Response to the IAB comments 2021

SciLifeLab response in Italics, the original IAB comment in regular font. *The response by SciLifeLab has been generated by the leadership and the management group, referring to the "we" in the responses below, after consultation by all major stakeholders and following approval of this response by the board.*

We make five major recommendations:

1. Complete the integration into a **truly national research infrastructure** with a strong Hub and distributed Nodes with complementary strengths.
2. Provide a mechanism for **independent quality management** for the research that is served by SciLifeLab infrastructure, promoting excellence across the board.
3. Leverage the integrated capabilities that have proven their value in the pandemic response to support large-scale **visionary research**.
4. Integrate the different fellows into a **Swedish young investigator program** with international recruitment based on excellence and competitive mid-career support.
5. **Leverage Campus Solna** to train the next generation of interdisciplinary leaders needed to move Swedish life science to the forefront internationally.

We want to thank the IAB very much for insightful comments. In discussions with the board, the rectors, the management group and other stakeholders, these comments have been considered valuable and relevant. We are all excited about the positive tone in the report and the impressive dedication of the IAB towards ensuring that SciLifeLab will continue to be a success.

We do not respond here to the five major recommendations above as they will be individually discussed later. However, we agree that these five points are key observations. In this report, we have responded to all individual comments given by the IAB, many of which will lead to clear actions. We are also commenting suggestions that may have been based on slight misunderstandings, or where the suggested changes may be more difficult to execute.

Now that the scope of SciLifeLab has expanded much beyond the infrastructure role on one hand and beyond the Stockholm and Uppsala-centric mission on the other, SciLifeLab often means different things to different people. The recommendations are therefore often interpreted somewhat differently by the various representatives,

stakeholders or members of the SciLifeLab community. The IAB report has been widely circulated for comments, and while there are sometimes differences in the interpretation of the same comments (see e.g., quality and quantity aspect), our task is not just to respond to these comments, but formulate a clear plan of prioritized actions based on the IAB suggestions. This should also promote clearer understanding, branding and awareness of the overall mission and role of SciLifeLab in the life science ecosystem in Sweden.

Our recommendations in 2019 were strategic and long term with the intention to be useful as guidance for the second decade of SciLifeLab. Therefore, many of them remain valid at this time and it is also not surprising that not all of them could already be fully implemented, especially with the major effort required to respond to the pandemic in the two and a half years since our last visit.

We will continue to execute the past IAB recommendations as well, and many actions are indeed still underway based on the suggestions from the 2019 IAB visit.

On the infrastructure side, big steps towards a more inclusively governed and better integrated national infrastructure have been made. This process is not completed, but on a very good trajectory and has allowed SciLifeLab to incorporate four new national sites in Umeå, Lund, Gothenburg and Linköping and succeed in renewing and increasing the government's funding commitment underpinning the national infrastructure mandate.

We agree and feel that the increased national impact, the launch of the new national sites is very important. The new sites will have a major impact on the role of SciLifeLab as a national infrastructure and as an organizer of national collaborations in technology- and data-driven science.

On the research side, progress on the SciLifeLab core research, pioneered by the four founding universities in pooling their life science research activities under one umbrella, has been much slower or even stalled. Some of our advice to improve the operational management of Campus Solna have been implemented by creating the Campus Solna Committee and appointing a Campus Solna director. Unfortunately, however, our recommendation to the four host universities to take the second step, after their first pioneering founding decisions over ten years ago, and create a truly integrated joint centre of research excellence that attracts, supports and retains the best junior PIs internationally in Sweden, have not been followed.

We strongly support the IAB view here to take a second step in developing Campus Solna (CS). Indeed, many positive actions have taken place and others are still underway and the new IAB recommendations enforce and stimulate the ongoing plans. Host universities are in general very positive about the future of SciLifeLab (to be discussed later). In the past 2 years, a decisive action took place to fix the practical challenges pointed out in 2019 in regards to the CS. This process is still ongoing. It is true that the next level of actions has not yet been executed, but needs to be a continued focus for the next two years. For example, the SciLifeLab Fellows program has been a very successful and dynamic program and an example of collaboration across universities. DDLS fellows' program is likely to follow suit. Thus, several aspects of the IAB envisioned center of excellence have already been realized. However, we still need to make the entire CS research community better integrated and dynamic. Through collaborations across universities, the research mission at CS will ideally support the evolution of the national infrastructure and the DDLS program and vice versa in that national infrastructure and DDLS create evolving research opportunities. Plans underway at the new SciLifeLab sites in Gothenburg, Linköping, Lund and Umeå to create synergistic, dynamic and complementary research environments (including the ongoing key role of Uppsala) should also energize plans at CS. CS, as the biggest SciLifeLab site should set an example on creating a synergistic research excellence mission. We are creating expectations for the new SciLifeLab sites and these should obviously apply to the old sites as well (CS and Uppsala). The continuation of the new SciLifeLab sites will be evaluated as part of the international evaluation of infrastructure and in the context of IAB visits. There is therefore an expectation for CS and Uppsala to develop dynamically in the future as well.

Disappointingly, the commitment to support the core SciLifeLab research by the universities' SFO funds has not (yet, we hope!) been renewed, due to delays in agreeing on the overall program with the government.

The future of SFO funding remains an issue and we thank the IAB for expressing their disappointment. However, we note that there are no decisions to discontinue the SFO funding either and indeed the host university SciLifeLab committees continue to make long-term commitments, e.g., hiring new SciLifeLab Fellows and supporting the development of the Campus Solna. This provides a solid indication that the universities feel confident and will continue to support their core SciLifeLab research activities into the foreseeable future. There is broad optimism that SFO funding will continue, and specific decisions are expected soon.

Although de facto, campus Solna exhibits many aspects of an internationally leading research environment, the IAB remains baffled that this is not embraced more

enthusiastically as a strategic joint research center of excellence with continuous evaluation and turnover of group leaders. We are concerned that it is insufficiently supported both strategically and as a consequence also financially, because such a forward-looking model would attract much additional funding from the outside. We will therefore come back to this topic in our 2021 recommendations.

