NEKIFUT: National Research Infrastructure Survey and Roadmap

Contents

Introduction

NEKIFUT, the National Research Infrastructure Survey and Roadmap project aims at devising a strategy for upgrading national research infrastructures (RI) as well as for effective utilisation of transnational large research infrastructures. It has been prompted partly by national initiatives, as well as by the ESFRI Roadmap. It also takes into acount other possibilities for co-operation in this field with other EU member states.

NEKIFUT was launched in Autumn 2008 by the National Office for Research and Technology and it is to be completed in 2010. This ?narrative? offers a brief overview of the major features of NEKIFUT (Section 2), its milestones and the lessons learnt so far (Section 3), including open questions for foresight practitioners, STI policy-analysts, policy-makers and other stakeholders in this domain (Section 4).

Policies for Research Infrastructure and the Relevance of Foresight

Establishing and upgrading research infrastructures (RIs)[1] have always been relatively expensive projects, even in those years when the absolute costs were much lower than nowadays. Further, running large RIs can also be rather costly. Thus, although RIs are usually not in the limelight, they can take up a considerable chunk of regional or national R&D budgets, and in some cases they can only be financed via international co-operation, given the funds required. Yet, RI policies have tended to be devised behind close doors, involving only a handful

of experts and policy-makers ? when national security or prestige has been at stake, politicians, too. Several issues call for a radical overhaul of these old decision-making practices.

First, the most visible and pressing factor is the sheer cost of building new RIs on the one hand, and upgrading the existing ones on the other. Envisaged RIs, which are crucial for dealing with fundamental S&T, environmental or other socio-economic challenges, and thus to be built in the coming years, tend to be large projects. Some of these would require an EU-wide co-operation, or at least the collaboration of several countries to build and run them. Besides, many critical facilities across the European Union have to be modernised and/or reoriented as they are nearing the end of their useful life. Simply not all these new investments can be financed, and thus choices have to be made, as well as other sources of funding should be mobilised [2].

Second, those RIs, which are to be built and run by international co-operation, pose further challenges for policy-makers, beyond raising the funds required. These RIs need a long lead time and wide-ranging expertise to be developed, as well as a sustainable institutional and organisational frame that allows them to be open to, and used by, the largest interested community of scientists, customer industries, and other potential users. Thus, budget cycles, financial rules and priorities of the participating countries need to be aligned in the long run; new, appropriate governance structures are to be set up, preserving open access based on excellence; and political negotiations on site selection should be concluded.

Third, given the importance of RIs ? their role in addressing major challenges, and thus the socio-economic consequences of their operation; the financial implications of building and maintaining appropriate RIs; etc. ? major stakeholders need to be involved when strategic decisions are to be made on RIs. Beyond scientists and managers of RIs, and policy-makers, these include users and potential users, as well as citizens in many cases[3].

Fourth, many RIs are exploited below the socially optimal level. Some experts, therefore, suggest that a shift in emphasis is required ? away from concerns about funding new or upgraded RIs (hardware) towards better use and management of existing RIs. Funding, interoperability, open access on the basis of merit, meeting educational and training needs, and data conservation are thus central management concerns. These issues require strategic responses that take a long view ? but the necessary strategic capabilities are underdeveloped in many facilities. Moreover, better co-ordination of RIs is needed, both at national and EU levels, to achieve more efficient utilisation of resources and skills. Further efforts are also required to reduce the duplication and sub-optimal use of resources given the current lack of co-ordination.

Finally, and most fundamentally, the way in which knowledge is generated should be reconsidered, and thus the role of RIs is to be revisited, too. Clearly, this requires a proper, thorough dialogue and understanding between the co-producers and users of knowledge, including businesses, policy-makers, researchers working for publicly financed research organisations (including universities), as well as the representatives of the civil society. Publicly financed research organisations and research infrastructures (RI) ? here put together as research systems (RS) ? are still playing a predominant role in producing knowledge. Research systems, in turn, can be organised in various ways, taking into account their main rationale: knowledge can be produced for distinct purposes, and thus public research organisations are governed in different ways. Mechanisms and tools for setting their agenda, evaluating their activities and disseminating their results are defined accordingly. RIs are also arranged in this broader logic, aligned with the overall rationale of a research system.

