reached and being developed, expressed in terms of the number of professors and/or staff at the location, the infrastructure scope (m2, value of the rent or of ownership, either in cash or in kind); the operational budget at the location, or other important aspects that arise locally.
3. How would the parent institution set a target critical mass (volume of activity), and what would the target critical mass be at the location (it could be defined using the indicators under B.2 above, and/or with additional qualitative criteria). If needed, setting the target may include the elements of collaboration with the local partners - the critical mass then being that of the overall activity at the location.

The feedback from the locations on the elements above is summarized schematically in **Tables 1-8**:

- Table 1: ETH Zurich Basel campus; D-BSSE (2007-2021)
- Table 2: EPFL Neuchâtel (2008-2021)
- Table 3: EPFL Valais-Wallis (2012-2021)
- Table 4: EPFL Geneva (at Campus Biotech) (2013-2021)
- Table 5: EPFL Fribourg (2014-2021)
- Table 6: Empa Sion (2015-2021) – collocated with EPFL Valais-Wallis
- Table 7: Singapore-ETH Centre SEC (2010-2021)
- Table 8: EPFL Middle East (2009-2021)

Table 1: ETH Zurich Basel campus (2007-2021)

Opportunities expected and seized since inception	Status and new opportunities
• Political mandate to strengthen the research location Basel with start-up financing by the Cantons BS and BL • Establish the new field of Systems Biology in Switzerland (as cornerstone of the national initiative SystemsX.ch) and integrate systems biology into a new, multi-disciplinary department at ETH Zurich • Physical proximity to University of Basel and the University Hospital of Basel, life science and health care industry and to excellent research institutions (FMI, Swiss TPH etc.) and integration and collaboration with these partners • Strong scientific networks were established with the University Basel and the University Hospitals Basel as reflected by many collaborations. Such collaborations are also institutionalized, e.g., in the NCCR Molecular Systems Engineering co-directed by D-BSSE and the University of Basel, as well as in the NCCR AntiResist to which D-BSSE contributes considerably. • D-BSSE and ETH Zurich are seen as strong partners in the Basel area: ETH Zurich and the University Basel are equal partners in the Botnar Research Center for Child Health (both directors are professors at D-BSSE). • Strong networks were established with the life science industry in Basel: this is manifested by many collaborations and substantial funding provided by the industrial partners. • Strong relations with cantonal institutions were formed (e.g., BaselArea.Swiss: D-BSSE is in the advisory board of the DayOne Health accelerator).	• The start-up phase in terms of hiring professors and setting up facilities was very successfully concluded • D-BBSE is part of ETH Zurich's integral planning cycle • In 2030, biosystems engineering and informatics will be essential components of biomedicine, not only in basic research, but also in the implementation of the knowledge gained in medicine and industry. D-BSSE aims to shape and drive this development. As the hub of the Basel Life Science Campus, D-BSSE will position itself as the world's leading department for the engineering of molecular and cellular systems and computational biology. Ultimately the developments will guide the department and its academic and industrial partners towards establishing the conceptional basis of Engineering Translational Medicine. • The strong connections with local partners from the University of Basel, the University Hospitals, and industry will be formalized, e.g., by MD/PhD programs, a joint Bachelor program, co-joint industrial doctorate programs, co-joint industrial postdoctoral programs.
Challenges that emerged since inception	**Foreseeable challenges over next decade**
• Not fully integrated into daily interactions within ETH Zurich as a whole ("Universitas"); physical distance from ETH in Zurich requires more effort (for scientific interactions, administrative support, student exchange), e.g., travelling, communication, etc.	• Building on the foundations laid in the first ten years of its existence, D-BSSE aims to focus on the understanding of the individuality and variability of biological systems ultimately leading to the control of living systems. As consequence this orients D-BSSE strongly

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- Different administrative requirements and support (e.g., access to Zurich-based central services like ASVZ, KiHZ etc., and core facilities), additional management attention required, dissipation of energies
- Need to duplicate core facilities and supporting services available in Zurich
- Access to Zurich-based (engineering) students
- Junior partner within (Hochschulplatz) Basel university centre

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towards translating corresponding results into medical and industrial applications. This approach includes the spatial and temporal investigation of biological systems at all levels from single molecules to entire patient populations. On the one hand, suitable experimental techniques and computational analysis tools must be developed to capture the variability of biological models. On the other hand, technical solutions must be developed to control variability in newly designed and modified biological systems.