Host universities are strongly committed to the national SciLifeLab infrastructure, data science (DDLS) and other research programs as well as to the development of the SciLifeLab Campus Solna (CS). Host universities have placed some of their best research groups at CS. The combination of SciLifeLab fellow positions, the upcoming DDLS fellows' positions and the national infrastructure add to the uniqueness of CS and the inter-disciplinary opportunity. Research at CS is already excellent, as the statistics presented to the IAB also show. It is also important to note that with the exception of the fellows' SFO support, virtually all of the research at CS is supported by external grants and hence is as such extensively peer reviewed. On the other hand, SciLifeLab SFO funding is not a single funding source, but four separate funding "pots" at each of the four host universities, where decisions are made independently by the local SciLifeLab committees. And CS is three separate universities (and the national infrastructure) coming together "under one roof". Universities retain their own legal, financial, HR and all other practices and functions. Joint programs across the universities can be accomplished for specific purposes, such as the RED research grants at CS, but creation of a fully integrated center by pooling all SFO funds across university boundaries faces major financial, accounting, legal and practical challenges, if not obstacles. Therefore, we think that progress can best be made at each university with the expectation that they continue to create dynamic and interactive research environments at SciLifeLab that are well matched with the other universities and by promoting collaborations across universities in SciLifeLab-level programs.

CS is a joint biocenter, housing research groups (and infrastructure) from three different universities under one roof, that today lacks deep central scientific/academic coordination or directed collaborations, evaluations, critical space review or turnover (except for the infrastructure and the term-limited appointments of the SciLifeLab fellows). Thus, we understand the IAB would like to see more ambition, synergy, and dynamic turnover. One concrete step is to engage international review and advice of the research activities at SciLifeLab and for CS as an entity specifically. Campus Solna should be a truly progressive example for the new SciLifeLab sites elsewhere in the country. We plan to create national expectations for all the SciLifeLab sites. This follows the IAB advice that SciLifeLab should strive for more than to be an "extension" of current departments or faculties and their existing research profiles and practices.

DDLS is a major new initiative for SciLifeLab, squarely placed in a critical area for

the future of life sciences and well aligned with other major investments by KAW into artificial intelligence and molecular medicine. Due to the volume of the DDLS program it will make up almost 50% of SciLifeLab's future resources. Integrating and aligning DDLS with SciLifeLab's other activities is thus a significant challenge. At the same time, it is a major opportunity and our recommendations are to seize it to increase SciLifeLab's added value for Sweden.

We agree with IAB's view that DDLS is a major opportunity for SciLifeLab and a way to develop new collaborations across the country (11 partners), within and across four research areas as well as cross-disciplinary interactions between national infrastructure, life science and data science.

In our view, the continued strategic engagement of the founding universities will be key to realise SciLifeLab's full potential, especially on the research side.

We agree that the role of host universities is critical and each one of them already has had strong contributions to recruitment of young PIs, to research, training and in data science. The next challenge is how the actions across universities can be catalyzed and leveraged to create synergistic excellence missions.

4.1 SciLifeLab mission and overall governance

- Continue to develop the mission of a research organisation based on the strong national infrastructure platform.

We agree that it is of utmost importance to continuously brand and communicate to the life science community that SciLifeLab has a new integrated model build on top of the national infrastructure. The aim is that the whole scientific community, and stakeholders, but also the political decision makers have a clear view of what SciLifeLab stands for. SciLifeLab is quite well known already as a national infrastructure. On the other hand, many people in Stockholm consider the SciLifeLab name to mean exclusively Campus Solna. The new components, such as capabilities and the DDLS program, are less well known. It is therefore important to constantly brand and communicate to the life science community about the national role of SciLifeLab not just as an infrastructure, but also in research, data, DDLS, training etc. The new SciLifeLab sites will have an important role here to serve as SciLifeLab "ambassadors" within their universities. We will continue to also promote national meetings, training events, DDLS program, capabilities and national grant programs which all promote awareness of the national role of SciLifeLab.

- Simplify the governance and make it more inclusive for the national RI and coordination/training missions and more functional and effective for the core research mission.

We agree fully with this suggestion and will work with the board to consider alternative models on how governance could be simplified. At the same time, we will need to consider that the different funding programs have different steering and reporting requirements and different stakeholders who need a voice and a role. This makes it difficult to converge on a simple model that accounts for all aspects of SciLifeLab.

- Seize the integration and re-structuring opportunity DDLS provides, rather than creating two parallel structures.

DDLS emphasizes the truly national role of SciLifeLab and together with the launch of new national sites, the launch of DDLS strongly promotes a fully national mode of SciLifeLab. DDLS will also operate a national graduate school in data-driven research together with all 11 partners. We will develop different integrated models of steering to better integrate national infrastructure, national DDLS operations and national SciLifeLab sites. Developments in some areas, such as Cryo-EM national services and corresponding DDLS data handling and bioinformatics are already being developed jointly between national infrastructure and DDLS. DDLS recruitments in many universities are coordinated by the WCMM centers at each site, hence providing a link from molecular medicine to data science.

- Define the international benchmarks you are aiming for, in terms of ranking and comparable institutions. SciLifeLab is unique, but there are role models for its different missions that should be defined, i.e. the research, infrastructure and training missions.

We agree that it makes sense to develop benchmarking models for the different components of SciLifeLab. Even if there is no exactly similar operation, there are fairly similar infrastructure organizations, fairly similar joint research efforts and also several data science centers or national data science programs. We will consider these and will define such benchmarks. At the same time, compared to most international peer organizations, SciLifeLab as a whole is i) much more infrastructural in nature, ii) has more prominent national role and mandate and iii) hence, it is the combination of research, infrastructure, data, training and other components that makes SciLifeLab unique and something that is hard to define by the combination of individual benchmarks.

4.2 National infrastructure mission

- Further extend the governance to a truly national and inclusive system that represents all sites.

We agree with this. The board composition is already national and is dictated by the SciLifeLab founding documents. The board currently includes equal representation of host vs. non-host members. At the level of management group currently only host universities are represented, while the steering of the DDLS program is already fully national.

