

Scientific cooperation between Southeast Asia and Europe in 2020. Driving factors as assessed by scientists and policy-makers

**SEA-EU-NET Deliverable 4.2 to the European Commission:
A Delphi-based Futures Paper on S&T cooperation between
the EU and Southeast Asia**



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Vienna, February 2011

Contents:

Executive Summary	3
1. Introduction	5
2. The methodology	6
3. Policy-makers' views	15
4. Driving factors – perspectives from open email consultation	23
5. Global assessment of important driving factors based on Delphi survey	30
a. Overall assessment	32
b. Regional differences	33
c. Developed countries – developing countries	35
d. The different views from hierarchy	37
6. The views from the scientific community contrasted by views from policy-makers	39
7. Conclusions and recommendations	42
8. The core logic of a success scenario	45
9. Outlook on further possible steps – scenario planning	49
10. Bibliography	51

Executive Summary

The European Commission tasked the project SEA-EU-NET to conduct a foresight exercise on determinants of future scientific and technological (S&T) cooperation between Southeast Asia and Europe.

This International S&T Cooperation Foresight study, conducted in 2009 and 2010, has been based on a driver-identification scenario workshop in Indonesia with policy-makers from both regions and on a survey of scientist's opinions using open email consultations and Delphi methodology.

The results of the exercise are a reliable and comprehensive set of drivers perceived by key stakeholders as influencing the 2020 future of S&T cooperation between Southeast Asia and Europe. Identifying these drivers not only helps to structure future policy-discussions, but they can in themselves be expressed in terms of recommendations and ideas for possible instruments to increase S&T cooperation levels. Furthermore, the drivers have been combined, also within this report, to the logic of a possible success scenario for S&T cooperation between Southeast Asia and Europe in 2020. This proposed scenario logic can inspire continued discussions on how a successful future scenario might look like and, accordingly, what drivers have to be addressed to move towards it.

Based on the unusually high response rate that we could achieve in the scientists consultations and Delphi survey, we cannot only conclude that our results are solid, but also that there is a real interest in S&T cooperation between Southeast Asia and Europe on the side of the scientific community.

Key recommendations for policy-makers 1) on a general level:

- This report should be further discussed among the stakeholders involved and could be taken as a stepping stone within the process of policy development.
- The dialogue on and planning of S&T cooperation should keep engaging scientists.
- The time-related windows of opportunity in the planning horizons of the cooperating regions' policy-making should be made clear and considered.
- Coherence between STI policy and other policy areas concerned by S&T cooperation should be continuously aimed at.
- It should be taken into account that both regions are internally highly diverse, with resulting region-internal differences in the needs and customs of the scientific communities.

and 2) as identified by the consulted stakeholder communities:

- It should be taken into account that the most important motivation for scientists to cooperate is the goal of doing state-of-the-art science on a topic of mutual interest and relevance. The feeling to contribute to the development of a country or the solving of global challenges, the access to a field, expertise and equipment, friendship or reputation are other important motivations.
- S&T cooperation should be sustained on a long-term basis.
- A suitable balance should be found between the flexible funding of cooperation activities in research projects defined bottom-up and the dedicated funding of S&T cooperation with a thematic focus.
- A suitable balance should be found between supporting cooperation in basic and applied research.
- Personal contacts are more relevant than institutional agreements. Therefore, supporting mobility is crucial.
- Measures should be adopted to enhance equilibrated mobility in both directions as, currently, there is a bias towards Southeast Asian scientists coming to Europe.

- Existing human and network resources should creatively be harnessed. Among the many options, established scientific conferences could be invited to convene in Southeast Asia; retired scientists could be offered part-time positions, senior scientists could be willing to engage in cooperation and exchange in the framework of sabbatical themes.
- PhD student exchange, joint PhD programmes and particularly co-supervision of PhD students should be supported to a higher degree.
- Southeast Asian Diaspora academics in Europe should be addressed as possible facilitators of S&T cooperation.
- Return and reintegration support schemes should be considered, especially for Southeast Asian scientists who have spent longer periods of time in Europe.
- Reward schemes for successful cooperation should be considered as potentially increasing the motivation to cooperate.
- Quality metrics for assessing the success of international S&T cooperation projects have to be further developed.
- Regional training networks, joint research centres and other joint research infrastructure can help to increase cooperation intensity.
- Bridging institutions offering administrative, research management and partnering support should be considered as a means to increase cooperation levels.
- Administrative burdens hampering S&T cooperation like visa issues, material exchange and field access clearance procedures should be simplified.
- Open access to literature and sample databases should be supported.
- The results of joint research should be made available in the respective regions, not only in international journals.