- "Engineering Translational Medicine" is a new strategic direction in which D-BSSE will play a pioneering role. The goal is to develop new therapeutic and translational approaches via engineering molecular and cellular systems to control cellular processes.

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Resources provided by the partners

- The Cantons of Baselland and Basel-Stadt both provided CHF 10 Mio each at the inception and a total of CHF 10 Mio in 2016.
- Direct contributions to equipment by industry (Novartis)
- Stiftungsprofessur Misrock to Prof Sai Reddy
- Fondation Botnar: Botnar Research Center for Child Health

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Resources provided by the institution

- At inception: 8 MCHF from ETH Zurich and 5 MCHF federal funds (SUK), followed by a yearly global budget provided through core funding of ETH Zurich (funding in 2020: 26.2 MCHF (base funding) and 6.8 MCHF in additional contributions)
- Space in m^2: 9'830
- New Building BSS as of 2022 (Campus Schällemätteli, jointly with University of Basel) with 19'000 m^2, approx. 236 MCHF

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Current volume of the local activity

- Key figures in 2020:
  - Professors: 20
  - Staff: >320 (headcount)
  - Students: 176 (Master), 164 (Doctorate)
  - Degrees: 37 (Master), 40 (Doctorate)
  - ERC grants (2007 – 2021): 17
  - Spin-offs (2007 – 2021): 15
  - Industry collaborations: >20
  - Publications: 200
  - 3rd party funding: 14.6 MCHF (31% of total expenditure)

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Target critical mass

- An overreaching initiative combining current activities in molecular and cellular systems engineering towards therapeutical and translational applications is "Engineering Translation Medicine (ETM)", which D-BSSE plans to establish in Basel. ETM will be a uniquely specialized and strong pillar of the overall ETH medicine strategy. Currently, D-BSSE is in negotiations with the Basel pharma industries to establish internationally unique doctorate and postdoctorate programs to bring this unique expertise into therapeutical and translational applications.

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Table 2: EPFL Neuchâtel (2008-2021)

Opportunities expected and seized since inception	**New opportunities**
• A rationalization of the academic landscape in Western Switzerland, mediated by SERI • Strengthening of microengineering on the *Arc Jurassien*, and strengthening of the collaboration with CSEM (through Art 15 and in the governance) • Development of new directions of research in the domains of advanced microengineering and microelectronics • The construction of a new building for microtechnology and regrouping of all the academic activities in Neuchâtel under one roof. EPFL Neuchâtel is the main user • Development of industry-sponsored chairs	• Development of advanced manufacturing and related fields • Canton intends to expand the activities, provide a second building (shared between the actors of academia, CSEM, startups and incubating ventures) • Increased industrial partnerships and potential for additional sponsored chairs. • EPFL Institute combines microengineering and electronics • Potential for increased shared infrastructure (CSEM, other partners)
Challenges that emerged since inception	**Foreseeable challenges over next decade**
• Physical distance to EPFL's main campus	• Increase participation from third parties • Develop shared platforms • Strengthen local collaborations (CSEM, other actors)
Resources provided by the partners	**Resources provided by the institution**
• Microcity building : 72 MCHF • 8035 m^2 • JD7 building in planning (50 MCHF)	• Estimated (2011-2024): 129 MCHF • Estimated (2011-2024): 127 MCHF in research projects (third parties)
Current volume of the local activity	**Target critical mass**
• 200 staff (incl. PhD students) • 78 MSc and semester students (2020) • 10 Labs (STI), 4 research areas • 2 centers (Artificial muscles, Micro-manufacturing science and engineering)	• Maintain current level or slight increase in areas of local strength and pertinence (10-12 chairs)