- Set up a system for adding/phasing out SciLifeLab sites or Nodes and giving them complementary profiles and strengths and represent them in the governance.

We agree and are working to execute this suggestion in regards to the functions, complementary profiles, expectations and evaluation of the sites. Like mentioned above, clearer roles and expectations formulated for the new SciLifeLab sites have ramifications also to the existing sites (Campus Solna and Uppsala). We will invite the site directors of the new SciLifeLab sites to participate regularly in the management group meetings.

- Include the quality of the research supported as a key performance indicator for infrastructure evaluation, in order to move from quantity to quality.

- Introduce a transparent quality management process of the research that is supported by the infrastructure, that is used by default.

These two suggestions above are important and we are interested to execute them. They are also in line with our main criterium for selecting national infrastructure units in that they should "facilitate world leading research that otherwise would not be possible".

At the same time, these two suggestions have raised more discussion than almost any other point in this year's IAB comments, particularly from the staff of the research infrastructure. This topic indeed has many sides to it, but it is up to the leadership to communicate this desired goal in a clearer way and discuss the challenges. Many feel

that from the infrastructure point of view, quality and quantity are not alternative goals, but are intermixed in many ways. You will need quantity of services (e.g., critical mass and turnover) to be able to provide higher quality and cheaper prices (based on volume discounts from vendors) and often you need high sample numbers (e.g., patients) to achieve statistically significant high-quality results. Quality also includes the entire chain from study design to sample preparation and ending in data analysis and FAIR data handling. The RI scientists also point out that as a national infrastructure, often also receiving VR infrastructure funding, they cannot say no to scientists who contact them for support with e.g., VR-funded research projects. The infrastructure scientists are also concerned on how to organize the evaluation of the constant flow of 3000 projects per year, such as projects on samples that have very little associated background information provided to the infrastructure.

This suggested change is therefore a big multi-level, multi-university, multi-year effort that will need systematic and careful execution. This will also link to the paradigm shift that we will try to achieve as part of promoting open FAIR data and data-driven science in that we should get more annotation data on the samples and the projects before they are submitted or analyzed by the RI. We will consider how to incorporate the quality-focused criteria increasingly into the RI aims, KPIs and evaluations, starting from the mid-term checkup in the fall of 2022. This is more difficult and challenging to platforms with a large number of small routine projects vs. few long-term or near-research services. Some units and platforms already exercise extensive project prioritization, including external peer review, while others have none. For example, the entire function of the DDD platform is based on careful evaluation and prioritization of projects from the academic user community. DDD will say no to most projects and will also guide users to take necessary extra steps to qualify next time or to advice on other service providers. Also, the bioinformatics platform operates their long-term projects (WABI) through an open call that only accepts 10-20% of the applications. Therefore, following these examples, we will continue to consider opportunities for prioritization of quality, but take into account the diverse situations. Also, the outcome may not be yes or no, but the degree of priority and level of hands-on tailored service provided by the infrastructure.

- Provide a national project to facility matching mechanism for each platform, i.e. not only for virtual services (in bioinformatics this is working exemplarily) but also for physical services, so national users can easily find the SciLifeLab site and facility best suited for their needs. The virtualisation of many physical services during the pandemic provides an opportunity to do so.

We agree and will consider this with the platforms. The infrastructure coordinator and the new platform coordinators already to some extent serve in this role, but this

could be further developed into a consultation/advice system for technology and service questions.

- Provide a pan-platform user consultation mechanism, so projects that need support by multiple technologies, in different facilities and platforms can be well planned and effectively supported.

This is another important and highly relevant suggestion that we have already begun to address. The infrastructure and platform coordinators will play a key role here. Also, in the areas of Precision Medicine and Planetary Biology, and in the Pandemic Laboratory Preparedness, we will create systematic services across platforms. This will also require integrating sample preparation and IT solutions to track samples and projects, and enable layering research data and meta-data on individual samples. This will be important to achieve with respect to data tracking challenges that will come up in the DDLS program.

- Collaborate more closely with the relevant European infrastructures beyond bioinformatics/ELIXIR, e.g. INSTRUCT, Euro-BioImaging, in order to synergise the national and European levels of RI coordination and make full use of the new European infrastructure access and training programs for the Swedish community.

We agree and several connections obviously already exist with ESFRI and ERIC infrastructure, but we will try to make them more significant and concrete and describe these better. SciLifeLab has had close ties over the years with ELIXIR, where SciLifeLab Bioinformatics (NBIS) is the Swedish node. DDLS will add new elements to data science and bioinformatics collaborations with both ELIXIR and EMBL-EBI. Also, many DDLS scientists will work with bioimaging and bioimages, which further could add capabilities for Sweden in Euro-BioImaging. SciLifeLab translational scientists and relevant infrastructure (e.g. DDD) are strongly engaged in EATRIS. Sweden is unfortunately not a member of some of the very relevant ESFRIs, such as INSTRUCT.

- Further promote a "happy marriage" between new technology development and challenging research applications for all platforms. This is a key mechanism to drive methods ahead and stay at the cutting edge, that should be built into the platform operations. The internationally leading example of the SciLifeLab spatial and single cell biology platform should be used as a paradigm to create a mechanism to promote this for all platforms, such as seed funding for suitable projects and

aggressive use of the 20% top-sliced capacity for technology development with the most innovative researchers.

We agree here and there is indeed strong support for the role of technology development in the SciLifeLab community and among stakeholders. We have also seen powerful examples and track record in the past of technology development, such as the spatial and single cell biology platform that the IAB pointed out. To a large extent the funding for technology development has arisen from external grants that the research community has acquired. However, such grants are often not sufficient to implement the technology in practice in the service. That is why the 20% effort from the platform budgets is a major contribution towards cutting-edge capabilities and towards engaging with the research community as alpha and beta users. We have also organized calls for technology development from national funds and both Campus Solna and the Uppsala SciLifeLab committees have made grants available to the local research communities for technology development purposes. In the future, technology development in data-driven science and AI is also similarly important and will be addressed as part of the DDLS program. While there are many opportunities, SciLifeLab could develop a more systematic plan on how to handle the entire pipeline from technology development, to promoting innovations, alpha-beta testing, and implementation in infrastructure services as well as in expanding to global markets. Given the strong and systematic technology expertise, SciLifeLab could have a globally leading role here. Indeed, for example, test-bed programs have recently been started to address this.