The ForeIntegra project has identified three types of RS as starting points for such dialogues: (i) ?Pure science RS? with the main goal to boost national prestige by achieving scientific excellence; (ii) ?Business oriented RS? organised to produce S&T results meeting businesses? needs, and hence enhance their competitiveness; and (iii) ?Citizen oriented RS? aimed at achieving S&T results to improve quality of life. Further details are presented in an accompanying document. (ForeIntegra, 2007b) These RS are to be understood as ?ideal types? (as defined by Max Weber); i.e. none of them could be found in historical (actual) cases. They are sharp characterisations of distinct research systems ? rather than descriptions of any ?real life? case. The aim of distinguishing these three

ideal types is to highlight the major differences among different types of RS: these might be important inputs when considering alternative policies, as well as broad organisational and institutional arrangements for RS.

In sum, decisions on building new RIs and upgrading existing ones present a complex challenge. There is a wide range of stakeholders, with their different, and sometimes even conflicting interests; while there is a lot at stake in terms of future scientific capabilities, with their consequences on socially, environmentally, and economically sustainable development. Strategic choices have to be made, with significant immediate financial repercussions, and potentially huge long-term implications ? while the constraints are severe, the opinions might significantly differ, and no evidence exists in a strict sense. Foresight is definitely not a panacea to address this complex challenge, but can assist decision-makers. It can reduce technological, economic or social uncertainties by identifying alternative futures and various policy options, make better informed decisions by bringing together different communities of practice with their complementary knowledge and experience, obtain public support by improving transparency, and thus improve overall efficiency of public spending.

Major Features of Foresight Processes

At a more general level, several salient features of foresight processes seem to be highly beneficial when tackling RI policy issues.

- Foresight is a future-oriented activity, though not in a predictive sense: it assumes that the future is not pre-determined, but can evolve in different directions, depending upon the actions of various players and the decisions taken today. In other words, the future can be actively shaped, at least to some extent, and there is a certain degree of freedom to choose among alternative, plausible futures, and hence to increase the likelihood of arriving at a preferred future state.
- Foresight values the multiplicity of perspectives, interests, and knowledge held across a dispersed landscape of actors, and seeks to bring these together in processes of deliberation, analysis, and synthesis. As the results of foresight often have implications for a wide variety of actors, it is particularly important to involve the major stakeholders as far as possible throughout the process.
- Foresight relies upon informed opinion and interpretation, as well as creative approaches in formulating conjectures on the future. However, these are seldom sufficient on their own and are complemented with various sorts of data from trend analyses and forecasting, bibliometrics, and official statistics, among other sources.
- Foresight recognises that many of the problems we face today cannot be understood from a single perspective nor the solutions found within a single discipline. Accordingly, foresight intentionally seeks to transcend traditional epistemic boundaries, bringing together different disciplines in processes of deliberation that result in improved understanding and new working relationships.
- Foresight enrols multiple actors to participate in decision arenas where conjectures on the future are contested and debated. Supported by various data and opinion, the foresight process aligns participant actors around emergent agendas, resulting in a coordinated mobilisation of people and resources.
- Foresight is not only about analysing or contemplating future developments but supporting actors to actively shape the future. Therefore, foresight activities should only be undertaken when it is possible to act upon the results.

Issues for Foresight on RI

1. Policy co¬ordination Efficient use of public funds would require a more effective orchestration of RI policies with broader science, technology and innovation policies. Just to mention a single aspect, RIs are operated in a large number of scientific domains, with their own specific features and needs, and all these have to be taken into

account when devising science, technology and innovation (STI) policies. Although it is already so complex a chain, that it seems unmanageable, actually the need for co-ordination possibly goes even beyond: other policy fields, which interact with STI policies with regards to socially, environmentally, and economically sustainable development should also be aligned with the help of broad strategies, underpinned by foresight.

2. Use of existing RIs Foresight can tackle the gap between the current operation of existing RIs and their potentially more efficient use by devising and systematically considering alternative governance, organisational and financial models.

3. Future needs vs. existing RIs Foresight can thoroughly explore the gap between the current RIs and future needs, derived from likely S&T, environmental, societal and economic developments, and by doing so, offer ?future-proof? RI strategies.