Table 3: EPFL Valais-Wallis (2012-2021)

Opportunities expected and seized since inception	New opportunities
• Set up an extended campus in an existing, robust industrial environment (particularly chemicals and hydroelectricity). • Important financial contribution of the Canton of Valais (CAPEX: 100 million CHF, OPEX: 5 to 12 million CHF per year for 40 years, from the seventh year • Possibility of collaboration with the HES-SO Valais Wallis in applied research. • The initial project foresaw the establishment of 150 EPFL employees and researchers in Valais. Today, more than 220 people are active there and this figure will most likely rise to 400 by 2023. • The synergies between green chemistry, renewable energy and climate are considerable and perfectly aligned with today's major challenges.	• Since 2017, second academic plan oriented towards the study of extreme and polar environments (ALPOLE). • Construction of a new 10'000 m2 building financed by the Canton of Valais, and to be opened in 2022. • New opportunities could arise within the hydroelectricity sector and the Canton has a favorable position with regard to a new development phase for the EPFL Valais Wallis Campus.
Challenges that emerged since inception	**Foreseeable challenges over next decade**
• The initial challenge was based on the success of the implantation of world-class researchers in Valais, particularly in terms of the socio-cultural environment, as well as the ability to find housing quickly for a large number of people and to manage the geographical distances. • The quality of the scientific instruments and the commitment of the involved faculty staff also allowed the success of the implementation phase.	• The ability of the region to provide a strong economic environment that offers employment opportunities to EPFL PhDs and postdocs as well as an ecosystem that allows its startups to thrive. • The development of a branch of the Swiss Innovation Park in Valais should make a significant contribution to this.
Resources provided by the partners	**Resources provided by the institution**
• The Canton of Valais has financed the infrastructure (buildings) • Basic scientific equipment • Starting funds of the funded chairs and the support of 7 chairs per year for 40 years. • Between 2013 and 2020 the Valais has financed 87 million CHF (CAPEX, OPEX and buildings).	• EPFL and third parties contributed to 133 million CHF (including overhead, contributions from sponsors, Swiss and European research funds and other external funding). • EPFL budget's share of this amount (excluding overhead) represents 38 million CHF.

Current volume of the local activity	Target critical mass

• As of 31.12.2020, 218 employees were located in Sion, of which
  • 186 scientific staff including 10 Professors (PO and PATT),
  • 2 full Professors
  • 1 MER
  • 76 PhD students,
  • 37 administrative and technical staff.
• As of today, EPFL Valais Wallis has more than 9500 square meters of space at its disposal. The use of these premises is not invoiced by the Canton of Valais.
• The overall operating costs for 2020 have reached 35.1 million francs (including overhead).
	• Eventually, the new Alpole building (10,000 m2, opening in 2022) will increase the number of staff employed on the EPFL Valais Wallis Campus to 400, which is a good critical mass.
	• The global Energypolis Campus project (including EPFL Valais Wallis and HES-SO Valais-Wallis) will bring together more than 1,500 people, scientific, technical and administrative staff as well as students.
	• In addition, startups, SME's and R&D branch of multinationals will benefit from 17'000 square meters of space (offices, laboratories, testing facilities) in the local branch of the Swiss Innovation Park that should be completed by 2024 in the immediate vicinity of the Campus.