- The SciLifeLab group leaders and especially fellows are often the ones that engage in technology development with the platforms. This should be embraced and promoted, especially to the fellows, rather than hidden as it might give the appearance of "privileged" access, which is not the case.

This is a very good suggestion and we agree that often routine service with new technologies will require implementation in pilot projects and with advanced alpha-beta-users. Several SciLifeLab fellows are already closely associated with platforms and act as key scientists also in platforms or as their scientific and technological experts. In addition to engaging with researchers and fellows in technology development and implementation, this is a way that we can also promote interactions between researchers and the infrastructure, without compromising the access to routine infrastructure services by any eligible scientist from anywhere in Sweden.

- Improve the credit and visibility the SciLifeLab brand gets for major new technologies and services, the press coverage often only refers to the host university involved and not to SciLifeLab.

This is very true in that we often see SciLifeLab-associated news that only mention the host universities. This is an important issue to consider with our SciLifeLab communication, the host university communication departments, but also discuss with all SciLifeLab associated scientists. If SciLifeLab is not mentioned in the news and branded more strongly, we may not see the continued support from the government as strongly in the future. We are also promoting SciLifeLab brand through technology and FAIR data access systems and through stronger co-branding of SciLifeLab in grants and contracts that formally require only the legal entity to be shown.

4.3 Research mission

General:

- Renew and increase the funding commitment (SFO) by the four host universities.

It is currently considered likely that the government will continue the funding of the strategic initiatives (SFO) to universities. The consensus is that this funding will continue from 2023 onwards, but the exact manner in which this program will continue is still unknown. We are in close contact with the host universities and will monitor the situation.

One should note that the host universities also provide substantial in-kind support to SciLifeLab (e.g., all PIs associated with SciLifeLab are engaged at one of the host universities and the majority receive full salary support from the host universities and not from e.g. the SFO funding). Also, there are specific funds from the universities for e.g., technology, instruments and local core facilities that indirectly support SciLifeLab. Last, several programs, such as DDLS, will require add-on support from the host universities to cover the compulsory indirect costs and overheads associated with each employment that KAW will not cover. However, it is the SFO funding that the government provides that is critical for the future of SciLifeLab fellows programs and for Campus Solna.

- Consider, if the additional universities that have joined SciLifeLab's infrastructure, several of them with physical sites (Nodes), could contribute to the

research funding as well. Bringing more partners in could potentially take inspiration from the Uppsala model on how to run SciLifeLab beyond Stockholm.

This is a highly relevant suggestion and opens a new opportunity now that universities outside of Mälardalen (Stockholm-Uppsala Region) could support and build their local SciLifeLab sites as a collaborative site, somewhat akin to the Navet in Uppsala. We are keen to work with each of the new SciLifeLab sites so that they could also enjoy the benefits of the combination of infrastructure and data programs with the relevant research communities. This could be accomplished by combining national infrastructure support, local research funding (e.g. future SFO support at each university as there are many SFO funded programs at other universities as well), and data support (mostly national DDLS funding) at each new site. This could also engage related activities, such as the KAW-supported WCMM centers or relevant local core facilities at each site, and even health care associated regional funding. Indeed, there are a lot of existing funds associated with various infrastructure and research and health care operators that could be linked up with the SciLifeLab sites and then indirectly with the national SciLifeLab organization. The hope is that there will be local and national synergies across all of these functions at each SciLifeLab site. The new sites should develop their own models that best fit their environments, but do this in collaboration and under the national branding of SciLifeLab. Also, we have seen that the new sites can inspire and inform each other and also CS and UU in terms of how they develop the SciLifeLab operations at their sites. Overall, this suggestion is actionable and a lot is already underway, as the early plans presented to the IAB from the three new sites indicated.

- We would expect that if all Swedish universities speak with one voice, the government will move quickly to establish the SFO framework and that an overall increase is possible, especially in the light of the large KAW investment into DDLS.

This is true, and the universities already do speak with one voice in SciLifeLab matters. However, this is a question that is much broader than the SciLifeLab SFO funding to the four host universities. There are numerous SFO-funded initiatives and programs outside of SciLifeLab and outside of life science and it is the full collection of SFO programs that will be decided together. Together with host universities, we have already been in contact with the government. Also, the support to SciLifeLab is likely to be viewed positively by the host universities, regardless of the fate of the SFO program.

- Now that the SciLifeLab fellow model has served as a blueprint for large scale Wallenberg investments, the host universities should take the next pioneering

step, rather than being driven by the agenda of private funders. For strategic ownership by the host universities it is worth highlighting, that currently the SFO support via host universities to SciLifeLab makes up only 20% of its total resources.

Targeted research funding to SciLifeLab comes in the form of the government SFO support to the four host universities. The SFO funds are mostly used for the SciLifeLab fellows' support, and for some common actions (e.g., postdoc and instrument calls) and costs of the Campus Solna. As explained already, this strategic SFO funding is likely to continue from 2023 onwards, but unclear if it will be ear-marked in the same way as today. At this point, universities may have more freedom to choose how they use such strategic funding, and it would indeed be critically important to ensure that host universities continue to use it for SciLifeLab associated research. Host universities have already expressed strong support for this. Governmental action regarding continued funding dedicated to support research at SciLifeLab is essential in that the host universities do not have sufficient extra discretionary- or base funding available on a scale that would make a difference to the future of SciLifeLab.

However, one should again note that the host universities do provide a lot of in-kind support for SciLifeLab-associated research, infra and data functions. Such funding comes in the form of e.g., salaries of researchers and professors, local core facility support, instruments, etc., as well as all the research funds that SciLifeLab-associated PIs bring in from external sources. Host universities will also continue to fund all the SciLifeLab and DDLS fellows after their 5-year term is over. This type of funding is difficult to calculate and account for and it is normally not considered as "SciLifeLab funding". However, this means that the total in-kind funding via the host universities to the SciLifeLab community is far greater than the dedicated governmental SFO research support.