Several issues deserve special attention when running foresight processes to consider this broad gap.

3.1. More efficient exploitation of existing knowledge vs. generation of new knowledge When considering if future socio-economic and S&T needs would necessitate the building of new RI facility, it is crucial to assess whether existing knowledge, available at important RIs, could be better harnessed. Some experts even suggest that knowledge transfer needs to be prioritised over and above new knowledge generation and have called for the development of increased capacities in this area. It is helpful to think of this issue by considering two options: (i) are there better ways to unlock a repository of knowledge, and would those be sufficient; or (ii) is there a need to change the way in which knowledge is generated in the first place? (see the three ideal types of research systems, presented in the previous section)

3.2. The life cycle of the RIs The financial implications of building and running RIs ? the budget constraints, from a different angle ? should be assessed in a comprehensive way: the long-run maintenance costs of existing and new RIs should be considered as a single issue. A closely related question concerns the decommissioning of RIs: how and when to close obsolete RIs (financial, employment, environmental, S&T and broader socioeconomic implications).

3.3. International co¬operation and competition In the case of RIs with an EU-wide significance, it is essential to have a sound understanding of the specific needs, roles and capabilities of the 27 members of the EU: how they could contribute to the building/ running these RIs, and how they could benefit from their operations. Most likely new models of co-operation are also needed to run these RIs, either by inventing truly new models, or reinventing some of the existing ones. A closely related aspect is to strike a balance between co-operation and competition among the EU members; but this issue can ? and in many cases should ? be considered at a global scale, too. Further, funding and eligibility rules to encourage collaboration and co-investment have also to be developed. Finally, regulations on intellectual property rights and ethical issues should also be aligned among the participating countries.

4. People RI policies should not consider only ?hardware?, i.e. the tangible assets ? people are equally important, but this aspect is often eclipsed because of the apparently more important financial or political considerations (how much to spend on RI, where to locate it, etc.). To rectify this deficiency, strategies on RI should be aligned with education and broader human resources policies: the current stock and flow of researchers who can strategically manage and govern RIs, and other highly skilled people who can exploit these services; the balance between future HR needs and the supply of skilled people; the various forms of training tailored to the future generation of researchers; life-long learning for the current generation to prepare them for meeting future challenges; career opportunities for people with these special skills; diffusion and exploitation of knowledge via the mobility of people (between sectors: e.g. RI, businesses, policy-making, NGOs; as well as between regions and countries inside and outside the EU).

Pulling together these four issues, foresight processes bring together the relevant stakeholders to consider the future needs, on the one hand, and can mobilise their expertise and experience to judge if the operation of existing RI can be modified to meet the future needs or new RI should be built. As a result, RI can better serve the respective research and innovation systems broadly, and not just the host/ funded institutes. Further, by encouraging systemic and systematic thinking, as well as by bringing together the diverse set of knowledge and skills needed, foresight can facilitate strategic deliberation on complex issues. It also compels developing alternative models drawing on the wide ranging expertise of the participants. The participants, in turn, would feel ?ownership?, and thus their future actions would be driven by the shared understanding of the context (where we are now), as well as by shared visions (what we want to achieve).

Major features of NEKIFUT

NEKIFUT is a strategy process to assist Hungarian RI policies (upgrading the domestic RIs, gaining access to, and effectively utilising, transnational RIs), that is, not a stand-alone and fully-fledged foresight process, per se. However, it follows foresight-like approaches, and relies on some elements of the foresight toolkit. Most prominently, it is intended to be a participatory process, reaping the so-called process benefits (5 Cs in foresight jargon). The members of the Steering Group (SG), as well as those of the 3 Working Groups (WG, each representing a major field of sciences) have been selected consciously to represent major stakeholder groups: researchers working for universities, publicly financed research institutes (to a large extent belonging to the Hungarian Academy of Sciences), business R&D units. Business people are also involved as SG members. Policy-makers are represented by the launching government agency, that is, National Office for Research and Technology. Further policy-makers are to be involved as members of an inter-ministerial group ? still to be set up, due to the constant re-organisation of the STI policy governance system.

Further fundamental ? and foresight-like ? guiding principals of NEKIFUT are to work in a transparent manner and conduct systematic analyses.

