

# Science, technology and innovation priorities

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This report has been prepared as an output of Aus4Innovation's Policy Exchange Activity, 'Supporting the development of Vietnam's Science Technology and Innovation Strategy 2021-30' and is being undertaken as a partnership between the Vietnamese Ministry of Science and Technology (MoST) and CSIRO.

This report assesses the relevance for Vietnam of international experience with setting priorities for Science, Technology and Innovation (STI). A complementary report assesses the relevance for Vietnam of international experience with STI indicators.

The full report is organised in the three parts:

- Part A discusses the frameworks for overall STI policy. The first section reviews the role, within overall economic development policies, of strategies for STI. It draws in particular on the experience of the successful East Asian economies. The second section reviews general frameworks for innovation management and policy. Over the past 30 years there has been a transformation in understanding of innovation processes and of the role of innovation in the economy. The major elements of this transformation and its implications for policy are discussed. This section concludes with an outline of recent developments in innovation policy. The final section draws out one particular discussion thread - the role of learning in priority setting systems and in STI policy generally.
- Part B summarises key points from cases studies of how nine selected countries approach STI priority setting: Australia, Chile, China, Europe (selected countries), Korea, Japan, Malaysia, Singapore, and Taiwan. The summary includes an assessment of the key challenges in STI priority setting and also identifies key implications for Vietnam of the diverse international contexts, approaches and experience. The detailed country case studies are provided as appendices.
- Part C discusses the policy context for STI priority setting in Vietnam. Innovation policy frameworks provide one of the foundational components for priority setting; Vietnam's development priorities and strategies provides another. The first section of Part C discusses pragmatic principles for selecting priorities from long lists of candidates. Subsequent sections review the draft of Vietnam's Socio-Economic Development Strategy (SEDS) 2021-2030, drawing out the indirect and direct implications for STI priorities. The SEDS has clearly been informed by analyses of the performance of Vietnam's innovation system.

## Innovation policy foundations for priority setting

Priority setting for STI has two key objectives:

- Steering activities in the STI system toward achieving social, economic and environmental goals. This relies on identifying those investments (of financial, human and organisational resources) in science, technology, innovation and related activities, that are likely to have the greatest impacts in relation to those goals.
- Facilitating the coordination of different actors and activities involved in the innovation system to improve overall efficacy and efficiency.

Identifying which investments in which elements of STI will have the greatest impact over time requires an understanding of the relationships between S,T and I. It also requires an understanding of the strengths and weaknesses of a national innovation system.

This is particularly important for Vietnam as the S&T Development Strategy of 2011-2020 focused on developing science and technology capacities but was not closely aligned with the Socio-Economic Development Strategy. It is considered that science and technology did not enable transformative change by raising labour productivity, and effectively applying science and technology and organisational and production management innovation. The lack of focus on raising the managerial, technological and innovation capabilities of firms limited the impacts of investments in indigenous S&T capability.

Since the 1990s, innovation policy in most countries has been increasingly influenced by the innovation systems perspective. This perspective emphasises the central significance of processes of knowledge acquisition and generation, and the roles that interaction among actors and institutions have in stimulating and shaping those processes. From this perspective it is firms that are the central actors in an innovation system.

From an innovation systems perspective, it is the accumulation of capability (ie learning) throughout an economy that raises productivity and innovation levels. Rather than focus on a few high -tech or high-R&D sectors and firms, it emphasises the role

of the diffusion of knowledge and hence of the absorptive capacities of all firms and organisations.

As innovation systems are complex, any policy intervention involves a level of uncertainty regarding the diagnoses of the source of problems, the identification of opportunities, and the likely impacts of policies to address problems and pursue opportunities. Consequently, policy is unavoidably experimental. All participants in innovation systems are continuously learning how to be effective and how to interact with other participants.