Table 4: EPFL Geneva at Campus Biotech (2013-2021)

Opportunities expected and seized since inception	New opportunities
• Mutualization of resources between the founding partners (EPFL and UNIGE): joint experimental platforms (Neural Microsystems, Preclinical Neuroscience, Human Neuroscience, Gene Therapy) • The Wyss Center for Bio and Neuroengineering, who has heavily contributed to the establishment of joint resources and collaborative projects, acts as an independent research institute with whom many EPFL PIs collaborate. The center has transferred the ownership of its platform to the founding partners in 2021 • In terms of computational neurosciences, the Blue Brain Project, and the European Human Brain Project have heavily contributed to the field, both scientifically and in terms of computational resources made available internationally • The Health2030 Genome Center has proven to be a central instrument for global health through its participation in the surveillance of COVID variants in Switzerland, and has recently been ISO 15189 accredited, which opens the way for analysis of clinical samples in routine, and better integration in the global personalized health Swiss effort • In terms of industrial valorization, EPFL has seeded the creation of 7 startups (one of them being a Swiss unicorn) from Campus Biotech	• Campus Biotech's owner plans to build a new building (B4) starting in Spring 2022, giving an opportunity for existing actors on Campus to gather even more research groups, allowing: 1. reaching an even stronger critical mass on-site (dedicated to neuro-research, from all founding partners) 2. the development of the EPFL Neuro-X initiative at Campus Biotech which is complimentary to the Brain Health Initiative of HUG and UNIGE. 3. the creation of a clinical interface with HUG, centered on brain disorders
Challenges that emerged since inception	**Foreseeable challenges over next decade**
• Campus Biotech is full, allowing very limited organic growth of the groups present on-site • Governance aspects between the various partners remain an issue, especially at two levels: 1. scientific coordination between partners 2. operational governance. In this domain, EPFL has recently restructured its operational governance, which should prove to ease campus management	• Maintain and increase the level of external funding (sponsored chairs, platform activities)

Resources provided by the partners	Resources provided by the institution
• Estimated Canton, City, other partners (2014-2024): 16 MCHF • EPFL and UNIGE contribute equally to the annual budget of the Fondation Campus Biotech Geneve (FCBG) • The Canton of Geneva provides funds to match the funds received by the via Article 15 of LERI • HUG contributes 1.5 MCHH/year to FCBG • Health 2030 is a joint initiative of EPFL, UniGE, HUG, UniL, CHUV, UniBE, and Inselspital. Each member contributes equally to the initiative's budget via membership fees • The initial investment for the Health 2030 Genome Center were covered by the donation (10 MCHF) received from a foundation	• Estimated incl. sponsoring and BBP (2014-2024): 431 MCHF • Estimated research projects (2014-2024): 187 MCHF • Participation of two Schools (STI, SV)
Current volume of the local activity	**Target critical mass**
• 11 EPFL chairs at Campus Biotech • 200 staff, among which 83 PhD and 60 postdocs (Center for Neuroprosthetics) • 150 staff, among which 12 PhD, 27 postdocs, Blue Brain Project • approx 5'000 m^2 • There are plans to further develop EPFL activities at Campus Biotech, with the addition of several chairs (within the Neuro-X initiative), and a clinical interface with HUG. EPFL decision is pending	The B4 building project creates a unique opportunity to develop the EPFL Neuro-X initiative with Campus Biotech as main hub, with a parallel increase in UniGE presence (in neurosciences at large). This joint and coordinated initiative between EPFL, UniGE and HUG (the BrainHealth Initiative) would form an on-site community (from all partners) of approximately 40+ chairs active neurosciences, neurocomputation and neuroengineering, in addition to a presence of HUG clinicians on-site. As such it would constitute a thematic cluster of international level, comparable to reference centers such as Imperial College (neurotechnology), the Paris Brain institute, the McGovern Institute at MIT

Table 5: EPFL Fribourg (2014-2021)