NEKIFUT is the first strategy project in Hungary in the field of RI policies, following these three principals: being participatory, transparent and systematic.

Although foresight is deemed particularly relevant to underpin RI policies (see Annex), it is not common practice to use foresight in this policy domain. Indeed, the small group managing NEKIFUT has not come across any of such project. Thus, it has not been possible to rely on international experience in this field, and learn from it.

Most noticeably, ESFRI has not followed any foresight-like approaches when devising its RI Roadmap. The RIs suggested by various research communities have been considered and assessed in isolation. Several observers ? who have closely followed this process ? stressed unfavourable consequences of this approach. First, important S&T fields might have been neglected, given the lack of systematic prospective analyses. Second, political lobbying is becoming dominant, especially national states play a decisive role ? driven by prestige and sometimes more mundane considerations ? as opposed to an ?ideal(ised)? ERA rationale.

NEKIFUT milestones

Definition of strategic RIs

Several countries have already compiled RI roadmaps, and international bodies have also identified development

needs/ opportunities in this field. All these documents have introduced an RI definition, usually one derived from ESFRI documents. But none of them defined RIs of strategic importance, i.e. the set criteria to be used when differentiating RIs and strategic RIs (SRIs), the ones, which should form a roadmap.

Thus, as a first step, we devised and run a broad on-line consultation, leading to a definition of SRI, to be used throughout the NEKIFUT project. It was discussed and finally approved at WG and SG meetings by late 2008. Initially several participants had expressed their doubts if it would make sense to spend time on this process. When the definition was accepted, all these voices became almost silent. A few months later, by the time WG and SG members were faced with the task of assessing RIs, a strong, broadly-held consensus have emerged that is has been an indispensable tool to assist them.

Register of SRIs

Actually, it was not foreseen among the tasks of NEKIFUT to develop a definition of SRIs. The first planned task ? which was performed as second ? was to run a survey of Hungarian RIs and set up a register of SRIs. A two-round on-line survey has been run to perform this task.

The first round was open: all researchers managing or using RIs in Hungary or abroad had an opportunity to ? nominate? RIs to be included in the register of SRIs. Over 2000 entries have been submitted, although the questionnaire was not short; it has taken some time and efforts to answer all questions. No wonder, assessing thousands of RIs was an enormous task, consuming several weeks. Again, no other countries have performed a similar task, and thus there has been no source of learning or inspiration. An assessment procedure had to be devised by the management team, and then discussed and approved by the WGs and the SG.

Following this procedure, around 100 candidate SRIs have been invited to take part in the second round of the survey, which is currently being run. A new questionnaire has been designed and a new software package has been developed, taking into account several needs:

- to obtain all the information needed to decide which candidate SRI could become SRIs;
- to use the answers obtained in the second round as the basis for the final SRI register (to avoid the duplication of tasks entering the requested set of data again);
- to obtain inputs for policy analysts and policy-makers on RIs.

Accordingly, rules of access to different sets of data for different groups of users have been defined. The future use of data ? who can get access to which data ? has been indicated to RI managers who provide data for the register.

Another important difference between the two rounds of the survey is the procedure of validation. In the first RI managers have entered the data, and submitted for assessment. in the second round data have to be validated by the head of an organisation, where a given RI is hosted (e.g. by the director of an institute, or the rector of a university).

NEKIFUT has put a strong emphasis on networking RIs for several reasons: to enhance the efficiency of the use of RIs, and promote scientific co-operation. The first results are already emerging, i.e. a visible networking process has been put in motion by NEKIFUT: around 400 individual RIs form the >100 candidate SRIs.

Major transnational RIs, frequently used by Hungarian researches ? or desired to be used ? will be assessed by a somewhat different procedure, taking into account the specific features of the RIs.

An important pragmatic lesson can also be drawn: to devise the questionnaire, to develop an appropriate software solution and test everything (technically, as well as in terms of feasibility from the point of view the respondents) has been very demanding and time-consuming.

A respective EU body, however, has just indicated that a similar register would be needed at an EU-level, too. Thus, experience gained during the NEKIFUT project might be very valuable ? with the necessary ?scaling up?, of course.