In the many countries that have moved from low levels of productivity and innovation capability to 'catch up to the global frontier', government STI policy has played a key role. However, the policies that have been critical in each country and the roles of the private sector, state-owned firms, foreign-owned firms, universities and publicly -funded research organisations have varied widely – each country has developed a unique path, shaped by both the national context and by the prevailing global technological and economic context.

The experience of these countries points to the importance of:

- strengthening the capabilities of firms and ensuring that the economic environment provides incentives for firms to invest and innovate
- recognising the role of uncertainty in planning
- developing mechanisms for coherence and coordination in strategies
- developing strategies at the sectoral level
- building momentum through positive feedbacks
- developing roadmaps to impact so that investments in knowledge and capability are linked to objectives
- addressing major shifts in technological regimes
- empowering opportunity discovery through entrepreneurship.

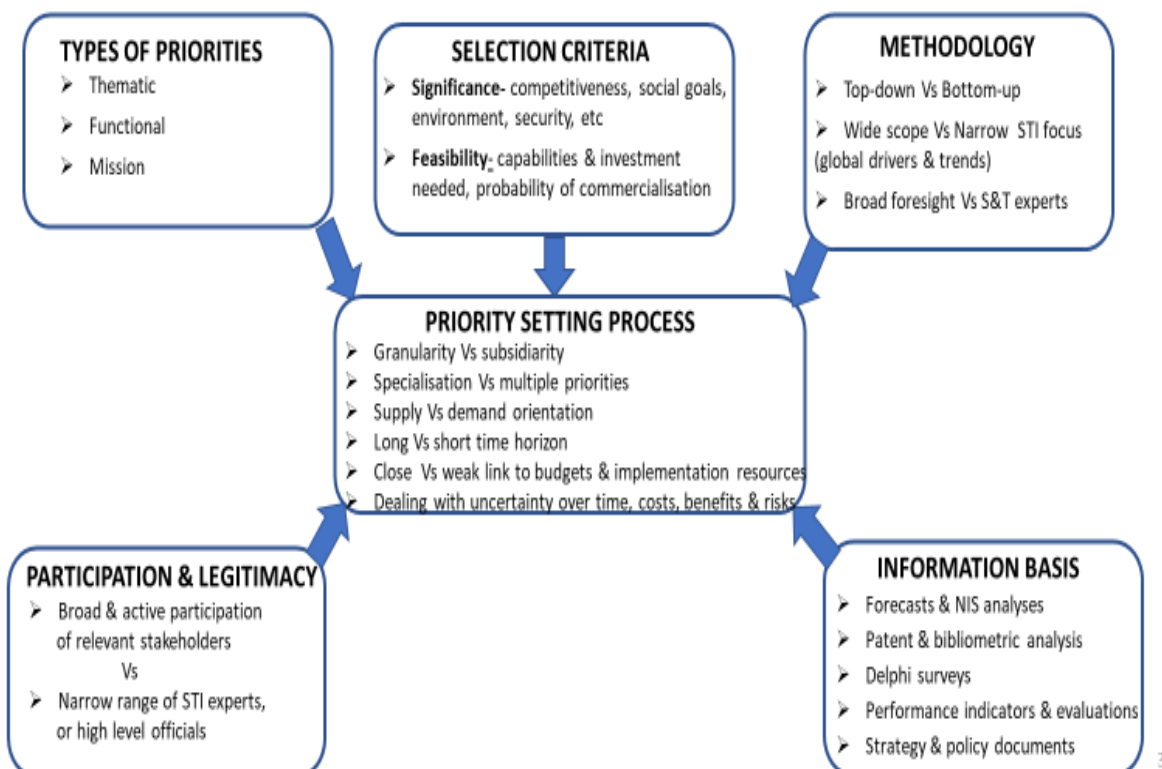
## Evolving perspectives on innovation

Understanding of the role of innovation in economies and societies, and of effective innovation policy, is continually evolving. This report discusses several aspects of innovation frameworks that are particularly relevant to innovation policy:

- Innovation is relevant to all activities- industrial (including services), social, administrative, policy.
- While major innovations can be transformative, ongoing incremental innovation is essential for productivity growth.
- Innovation often draws on knowledge from many fields and sources and involves close interaction among (and within) organisations.
- Patterns of innovation, and the sources of knowledge used, are markedly different in different sectors.
- The capabilities of firms to acquire, adapt, apply and improve knowledge is a critical element of an innovation system – it is one determinant of the rate of productivity growth and the demand for knowledge from all sources.
- Entrepreneurship is a form of business experiment that can identify new scope for value creation.
- Firms’ potential and propensity to innovate is shaped by their capability, but also by their access to skilled human resources, markets, knowledge, finance, supportive institutions, high quality suppliers etc- ie firms innovate in the context of sectoral, regional and national innovation systems.
- The report includes a discussion of recent developments in innovation policy that are based on new insights into innovation and on experience with policy implementation.

## International approaches to STI priority setting

There are many options in the scope, objectives and design of STI policy setting processes, as summarised in the following diagram:



Based on Grebenyuk, et al, 2016b

## National approaches and dominant trends in priority setting

The report assesses the approach to STI priority setting in nine countries: Australia, Chile, China, Europe (selected countries) Korea, Japan, Malaysia, Singapore and Taiwan.

The assessment is organised around eight dimensions of the design of STI priority setting systems:

1. **Scope and content of STI priorities:** As STI has a pervasive and increasing role across the economy and society and all areas of public administration, what is the scope of STI priorities?
2. **STI governance and leadership:** Who is responsible for developing STI priorities, how are these priorities integrated with other areas of public policy, how is legitimacy established, and how are the views and interests of different stakeholders coordinated?
3. **Processes of priority setting:** What issues are considered, information sources used, and assessments conducted?
4. **Approach to consultation & participation in priority-setting:** Who contributes at what stage to identifying and selecting priorities?
5. **Types of STI priority:** To what extent do priorities focus on capability in a specific area of science or technology, on improving the performance of the innovation system or on social, environmental, economic (etc) objectives to which STI contributes?
6. **Integrating innovation goals:** As innovation is broader than S&T, is shaped by policy in areas beyond S&T and has wide ranging impacts, how is the 'I' integrated with the S&T?
7. **Implementation of priorities:** What policy instruments are used to drive implementation and to what extent is the detail of broad priorities delegated to lower-level actors, such as funding agencies, Ministries etc?
8. **Monitoring, evaluation and systemic learning:** How do all actors in the STI system, including the priority setting and implementation component, improve their capability and effectiveness?

## International experience with STI priority setting – key implications

The nine detailed country case studies are provided in an annex to the full report.

In our view the key points that we have drawn from international experience provide useful guidelines for STI priority setting in Vietnam. We have emphasised that while different countries may follow similar principles in their approach to priority setting, the specific characteristics of their approaches will be shaped by their context and experience.

The following points identify what are likely to be some of the main implications of that international experience for STI priority setting in Vietnam.

### Scope and content of STI priorities

- STI priorities needs to be thoroughly integrated with, and reflect, broader national ambitions.
- Innovation is important for a wide range of policy objectives and involves much more than S&T. Innovation performance is shaped by economic incentives, management capability and business culture – which in largely determine the demand for new knowledge and the willingness to innovate
- Building capabilities throughout the innovation system to absorb knowledge and to learn to improve technology, collaborate and innovate, will shape the demand side without which investments in the supply of knowledge through investment in R&D will have few benefits.
- The role of technology acquisition from foreign sources is a component of STI priorities.
- Important priorities will be those transformative opportunities to remove barriers and seed self-reinforcing dynamics that drive a widening process of upgrading.

### Governance and leadership

- Priority setting is an issue for all levels of the innovation system - the national level and the level of research organisations, sectoral agencies, universities, funding bodies etc.
- Strategic STI policies that have been developed with stakeholder participation, and that provide a clear *vision* and high-level goals and priorities, guide funding bodies, research organisations, universities and enterprises to develop operational priorities.