Opportunities expected and seized since inception	New opportunities
• Creation of 4 new chairs + 1 invited professor (funding from Canton FR for 2 chairs + 1 invited prof). • Creation of a joint research centre with HEIA-FR and UNIFR, the Smart Living Lab, leveraging synergies in fundamental and applied research, at the interface between disciplines and in close interaction with industry. • Location: good central location in the city of Fribourg, close to main train station and University / HES campus Pérolles • Facilities: The Canton FR committed to build a building for the Smart Living Lab and provide temporary offices until the building is ready.	• Funding for 2 chairs + 1 research group (4.5M/year) is secured by agreement between EPFL and Canton FR for 20 years, from the date when the building of the Smart Living Lab will be delivered (2024-2044). • The building of the Smart Living Lab will serve as object for full-scale experimentation, with flexible spaces, systems and components accessible to researchers and high-resolution monitoring of performance and usage. An annual budget of 1M for the evolution/adaptation of the building for research purposes is foreseen in the agreement with the Canton FR (funding 50% Canton, 50% EPFL). • New synergies with the Architecture school of HEIA-FR will emerge when they relocate, after repurposing of the building "Halle grise" next to the building of the Smart Living Lab.
Challenges that emerged since inception	**Foreseeable challenges over next decade**
• Delays in development of the Bluefactory site (where EPFL Fribourg is hosted), due in part to political controversy, limited resources, regulatory hurdles, urban and energy planning processes • Delegation of construction and ownership of Smart Living Lab building by Canton to BFF SA, resulting in complex triangular relationship (EPFL-Canton-BFF)	• Create an attractive, high-quality work environment for EPFL staff in such conditions
Resources provided by the partners	**Resources provided by the institution**

• Total funding from Canton 2014-2021: 33.8M + 25M (building) = 58.8M
• Lump sums :
  ○ 3.66M for the seminal research program (2014-18) 'Building 2050'
  ○ 1.57M for collaborative research projects (2014-18) and Solar Decathlon 2017
  ○ 2M for the creation of two chairs (startup funds)
  ○ 25M for the construction of the building of the Smart Living Lab (not owned by EPFL but usage is granted free of charge)
• Recurring:
	• ca. 1M/y for two chairs (PATT)
	• 0.5M/y covering management and admin, and architect senior project manager for building project
	• 750k/y for maintenance + evolution of building (starting when building is completed)

○ 4.5M/y for EPFL chairs and research group ○ 377k/y for rents of temporary offices, until building is ready ○ 750k/y for maintenance + evolution of building (starting when building is completed) ○ 43k/y for communication and operational costs of the Smart Living Lab • Committed contributions from Canton for 2022-2044: total ca. 120M	
Current volume of the local activity	**Target critical mass**
• Professors: 4 since 2018 (1 full prof, 3 PATT) • From 2022: +1 new PATT • Staff: EPFL headcount 45-50 in 2021, target 65 in 2023. • Surface rented: ca 5'600 m2 for Smart Living Lab, eq. ca. 2'900 m2 for EPFL (rent paid with contributions from Canton) • Operational budget: ca 550kCHF/y (without HR and without rents) of which 500kCHF/y covered with contributions from Canton	• Based on heuristics, estimates provided by professors regarding an intellectually fertile and stimulating environment, a good level of peer interaction, efficient administrative and technical support, etc.: ○ A good target is 10 professors or more, ideally of mixed seniority and collocated onsite. ○ The share of EPFL in the Smart Living Lab should not be less than 50% of the staff involved in the joint research centre