- We advise the host universities to create a jointly funded interdisciplinary research Hub at the Campus Solna coordinated by SciLifeLab. It will attract much more funding from the outside, than the universities have to invest themselves and become a magnet to attract and retain international talent to Sweden. In line with the Krantz report, KTH might be in a natural position to lead such an effort jointly with the other host universities.

This is an important suggestion as a future Campus Solna model. The three host universities in Stockholm will also continue to separately administer their own SFO funding. However, there are still possibilities to work towards this model in other ways and in parallel actions from different funding sources. A recent example of this includes the establishment of a long-term (six-year) Campus Solna Budget, which includes allocating SFO from each of the three universities for Campus Solna common funds (12 MSEK / yr). This will finance e.g. Research Environment and

Development (RED) grants as postdoctoral fellowship grants, early-stage technical development, project grants and minor equipment. The implementation of these common funds provides a paradigm for other future joint activities, which should be coupled with other activities and suggestions (see below).

- Such a **Campus Solna SciLifeLab hub** will provide a unique interdisciplinary life science environment, where all cutting-edge technologies and major directions of life science are integrated. It would be a major asset to the host universities and to Sweden, allowing to train the urgently needed next generation of trans-disciplinary life scientists, in a flat scientific hierarchy based on small innovative groups, continuous evaluation and turnover. All host universities would immensely profit from this second step in their joint effort and set a future model for new investments by other funders such as KAW.

We agree that we should aim towards an ambitious model for the future of Campus Solna as an example for the new SciLifeLab sites across the country. The three Stockholm universities realize that SciLifeLab Campus Solna is a significant asset to their organizations, and particularly to the potential to contribute to the recruitment and training of next generation scientists. The need for evaluations and turnover of research groups at Campus Solna is necessary for Campus Solna to develop on par with the international models that the IAB requested us to consider. A core part of the IAB suggestion here is the international evaluation with consequence, which should be exercised at high priority.

- An easy first step towards this is to provide more delegated authority to the new campus Solna director and committee to run the campus effectively. We recommend that this includes for example the authority to assign space and instrument access to SciLifeLab Fellows and to the most productive and impactful SciLifeLab scientists - even if this means reducing space allocations to other group leaders that are occupying ‘historical’ space in Campus Solna.

The steering documents for SciLifeLab (4-part), Campus Solna (3-part) and rules of procedure (Arbetsordning) are currently being revised. A major update of the 3-part agreement is the inclusion of a defined role for the Campus Solna Director. Here, the IAB comments have provided helpful input. There is a need to coordinate actions from the three universities, which is challenging. As described, available space at Campus Solna is also currently limited. Research funding and personnel administration is carried out by the host universities in multiple departments, and thus research groups are differentially subject to financial overhead, HR and other policies. Merging the expectations and creating consensus at CS is needed.

The Campus Solna Director and Campus Solna Committee are establishing strategies for Campus Solna space use and while doing so, take into account the national SciLifeLab strategies and changes. There should be a review system for all research groups that includes not just scientific aspects, but fit for Campus Solna and the SciLifeLab community as well as the active engagement of scientists in the community, in the collaborations and synergy with e.g., technology development, infrastructure and data science.

In addition, national funds pay for 25% of many of the CS costs, reflecting that CS hosts national infrastructure covering about 25% of the total space use and therefore it is important that CS also plays an active role to promote the national mandate of SciLifeLab. And that SciLifeLab national (board) promotes CS as a unique national site for multi-disciplinary research and as a site for technology development, hence contributing to the entire national infrastructure. Therefore, both the national and CS aspects of SciLifeLab need to be seen in a synergistic manner.

- The **SciLifeLab group leader** definition is a step forward, but seems to be very “soft” and have no system for quality management or turnover. We recommend to set up a system for obtaining and renewing the status of SciLifeLab group leader and building in an external evaluation by default, to avoid inflating the numbers (189 is already very high!) and losing the “mark of excellence” that being a SciLifeLab faculty member must have to be meaningful.

We agree with the IAB statement that the current SciLifeLab group leader definition is "soft", broad and very inclusive, and without defined expectations and responsibilities towards SciLifeLab. Reaching a degree of harmonization has not been straightforward even between Uppsala and Stockholm locations. The IAB is right in that there is also at the moment no external scientific review and not many expectations for the associated group leaders to "earn and maintain the status" of a SciLifeLab group leader. With infrastructure leaders, DDLS fellows and all new sites eventually included, there will soon be >300 group leaders associated with SciLifeLab across Sweden. We will consider the IAB suggestion in the context of striving for excellence. Now that the new sites have begun to suggest group leader nominations, we will also better define expectations for all group leaders. These expectations currently merely include general issues, such as assigning publications, promoting SciLifeLab, etc., but we plan to ask each group leader for their contributions to technology development, collaboration with infrastructure, links to capabilities, SciLifeLab training events, participation in the DDLS program etc.

As indicated earlier, CS-specific group leader matters and space allocations will be handled separately

- In addition, we advise to consider to integrate the Unit and platform leaders into the SciLifeLab faculty program at the same level as research faculty, to ensure they get the recognition they deserve for their important role.

We agree and this has already been accomplished.

- The impact assessment of publications resulting from SciLifeLab's own research has to better stratified in order to assess SciLifeLab's impact on the quality of Swedish life science: We suggest the following four categories: (i) entire Swedish life science community, (ii) SciLifeLab infrastructure enabled community, (iii) SciLifeLab group leaders, (iv) SciLifeLab fellows.

We agree and this is how publications are already classified. As the new group leader definition was just started 2 years ago and is still evolving (see above), the classification of all SciLifeLab group leaders was not visible in the statistics. We have to be cautious in changing the definitions of the group leaders too often, as the statistics from year-to-year will *then not be comparable.*

SciLifeLab Fellows:

- Assuming a renewal (and hopefully increase!) of the founding universities commitment, the highly successful SciLifeLab fellows program should maintain its core strengths but must address some of its structural problems in the next phase.