- STI Councils, with participation by key Ministries and major stakeholder groups, and chaired by the head of government, contribute to the legitimacy and effective coordination of STI priorities and implementation.
- An effective priority-setting system requires capable and resourced participants committed to learning about: priority setting processes; the outcomes and lessons of previous priorities and approaches; research and innovation systems, and new challenges and opportunities.

### **Priority-setting processes**

- Developing a comprehensive range of information on which to base decisions, and sharing (and discussing) the analysis of that information with participants in the STI priority setting process, is an essential investment of time and resources.
- A critical source of insight is previous experience in selecting and implementing priorities. Learning from that experience, and engaging all major stakeholders in such reviews, contributes to building a shared perspective on the national (regional, sectoral) context and the challenges faced.
- Empowering organisations close to STI activity with significant scope for making decisions on the allocation of resources at the detailed/tactical level- and ensuring that they are accountable for those decisions – will strengthen the overall STI system.

### **Approach to consultation and participation in priority-setting**

- Sharing among participants in the STI system the assessments of trends and opportunities (eg foresight studies) that inform priority setting, contributes to the quality of participation and in turn to the legitimacy and influence of the STI priorities.
- A shared perspective based on sound analysis and extensive consultation also contributes to aligning the future actions of STI system participants.
- High-level councils with representation by relevant ministries and the significant stakeholders from research and industry, and national conferences with similar participation, are mechanisms that can be used for

participation and consultation. Well-designed foresight can also enable wide consultation.

### **Types of STI priority**

- There is a role for all three types of STI priority – thematic, functional and mission-oriented.
- When combined in an overall strategy these can be synergistic, particularly when the need for complementary capabilities to ensure a ‘path to impact’ is kept in perspective.

### **Integrating innovation goals**

- STI policies that focus on the supply-side often lead to problems of poor knowledge transfer. The users of knowledge need to be active participants in STI priority setting, and the requirements for strengthening and orienting demand need to be addressed in STI priorities.
- Including mission-oriented initiatives in the policy mix can facilitate cooperation among Ministries and the development of public-private partnerships. The requirement within such approaches for ongoing evaluation can be a powerful mechanism for policy and strategy learning.

### **Implementation of priorities**

- The priorities of an STI system are to a significant extent emergent, in that they develop from an interaction of top-down and bottom-up priorities and processes. High-level priorities cascade through the levels of an STI system and are interpreted and translated into actions at each level.
- International experience is that decision-making about the detailed allocation of resources is most effective when decentralised and made by those ‘close to the action’. A system with a high level of autonomy but with targets, monitoring, accountability and a tolerance for failure is one that will learn more rapidly and empower the participants.
- As most countries aim to avoid a narrow definition of thematic priorities, while nevertheless providing direction to innovation policy, many have developed broad programs addressing a set of interrelated technology targets. Their targets and approaches usually evolve over time as more is learnt.
- An organisation with responsibilities, and authority, for coordination (horizontally, across sectors, and vertically, across layers of

implementation) and also at least oversight of monitoring and evaluation, can help to reduce fragmentation and duplication. Many countries have some form of high-level council or committee with participation from major stakeholder groups, which facilitates coordination among government departments and between the public and private sector.

### Monitoring, evaluation and systemic learning

- International experience indicates that monitoring and evaluation plans should be incorporated into policy design and lead to specification of the data needs and the criteria for evaluation. This experience also indicates that evaluations are most effective in promoting policy learning when they are independent and the results made public.
- The priority setting process itself should be evaluated not in terms of success or failure, but rather to identify what can be learnt to improve the next iteration. This is characterised as ‘double-loop learning’, which entails the modification of goals or decision-making rules in the light of experience. This may require not only a change in the design, but also a revisiting of the organization's underlying norms, policies and objectives.

### Initial broad recommendations

The Draft Socio-Economic Development Strategy (SEDS) has clearly been informed by analyses of Vietnam’s innovation system and by the experience of the S&T Development Strategy of 2011-2020. The SEDS provides a large part of the foundation for STI priority setting.