Register of RIs

A register of RIs will be also set up to (i) make them visible for potential domestic and foreign users; (ii) foster partnering/ co-operation in order to foster S&T excellence by pulling resources together, and also enhance financial/ technical efficiency of RIs (raising revenues).

Again, it had not been among the planned tasks, but during the process the participants have expressed a strong desire to set up this register, too.

RI roadmap

This part of the NEKIFUT project is where several elements of the foresight toolkit are the most obviously needed ? but in the same time perhaps the most difficult to apply. There are several straightforward, pragmatic reasons to explain these difficulties: the management team and the participants are overwhelmed by the other ? partly unforeseen, extra ? tasks of the project. Moreover, most participants do not have experience in using these techniques ? and to busy to be trained. (Some other, partly hypothetical, reasons are presented in the concluding section.)

In brief, several paths have been started (e.g. identifying drivers via groupwork, followed by broader on-line consultation, including open questions, too; devising multiple visions for RI developments and/or RI policies), but eventually a fairly simple, less demanding method is being followed right now. Major RI-relevant S&T trends are being identified by thematic groups (formed by WG members and invited ?external? experts. SWOT analyses of RIs relevant to identified S&T trends are going to be performed. (Various types of background analyses are also to be conducted, e.g. using bibliometrics, statistics on RI investments, etc.)

Finally, by pulling together these threads, policy recommendations will be derived in the form of a roadmap for RI development, as well as proposals on policy rationale, methods to prepare and implement decisions, and policy tools to be used. Some recommendations would concern certain fields of scientific research (i.e. the level of WGs, or branches in those fields), while others would be at a higher level (the overall RI policy, i.e. the level of the SG).

Lessons learnt so far and dilemmas/ open questions

It would be logical to group these issues into two broad categories, namely external to NEKIFUT, and internal ones. There will be an attempt to follow this logic below, but real life overrides ?neat? abstract structures.

The overall decision-making culture

In many countries the decision-making procedures tend to be opaque, only a small circle of confidants are involved, and short-term political considerations overrule longer-term policy rationales, based on evidence and analyses. Hence, participatory, transparent, systematic processes, openly presenting and discussing substantially different options are rarely welcome when it comes to actual decision-making.

The legacy of ESFRI

As already mentioned, ESFRI has not followed foresight-like approaches, and several key persons of NEKIFUT has been ?socialised? in that culture. A strong ?imprinting? is quite natural when people act and interact in a certain ?micro culture? for years, especially when that community is setting the norms at an EU-level for a particular policy domain. It becomes so ?intrinsic? that it takes quite some time just to understand that this background is counterproductive, and obviously requires even longer time to change it: conscious efforts and mutual learning are needed to develop a new common language and a set of shared professional norm required to perform the tasks of a different strategy process.

Political (in)stability

Political and organisational stability are basic pre-conditions of successful policy projects. Organisational learning, in turn requiring stability ? is also a major factor for smooth and efficient project implementation. In contrast, the main bodies responsible for STI policy formation, co-ordination, decision-making and implementation have been constantly restructured in Hungary since 1990. Each government reorganised the system at least once (in 3-4 years). There were 3 governments in 2006-2010 - under the political control of the same Parliament -, and the STI policy governance system was restructured in May 2008, and again in March and September 2009.

Just to take the most immediate level of decision-making and most recent developments from the point of view of NEKIFUT, a new position of Minister without portfolio was created in May 2008 to co-ordinate and oversee STI policies, and to supervise the National Office of Research and Technology. However, in April 2009 this position was abolished when a new government was formed, and the Minister for National Development and Economy took over (again) the responsibilities of the Minister without portfolio. In practical terms, three different high-level decision-makers had to be convinced in around two years to give green light and resources to prepare NEKIFUT, to launch and then to continue it, in spite of changes at a higher level of the political hierarchy. For these reasons, it has not been possible to set up a an inter-ministerial expert group, whose role would be crucial when translating policy recommendations into actual policy measures, and implement them.

There were general elections on 11 April (the first round) and it is already decided that the current opposition will get the political power in a few weeks.