We appreciate and agree with this comment. With the start of the DDLS fellow program and with the rules provided by the KAW funding conditions, several new practices are being adapted, such as coordination of recruitments, publicly open interviews, inclusion of SciLifeLab/DDLS representatives in the DDLS fellow interviews, a role for the SciLifeLab board in accepting new DDLS fellows, as well as joint networking and advisory programs for the DDLS fellows. The SciLifeLab fellows' program is different from that of the DDLS fellows, in that the recruitment decisions and practices are run independently by each university and the individual departments. Presenting the candidate lectures publicly to the SciLifeLab community is only the first step in making the new recruitments more coordinated.

We will discuss and try to see as to what extent the practices started with the DDLS fellows program could be adapted in the SciLifeLab fellows program and how the various programs could be harmonized, which was another suggestion by the IAB.

According to the early decisions by the SciLifeLab board (e.g. board from June 18, 2013), the board should validate also each fellow position to be announced under the brand of SciLifeLab. This practice could be reactivated to enhance the coordination and synchronization of the SciLifeLab fellows' program, but that is only one step in the "career cycle" of a fellow.

- Introduce a comparative evaluation between all fellows recruited each year, by default with external members in the search committee and a clear primary objective for excellence and thereafter good fit to university departments for future tenure perspectives.

There are indeed differences in the procedures of recruiting and evaluating Fellows across universities and across sites (e.g., Stockholm CS vs. Uppsala), but the outcome has in any case been an excellent group of fellows (based on ERC grants, other grants and publications) that the host universities and SciLifeLab can be proud of. Currently each university recruits SciLifeLab fellows based on their interests and at their own "pace" in a relatively autonomous process. At CS these are discussed across universities ahead of time, to ensure space availability and fit with the research environment. The calls for new fellows are based on funding decisions within the four SciLifeLab committees (governing the SFO funds at each university), with input from departments or faculties. At KTH, SU and UU, a host department is usually predefined, and is responsible for the long-term career support and hosting of the fellow, including tenure evaluations. At KI, the process is based on broad calls and the host department is defined at a later stage according to the department that represents a good match (fellows can choose this).

As noted, SciLifeLab does not have a role in guiding the recruitment of SciLifeLab Fellows, or e.g., have an active role in their tenure process. The final decision is entirely up to each university as a legal entity and the process is governed by government regulations on tenure-track scientists that only host universities as employers can exercise for their own staff. Each university already relies on external international ad-hoc reviewers to evaluate applications from SciLifeLab fellow candidates, but this is not coordinated between universities. There would be both practical and legal obstacles to shift the recruitment or tenure decision processes away from the host universities and the responsible departments/faculties. However, as per IAB suggestions, we will implement some of the strategies developed in the DDLS program. There could be e.g,. a joint pool of external reviewers, or there could be stronger request for advisory functions that are not legally mandating the universities, but could help in the process and promote excellence.

Thus, this would not change the SciLifeLab fellows' program to a SciLifeLab-driven "centralized" process, but would make it better SciLifeLab-coordinated.

- Develop instruments for fellows to collaborate with each other, especially across host universities, for example a joint postdoc recruitment program, prefunded for the first year and with a pool of 3-year fellowships for the best candidates.

This is an excellent suggestion that is again also built-in into the DDLS fellow program and funded as such, but is presently lacking from the SciLifeLab fellows' program. However, both the SciLifeLab committees and the CSC committee have launched grants available to scientists to collaborate e.g. across universities or between infrastructure and research or to promote collaborations. At CS, the three Stockholm University committees have agreed and committed to long-term support for common funds (4 MSEK/yr/univ; total 12 MSEK/yr), including postdoctoral fellowships. At Uppsala the SciLifeLab committee allocates funding to similar purposes, again including postdoc grants.

- Increase transparency and remove inconsistencies between departments/ universities regarding the tenure system.

The tenure system is regulated by the government and the regulations apply to all universities and all fields of research, and as such the rules should be the same for all. However, in practice this is implemented somewhat differently. However, it is difficult for SciLifeLab to impact on the tenure processes due to the fact that they are core university functions across all fields of science, and that tenure i) is governed by established legal tenure regulations, ii) is coupled to financial and HR responsibilities and iii) is a process that universities want to retain full autonomy for since tenure decisions dictate their future permanent faculty. In the DDLS program, we are also considering to launch an (international) advisory body for the DDLS fellows to advise, mentor and follow their progress. This could also help and support the tenure process of DDLS fellows, at least in an informal, advisory manner, and it could even be extended to the SciLifeLab fellows.

- Ensure that SciLifeLab fellows are not at a disadvantage compared to their university peers to apply for international funding through their host universities.

We do not know where this comment arises from and what it really means. There is absolutely nothing in the SciLifeLab fellows' program that places fellows in a disadvantageous position, but it is possible that other factors, such as departmental budget limitations, availability of matching funding or lab space, the remaining years of fellows' own position, etc. may have in some cases led to restrictions in individual cases. SciLifeLab does not control the department practices that apply to external

grants to the fellows. It is the head of the department that controls and accepts all applications for external funding. However, the SciLifeLab management group is happy to discuss any matters of this nature if they are brought to our attention, either case by case or in general. Based on discussions with fellows, it does not appear there are wide-spread issues in this regard, but we will continue to explore the situation.

- Provide competitive mid-career support packages (similar to an ERC consolidator grant) for the most successful fellows and options for fast-track tenure to be competitive with international offers and retain them in Sweden. This will furthermore lead to spawning of new visionary research ideas that make best use of the SciLifeLab infrastructure.

This is a good suggestion and needs to be discussed. A funding base is required to support any mid-career support strategy. In some of its programs, e.g., KAW, has offered extension terms to fellows. SciLifeLab fellows have been extraordinarily successful in acquiring external funding, but often when their "young investigator" status is over, there will be increased competition. We also see that as the number of fellows being recruited is quite big, support to universities for the next career phase could be welcome.