Table 6: Empa Sion (2015-2021) – collocated with EPFL Valais-Wallis

Opportunities expected and seized since inception	**New opportunities**
• The intention of the new establishment joint laboratory at the "EPFL Valais Centre" in Sion was to expand the cooperation between Empa and EPFL in the field of energy research. • Andreas Züttel was appointed as Full Professor of Chemical Physics at EPFL and he successfully built up the joint Empa - EPFL Laboratory at the "EPFL Valais Wallis" in Sion. • The laboratory has developed its research activities extremely well and has also significantly strengthened industrial cooperation with companies in this region.	• The collaboration continues to open up major advantages, such as the use of the joint network, cooperation between the two institutions in project submissions, but also through the use of the joint equipment pool.
Challenges that emerged since inception	**Foreseeable challenges over next decade**
• See EPFL Valais-Wallis	• The current contract between EPFL and Empa ends in 2028 with the retirement of Andreas Züttel.
Resources provided by the partners	**Resources provided by the institution**
• See EPFL Valais-Wallis • As part of the development of the "EPFL Valais" campus and the energy initiative at the level of the Swiss Confederation, Empa and EPFL have agreed to jointly establish a research focus in the field of hydrogen & energy in Sion under the leadership of the former Empa laboratory head Prof. Dr. Andreas Züttel.	• As start-up capital, the EPFL and Empa provided the joint institute with an additional CHF 1.6 million for the first four years. The Empa contributed CHF 1.25 million from the Energy Fund received from the ETH Board to this start-up aid and additionally supported the laboratory set-up with laboratory equipment worth CHF 260,000. • For the duration of Prof. A. Züttel's appointment at the EPFL (summer of 2028), the Empa will contribute an annual amount of CHF 500,000 to the total budget of the laboratory.
Current volume of the local activity	**Target critical mass**
• Publications since 2015: 79 • Patents: 6 • Employees, thereof professors: 22/1 • Space: 600 m^2	• The current size of the laboratory, with around 20-25 employees, is very well suited to the needs of both institutions. The scientific output with 20-25 publications or patents is adequate. There is a regular exchange at management and scientific level. This constellation is currently successful, and no adjustment is planned at present.

Table 7: Singapore-ETH Centre SEC (2010-2021)

Opportunities expected and seized since inception	Status and new opportunities
• SEC was set up as research center to strengthen ETH's long-term global reach and competitiveness, by broadening its research and networks in Asia. • Singapore, with its smart nation concept, provided a unique base for ETH to research, develop and pilot innovative solutions for rapidly developing, high-density urban environments – a context with global scientific implications that is prevalent in Asia, but that does not exist in Switzerland. • SEC has become recognized as a leading urban science research center. The SEC has continuously grown, strengthening the research and networking capacity of ETH Zurich to develop solutions for pressing global challenges. SEC research results are now flowing back to Switzerland and becoming applicable in Swiss universities, cities, and industries.	• SEC is an internationally recognized hub of ETH Zurich in the center of Asia with more than 300 directly employed or affiliated researchers. • As ETH strives to strengthen its networks and partnerships in Singapore and other Asian countries, new and critical research priorities have emerged that would unlikely have arisen in Switzerland. In the next few years there will be opportunity to rethink and revise the topics and goals of its strategic research program. It is intended to maintain and consolidate the SEC's solid scientific standing and high reputation by attracting international talent, fostering exchange between researchers mainly from Switzerland and Singapore, and focusing on excellence.
Challenges that emerged since inception	**Foreseeable challenges over next decade**
• Due to the success and growth of the SEC and the resulting changed initial conditions, the legal agreement needed to be amended in 2020 • Recruitment and attraction of new talent as well as residency in Singapore and progress in SEC's research projects have been hampered by the Covid-19 pandemic. This has also affected budgets, as operating costs remained unchanged while research projects were delayed. • The administrative and managerial workload has increased, owing on the one hand to the SEC's increased size and number of research projects and programs, on the other hand to operational requirements (incl. audit requirements).	• There is a strong dependency on NRF (National Research Foundation Singapore) and as a result, with Singapore's overarching strategic research themes, guidelines and regulations. While this dependency does not directly affect the SEC's current strategic positioning, there is limited strategic flexibility compared to a fully independent legal entity, and potentially reduced relative attractiveness given its macro location. • Research is the foundation of the SEC. Major research programs are designed in five-year phases. Successful programs may be renewed for a second phase (total ten years). Thereby, continued funding of the programs and their planning perspectives depend among others on reviews by the NRF.
Resources provided by the partners	**Resources provided by the institution**
• As per August 2021, the SEC has >100 own employed staff. The researchers come from a diverse geographical background whereas management staff is mostly local. Furthermore,	• ETH Zurich usually does not directly contribute to the funding of the SEC.