Embeddedness vs. autonomy

There is a general dilemma for all foresight(-like) projects: how to ease an inherent contradiction between the need for a strong (but ?reserved?) political support (or ?embeddedness?) for a successful foresight programme on the one hand, and for intellectual, organisational, financial independence from any government agency, on the other. How to design such an organisational set-up in a specific context?

A thorough preparation, project planning and management is key

This a self-explanatory ? even almost boring ? point, a commonplace; and thus there is no need to elaborate on it. Thus, suffice it to mention a few key notions: scoping a project, budgeting, planning activities, selecting the right participants, and train them in an appropriate way, hiring able analysts. Several of these resources are scarce in many countries, though: especially time for all these, and also the skills and experience (in a context-specific form) needed to perform these activities. Hence, the real question is how to overcome these barriers, what ?compromise? is acceptable, and what level of ?flexibility? would undermine seriously the quality and credibility of a foresight(-like) project.

Availability of WG and SG members

Availability of these participants should b understood both in terms of their time (for training and other preparatory activities, and to perform their tasks) and their mindset, that is, being open to new, unusual tasks; not just being present, but actually available when they are needed. Yet from a different angle: making available their special knowledge and skills e.g. for a group work, when bringing together various ? complementary ? experience and knowledge is essential.

Methodological questions

4.7.1 Is it feasible to devise concise, comprehensive ?futures? for RIs?

More specifically, how to account for the diversity of S&T dynamics, idiosyncratic features of various S&T fields and their RIs?

Or, if policy rationales are in the focus of a prospective analysis, how to devise convincing, attractive, simple enough, and ?actionable? futures, yielding visible results in 1-2 years?

If any of the above approach is feasible in principle, who would be able to devise such futures? (What set of knowledge, methodological experience and communication skills would be needed? How to assemble and manage such a team?)

4.7.2 Is it feasible to devise multiple ?futures? for RIs?

4.7.3 Is it feasible to devise ?futures? for RIs in a multi-level structure?

E.g. taking into account EU-level, supranational regional, and national factors/ developments in a ?cascade? of futures? Given the significance of these levels in the domain of RI policies, it would be certainly beneficial.

Fully-fledged, stand alone foresight vs. embedded, foresight-like activities

From an abstract, somewhat rigid methodological standpoint one might argue that ?pure? (fully-fledged) foresight programmes should not be compromised; i.e. should not be ?downgraded? in order to tailor the methods to meet practical requirements, or important elements should not be ?stripped off? because of resource constraints.

An opposite, more pragmatic approach could equally forcefully claim that it is better to embed some foresight-like activities into an actual decision-preparatory process than aiming at ?perfect? processes ? but with

low chances of implementation. Three inter-related reasons might be thought of to support this claim. First, foresight-like activities are likely to yield better informed policy recommendations (compared to those instances where none of these methods are applied). Second, given the embeddedness into an actual decision-preparatory process, there might be higher chances to implement these recommendations. Third, in case a sufficient level of participation and ?joint ownership? of recommendations, the prospects of implementation would be even more promising.

Notes

1. ? The ForeIntegra project has followed the definition of RIs offered by the European Strategy Forum for Research Infrastructures (ESFRI): ?Research infrastructures are tools that provide essential services to the scientific community, across the range of scientific and technological fields. Examples include libraries, databases, biological archives, communication networks, research vessels, satellite and aircraft observation facilities, observatories, telescopes, synchrotrons, accelerators. They can be ?single-sited?, ?distributed? or ?virtual?.?
2. ? The recent Green Paper on ERA (EC, 2007) confirms this observation: ?Implementing the ESFRI [the European Strategic Forum on Research Infrastructures] roadmap would cost €14bn over 10 years. Despite the increase in funding allocated to infrastructures in the 7th research Framework Programme and the possibilities for infrastructure-support in less developed regions under cohesion policy programmes, the EU budget is not big enough to provide core financing for the construction of new pan-European infrastructures, in addition to supporting open access to infrastructures of European interest and stimulating their coordinated development and networking. The mobilisation of national, private and other sources of funding is essential. Attracting investment from industry is particularly important given its current low level of involvement, even for infrastructures of direct interest.? (p. 13)
3. ? It is particularly important when the RIs in question are critical from the point of view of quality of life (e.g. they concern environmental issues, or food quality and safety); or ethical issues, etc.