4.4 Capabilities

- The pandemic response provided an excellent example of switching to “war time” mode and bundling all technology platforms, in order to deliver pandemic services in close coordination with clinics.

- Transfer of this excellent blueprint for long-term preparedness and linking all omics capabilities to clinical samples more broadly is excellent and forward looking.

We agree and indeed, we should not lose the lessons from the pandemic. The pandemic laboratory preparedness program (PLP) will ensure that this line of research and the mindset of fast translation to practice can continue. We hope that especially the DDLS program and its four broad research areas will be influenced by these lessons.

- Define better for which grand challenges, e.g., major diseases in Sweden, these capabilities will likely deliver impact in “peace” times.

This will be discussed by the SciLifeLab Precision Medicine (PM) capability team and by the DDLS PM research area in collaboration. In addition, the SciLifeLab precision medicine actions are coordinated with those of the national Genomic Medicine Sweden (GMS) program and the health care regions across the country. Also, we are well integrated and in close communication with the government Life Science Office and several other government departments and agencies.

- Take note of the rising role of personalised diagnostics and the closer and closer link to therapy (e.g. theranostics) that this can enable.

We do and we will, thank you for the comment.

- Define a mechanism to identify and support similar grand challenges or ground breaking research questions in the other capability areas such as biodiversity and cell biology, so that a similar “bundling effect” can be realised there as well. This could synergise with an SciLifeLab branded junior – consolidator – advanced grant funding scheme for the best ideas among SciLifeLab fellows (see 4.3. “Fellows” above).

We agree and this will be discussed. Indeed both the DDLS program and the 3 SciLifeLab capabilities now launched (PLP, PM and the planetary biology) will provide opportunities for launching more targeted grand challenge initiatives with external funding.

4.5 Data Driven Life Science

- The IAB is delighted to see the Knut and Alice Wallenberg Foundation creating a large cutting-edge programme together with SciLifeLab.

- DDLS is a very impressive programme, a large scale and timely investment in young PIs, students and postdocs in data driven life science.

Thank you for the comment and we do agree about the opportunities and the significance of the program.

- It could be stated more clearly that ground-breaking research will develop bottom up from the young PIs. To take the best of those and develop them into “big science”, we encourage to consider a junior – consolidator – advanced grant funding mechanism that would also provide mid-career support and retain the best PIs in Sweden (see also 4.3 “Fellows” above).

This is true and we will discuss the consolidator approach with the DDLS steering group and with KAW as a funder. Currently this possibility is not built into the 12-year funding plan for the program.

- It is pivotal for the success of the programme to form a very strong and closely networked cohort of excellent PIs and not allow that the large investment disappears into the existing departmental landscape of the hosting universities.

We appreciate this comment and agree with this being a potential risk. The aim of the DDLS program has been very clearly defined as being a nation-wide joint program in which all participating PIs need to engage. At the same time, it is the hosting universities that have the overall responsibilities for employment of all fellows, including both the SciLifeLab and DDLS fellows.

- To ensure this, we would strongly advise recruitment based on excellence with independent and international evaluation for all candidates recruited into the programme. Only in this way can the DDLS programme as a whole attain a stamp of excellence that will be needed to attract additional investment into this critical area.

Following the completion of the first phase of the recruitment in the DDLS program this spring, there will be a need to evaluate the lessons learned and the new practices on how they have been implemented. We have seen variability of opinions by the international ad-hoc reviewers, as well as in the practices and opinions of the local recruitment boards (often reflecting local interests and needs). Therefore, this process has been an interesting experience for the future in how to build a national distributed competence and research program. This will also potentially also give lessons that could impact the SciLifeLab fellows' program and its practices.

- Furthermore, by coordinating recruitments between universities, DDLS provides a unique opportunity to achieve true integration of research activities across

universities and make all of them stronger than any of them could be individually.

This is true, and indeed the inclusion of the DDLS steering group observers in the recruitment groups has already had some influence in this direction.

- Finally, we feel that the four research areas DDLS sets out with are good, but rather broad and sometimes even vaguely defined in terms of the computational science requirements. It might therefore help to quickly built critical mass by focusing the first recruitments on the computational counterparts of experimentally already strong areas in Sweden, including for example spatial and single cell technologies or evolutionary/ecological genomics.

This is true as far as the definition of the 4 research areas goes. Going forward, each research area will need to define their profile and niche opportunities. Also, we will need to define the data-driven term more explicitly and describe the expectations that the DDLS program has for the next recruitment rounds. Obviously each university has also had a chance to consider their best areas as potential local environments for each new DDLS fellow. Thus, indirectly this IAB recommendation may have already been realized. However, such experimentally strong areas are probably more linked to local areas of excellence and not national or SciLifeLab infrastructure capabilities.

- Furthermore, we strongly advise integration of the programme with the SciLifeLab fellows programme on which it (as well as the WCMM programme) has been modelled as much as possible (see also 4.3 “Fellows” above, and 4.7 below).
- This will allow the DDLS community to interact closely with the data producing community, especially as more and more quantitative and high throughput data is generated, often by physical colocation.

These two suggestions are excellent and will surely be discussed. Despite of the differences of the SciLifeLab, WCMM and DDLS fellow programs, there are many similarities and clearly untapped opportunities for synergy. Over the past 5 years, we already have had close interaction between SciLifeLab and WCMM programs. The annual meetings of the young PIs at WCMM and SciLifeLab, together with the management of each site and infrastructure representatives, have been an excellent opportunity to meet and network among scientists.

- We would advise to stimulate interactions between the different research areas within DDLS, as well as interactions with the WASP and SciLifeLab fellows

programme by dedicated funding for joint staff, such as for example shared postdocs or technology development engineers.

We agree, and to some extent such opportunities already exist, such as in the form of dedicated DDLS-WASP joint funding as well as future calls that will be launched for open PhD student and postdoc positions.

- To implement DDLS Swedish health data management and integration has to improve, especially for the Precision Medicine and Infection Biology research areas. SciLifeLab has a key role to address this, setting up a working group with the government to rapidly establish a pilot programme and in the medium-term change policy. The strong support by KAW should be beneficial to achieve this.