the SEC hosts several research staff from research partner institutions. • The SEC is predominantly financed by the NRF which either acts as the grantor of research activities or the administrator of funds granted by other local government agencies. • SEC's net turnover (i.e., excluding funds passed on to research partner institutions) in mSGD was 12.7 in 2020/2021.	• There are two exceptions where ETH has a particular own interest: (i) FCL Global where ETH funds the Zurich hub of the program, and (ii) FHT where ETH supports establishing and maintaining a secure IT infrastructure and specific research elements not funded by the NRF. • ETH provides in-kind contributions by means of ETH researchers being involved in SEC research programs or projects, and to the backbone of the SEC, *e.g.*, by supplying transactional legal services, selected IT services, and by providing the senior management.
Current volume of the local activity	**Target critical mass**
• The SEC aims to provide practical solutions to some of the most pressing challenges of urban sustainability, systems resilience, and health through currently three main research programs: Future Cities Lab Global (FCL Global), Future Resilient Systems (FRS), and Future Health Technologies (FHT). FCL Global maintains two equally sized hubs, one in Singapore, and the other in Zurich. • These largely NRF-funded 5-year programs (with potential for usually one 5-year extension) are complemented by several shorter-term projects tackling challenges such as the urban heat island effects, climate change, social community resilience, digital healthcare, and sustainable food systems, as well as numerous exploratory research studies. • The SEC currently has a network of 20+ academic partner institutions, 8 industrial partners, and 10+ government agencies. • The SEC's academic output and outreach includes 1000+ peer-reviewed publications, 30+ conferences/symposia, 400+ scientific seminars and presentations, 130+ workshops, 48 awards received, and a total of 60+ projects funded through research grant calls / partnership / sponsoring. • Public outreach has been achieved through a total of 50+ exhibitions, 280+ media appearances, and more than 2000 visitors hosted.	• In light of the increasingly economic interests of some of SEC's institutional partner organizations and owing to the disruptive effect of the COVID-19 pandemic which has practically paralyzed collaborative research and cultural interchange on a personal level, the SEC and ETH Zurich are currently preparing for different scenarios, but a definite decision on the future strategic development of the SEC seems mistimed at present.

Table 8: EPFL Middle East (2009-2021)

Opportunities expected and seized since inception	New opportunities
• Create a MSc for energy transition, post-oil or post-nuclear, and innovation **Fulfilled** MES >150 graduates, program was useful for Switzerland too • Develop graduate research and innovation in the Middle East (no Swissnex in MENA) **Partially fulfilled** Research was applied in the UAE but researchers were not based in the UAE • Create a pool of 5+5 mirror laboratories between the UAE and EPFL, with an academic focus on sustainability **Partly fulfilled** 10 Research labs participated in Lausanne, none created in UAE. 12 PhD theses, 150 MSc projects, 200+ publications • Develop graduate level research/innovation **Fulfilled** Technology transfers, local impact through student projects. Start-up company (150 jobs). Significant CO2 abatement	• Develop larger-scale multi-university partnership with UAE Ministry of Education. (discussions underway). • Expanded regional presence in Gulf region, with significant cluster initiatives, sole Swiss presence in the Middle East. • Similar opportunities that presided at the inception, augmented now with UAE Federal level interest. • Demonstrated local value can be built on. UAE Federal and local and government (Ras Al Khaimah) interest is maintained.
Challenges that emerged since inception	**Foreseeable challenges over next decade**
• Large default of the partner on financial plans, due to the 2009 financial crisis • **EPFL proposed** a settlement, applied mitigation measures, and changed strategy. EPFL redirected MES program • Lack of visibility, despite high output/impact	• Will depend on the model of federal collaboration in preparation • May be similar to those expected in the first risk analysis
Resources provided by the partners	**Resources provided by the institution**
• 1000 m2 premises in UAE • 35 M$/12 years, 0.75-1 M/year (2020,2021)	• Academic program complete • Access to 10 EPFL labs • Human capital (1 person)
Current volume of the local activity	**Target critical mass**
• 10 EPFL labs involved, 12 PhD theses, 150 MSc students. • 12 EPT at location.	• Will depend on the model of federal collaboration in preparation.