In the full report, we have sought to identify the particular elements in the Draft SEDS that have implications for functional, thematic and mission-oriented STI priorities.

Here we emphasise what we see, on the basis of our current knowledge of the Vietnamese context, as the most important priorities – focusing on horizontal priorities and on governance issues.

### Horizontal priorities

The experience both of Vietnam’s 2011-2020 S&T Development Strategy, and of STI development internationally, emphasizes the importance of the managerial, technological and innovation capabilities of firms. An effective STI strategy must include strategies for the ongoing upgrading of firms’ capabilities.

Sectoral strategies, informed by analyses and consultation with all stakeholders, can identify opportunities and barriers to upgrading and growth. Such strategies can include targeted measures to strengthen firms, identify measures to stimulate investment, innovation and collaboration and communicate to government issues that require attention.

It will be important to ensure that foreign investment into Vietnam contributes not only to production capacity, but– through knowledge transfer and in-house innovation activity – also to building Vietnam’s innovation capacity. The experience of several countries provides exemplars for effective approaches to actively promote such ‘spillovers’.

Entrepreneurs discover, create and pursue opportunities based on emerging markets, under-used resources, or the application of capabilities or new technologies. They have a vital role in an economy and innovation system. While assessments of the entrepreneurial ecosystems in Vietnam will be essential, it is likely to be important to ensure that early stage and growth funding is available, and that regulation and the anti-competitive behaviour of major firms are not significant disincentives for entrepreneurs. Continuing to strengthen STEM education and introducing entrepreneurship courses into higher education will also contribute to building the potential for entrepreneurial activity.

### Governance

A review, with participation by all relevant Ministries and major industry associations, of the outcomes of the S&T Development Strategy of 2011-2020 would be valuable for the current

strategy development. It would contribute to an informed and shared view of the strengths and weaknesses, both of those strategies and of the approach to priority setting.

STI systems are open systems, characterized by complexity and uncertainty, with many actors and diverse interactions. Planning to learn is as important as learning to plan.

A key objective of strategies for STI is to enable rapid learning by all actors –learning about opportunities, their own and others’ strengths and weaknesses, how to collaborate to address constraints, how to build capabilities to improve performance and to innovate.

Monitoring and evaluation can play a role in stimulating learning, if it is accepted that mistakes, failures and unforeseen problems are both inevitable and opportunities to learn and improve. Developing an evaluation culture should be an aspect of STI strategy. Similarly, pilots and policy experiments are explicitly designed to enable learning.

Autonomy combined with clear mandates, assessment and accountability drives change more effectively than prescriptive control. Where research organisations and universities are funded on the basis of performance agreements (ie the organisations are required to have an explicit strategy with goals and relevant indicators) they have flexibility in achieving their missions and incentives to learn to be more efficient and effective.

## Thematic and mission-oriented priorities

We list a set of basic principles for identifying major thematic STI priorities. Areas likely to stimulate positive feedbacks and hence increasing returns are particularly important. Positive feedbacks drive growth and upgrading, leading to increased production capacity, deepening capabilities and a widening range of participating firms and organisations.

These are the dynamics of cluster growth, but also of successful sectoral and regional innovation systems. These areas will often begin as small niches where there is an alignment of relevant capability and opportunity. For example, these could be opportunities to expand roles in global value chains to build higher value adding positions, or the application of advanced digital or biotech technologies to otherwise ‘low tech’ sectors such as resource processing or service industries.

There are two roles for government in relation to these growth foci: identifying and seeding early emergence; removing barriers to growth. One option for undertaking these roles, where integrated policy and public-private joint initiatives are essential, is the formation of an Innovation Agency with a broad and flexible mandate to pursue these roles and to undertake pilots.

The pervasive significance of the digital technologies of Industry 4.0, and the objectives set out in the Sustainable Development Goals (SDGs), are likely to be foci for major mission-oriented STI policies.

### For further information

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