We agree and this is among the list of key actions both for the SciLifeLab PM and PLP capabilities and the DDLS PM research area as well as with a new effort to build data area node for precision medicine at one host university in Sweden. There are also currently many ongoing activities in this domain in Sweden.

- DDLS has substantial computational implementation challenges. We advise to be careful with committing to use large central compute facilities, before the specific needs of life science (e.g. GPU's and bringing compute such as AI models to large data sets rather than the other way around) have been formulated and tested.

We agree and our intention is not to build major dedicated e-infrastructure hardware. We will make strong use of the Berzelius KAW-funded GPU HPC, as well as future new computational service facilities that the government will fund for science.

- We furthermore advise to form communities between the technical staff on the research side ("ResOps") in the DDLS fellows groups and the technical staff on the infrastructure side ("DevOps") in the Data Center/DDLS data support team early on.

This is an interesting suggestion to be followed up on.

- DDLS puts SciLifeLab in a key position to establish the first prototypes of future compute services in several key domains of life science. We therefore encourage SciLifeLab to actively contribute to European and international projects in this area.

This is a good suggestion and we are in close communication with e.g. EBI, EMBL Data Science Center, ELIXIR as well as efforts regarding e.g. the European Health Data Space. We will also be active to promote Swedish participation in the EU presidency in 2023, which will involve strong data, IT and digitization themes in the life science and health domains.

4.6 Training, Innovation and Career Development

- Take an enabling role in **innovation**. Despite the "professor privilege" and University ownership of IP, SciLifeLab has a key role to play to promote the commercialisation of new technologies and applications and could easily fund this activity from a small part of the proceeds of successful initiatives.

We are considering new initiatives in this space, particularly in the context of the DDD activities. For example, sometimes excellent targets are discovered by scientists who are not interested to engage in spinoffs, licensing or any other commercial activity, and such opportunities currently often remain unexplored. There needs to be a legal host which is able and interested to handle the protection and licensing of IP as well as ability to return funds to the original program (e.g. DDD). This task sounds straightforward, but is not easy to implement across university boundaries and often against the established and accepted traditions of handling IP in Sweden. However, SciLifeLab will continue to discuss this together with all universities, but this requires a lot of work and a joint vision and agreement across all stakeholders before it can be realized.

- The critical gap to address often is to fund the first mile from the research lab/service platform to a business plan that can be used to attract private investment. The model Novo Nordisk has created with the BII institute may be instructive and worth drawing inspiration from, especially for discussing with KAW for the Swedish innovation landscape.

We will consider the BII opportunity. In addition, there is the Wallenberg Launch Pad (WALP) that is able to take innovations arising from KAW-funded efforts forward.

- Not only, but especially in innovation, SciLifeLab has to be able to act as a partner. We recommend that the SciLifeLab board sets up a task-and-finish group that provides a report for the options of a legal representation that would allow

SciLifeLab to fulfill its integrating and coordinating activities across its stakeholders at a higher (national) level, without compromising the ownership of the host universities. The legal frameworks of research infrastructure consortia that operate successfully at the European level (ERIC) for similar purposes might provide an instructive example. A similar framework at the national level would allow SciLifeLab to partner effectively with industry and the health care sector, which is critical for its future success. Finally, such a framework, that formally provides national coordination, would also be eligible for European funding streams that individual universities are typically not eligible for.

Indeed, several of the IAB suggestions are challenging to execute in the multi-university environment where SciLifeLab operates today as a government funded "program". We now have a task force among the board members to look into the legal matters. In addition, a lawyer dedicated to SciLifeLab matters just started at KTH, and therefore, for the first time, we can start discussing the legal challenges with all universities from the SciLifeLab angle, and not just from the angle and mandate of one of the host universities.

It is critical that **career development** for technical and service staff is addressed to prevent losing these highly skilled and sought-after colleagues that the whole infrastructure operation critically depends on. This need has been highlighted in several IAB reports and is recognised by the stakeholders, but we can see no sign of concrete action, using the complex university governance of SciLifeLab as an excuse. In our view it is paramount that this is addressed and finished, even if it is in a pilot form where SciLifeLab would test and spearhead a mechanism before it gets generally implemented in the Universities.

- We thus strongly recommend that the SciLifeLab Board establishes a task-and finish-group on this subject, with a clear goal, roadmap and timeline, for example taking inspiration from the KI model that is starting to be implemented.

We agree that this is important and several discussions and efforts are already underway. This program has just started at KI as well, and while this model is promising, it is still not ready for large-scale implementation.

- Regarding **training**, the plans are very promising. We advise to integrate the DDLS related training activities into the overall SciLifeLab training programme.

This is precisely the task of the SciLifeLab-DDLS training planning group, which was already launched in late 2021.

- We furthermore recommend to collaborate with European level training role models such as EMBO courses as well as EMBL's International Centre for Advanced Training to build on best practice and realise synergies between national and European initiatives.

Agreed. This is also being discussed by the training planning group.

4.7 Continuing to shape the second decade of SciLifeLab

SciLifeLab has set out an excellent 10-year forward looking strategy and roadmap and has proven its value for Sweden in a "baptism by fire" bundling all its capabilities to respond to the pandemic in a "war" time mode.

In switching to "peace" time and implementation of the 10-year strategy, we recommend to focus on promoting the quality of Swedish life science research across the board, led and enabled by SciLifeLab with the aspirational goal of Sweden being ranked as one of the five leading European countries by the end of the second ten-year period of SciLifeLab operation.

To achieve this, it will be important to use the opportunities the new resources provide to continue to shape and integrate SciLifeLab's activities into a truly national, transparent and inclusive organisation. SciLifeLab must keep the visionary strengths it was founded on to integrate groundbreaking interdisciplinary life science and the infrastructure to enable it across universities. But significant change is needed in order to move forward and attain international leadership by integrating and simplifying its governance and operation, rather than trying to reform and continue to patch up a system that is too complex already.

We appreciate all the IAB comments, particularly the conclusions, and we will make sure that the SciLifeLab board and all the stakeholders pay attention to the last statement (underlining done by SciLifeLab).

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