6 Annex 2 – Summary of resources (input) and outcomes (output)

Inputs		EPFL [1]					ETH Zurich [2]	
Location and scope	**Totals**	Neuchâtel	Geneva	Valais-Wallis	Fribourg	Middle East	Basel	Singapore
Year of inception		2008	2013	2012	2014	2009	2007	2010
Status		active	active	active	active	in renewal	active	renewed
Professors in residence or partner	**80**	10	11	10	4	10	20	15
All staff	**1242**	200	350	218	50	4	320	100
Infrastructure (locally provided)								
Surface area by 2024 (m2)	**61400**	9000	5000	19500	5000	1000	19800	2100
Funding								
Period (years)		2011-2024	2014-2024	2014-2024	2015-2024	2009-2021	2007-2024	2010-2024
ETH Domain resources (budget)								
MCHF	**1554**	144	426	95	33	0	580 236 (own capex)	40
Competitive funds (third-party)								
MCHF	**667**	167	153	137	4	1	205	1
Local Government funds								
MCHF	**623**	72 (own capex)	16	202	72	35	30	196
Projected Totals by 2024 (MCHF)	**2844**	383	595	434	109	36	1051	237

Notes:

[1] The attached figures are from a report prepared by the EPFL VPF in March 2018 in response to a request from the CEPF. They were subject to a summary review in November 2021 to identify and correct any significant discrepancies between what was known or projected at the time and what is known and projected today, primarily for the 2018-2024 period. It should be noted that the associated campuses are not subject to a central and specific reporting within EPFL, as their management is decentralized to the various Vice Presidencies and Faculties in charge of their different components. As a result, certain amounts had to be estimated in March 2018 and were not questioned in November 2021. Finally, some funding and expenses are shared in whole or in part between the main campus in Lausanne and one or other of the associated campuses, which may create several options without the way to allocate these elements to the associated campuses.

[1,2] All financial values presented here are based on institutional reports, but have not been cross-audited for this document.

Outputs

Outcomes (since inception to date)		Totals	EPFL					ETH Zurich	
			Neuchâtel	Geneva	Valais-Wallis	Fribourg	Middle East	Basel	Singapore
Doctoral theses	Completed	**554**	188	90	81	2	12	181	94 [1]
	Ongoing	**431**	104	79	69	15	-	164	59 [1]
MSc projects	Completed	**2417**	834	625	316	176	150	316	n.a. [2]
Publications		**8422**	2605	788	1162	97	200	2200	1370
Technology transfers	Priority patents	**217**	92	48	26	2	-	47	2
	Licensing contracts	**80**	35	13	9	1	-	22	-
Spin-off companies		**45**	12	7	7	2	1	16	-
Jobs created	*In Switzerland*	**432**	84	47	27	4	-	270	-
	outside Switzerland	**252**		53		19	150	30	-
	Capital raised (MCHF)	**605**	*across all EPFL locations*		480			125	-

General note:
During the Domain meeting of 27.10.2021, the working group was requested to provide the "input" numbers (financial resources). In relation, the working group decided to provide the corresponding academic outcomes ("output"). The number of jobs created is an estimate based on publicly available information and may entail some level of uncertainty.

Notes:
[1] Not differentiated by institution awarding the doctorate (i.e., ETH Zurich or local partner university). Number not included in Totals.
[2] The Singapore-ETH Center does not educate MSc students