The second group of policy recommendations emanates directly from the concerned stakeholder groups. The authors have coded and structured the empirical data.

1. Introduction

As part of its analytical activities, SEA-EU-NET was tasked to conduct a foresight study on the future of science and technology (S&T) cooperation between Southeast Asia and Europe. The aim of this future looking activity was to open up and structure as well as subsequently inform the discussion on the potential future cooperation between the two regions.

This deliverable is the output of activities undertaken towards this aim between October 2009 and December 2010. Concretely, after substantive preparatory work consisting in desk research and consultations with foresight experts, a scenario workshop with a group of policy-makers from both regions was held in November 2009 in Bogor, Indonesia. The goal was to gather and assess driving factors of S&T cooperation between Southeast Asia and Europe relevant over the period of the next 10 years. Results of this part of the foresight exercise were then analysed for project-internal purposes and published¹ as a case study in a paper discussing methodological specificities of what is best called ‘International S&T Cooperation Foresight’, a rather recent type of foresight activities. Concrete recommendations coming out of the policy-makers’ assessment have been included in a project deliverable (first version of deliverable 4.1, “Policy Recommendations for enhancing Science and Technology cooperation between the European Union and Southeast Asia”) that has been distributed during the meeting of the Association for Southeast Asian Nation’s (ASEAN) Committee for Science and Technology (COST) in May 2010 in Vientiane, Laos. Furthermore, aspects of this first part of the foresight exercise were discussed in expert interviews conducted with relevant Southeast Asian stakeholders in the context of the ASEAN COST meeting.

While it is the policy-makers who frame and set more or less favourable conditions for S&T cooperation between the two regions, it is the scientists who are actually cooperating and invited by the recent political agenda to do so to a higher degree. In order to access the knowledge of those who already have palpable experience in science cooperation between Southeast Asia and Europe, we approached all scientists from Southeast Asia and Europe who have published together with one or several colleagues from the respective other region and engaged them in an open email consultation and a subsequent two-stage Delphi survey in order to find out what they consider potentially increasing cooperation levels. Our expectations that this stakeholder group would be able to offer very concrete and sometimes unusual ideas of instruments and framework conditions have been confirmed.

In a final phase of desk research, policy-makers’ and scientists’ assessments of driving factors behind Southeast Asia – Europe S&T cooperation have been combined and distilled into a set of policy recommendations and of dimensions along which concrete scenarios for planning purposes can be developed. Interest from the side of our project partners as well as available resources within the project have led us to consider driving the foresight task further than originally planned by implementing a scenario discussion workshop with Southeast Asian stakeholders scheduled in May 2011 in Thailand. Apart from continuing discussion and deepening analysis, such a workshop can ensure that the outputs of the task prove useful for actual decision-making and joint planning.

In the following chapters, after a detailed account of the study’s underlying methodology (chapter 2.), the intelligence produced by the SEA-EU-NET International S&T Cooperation Foresight is presented chronologically along the lines of its production that also follows a logic of combining expertise on framework conditions (from the policy-makers) with practitioners’ (scientists’) inside knowledge and, put differently, top-down with bottom-up approaches. This series of chapters (3.-5.) is followed by a synthesis comparing the results of the policy-makers and scientists consultations (6.), thus breaking the chronological and logical order with the aim of comparing the policy-maker and scientist levels. A concluding chapter summarising the foresight task’s findings in a set of policy recommendations and ideas for future instruments (7.) is followed by an outline of the basic logic of a possible success scenario (8.) and an outlook to possible next steps (8.).

¹ Gruber, Florian / Degelsegger, Alexander (2010): S&T Cooperation Foresight Europe – Southeast Asia, in: *Форсайт (Foresight)*, 4(3), 56-68.

2. The methodology

General considerations

Foresight is a tool to engage relevant stakeholders and experts in a structured way of thinking about and exploring possible futures of shared interest in order to create awareness for possible future developments, act upon these futures or react in face of foreseen or unforeseen changes. In this foresight on the future of S&T cooperation and, more concretely, on driving factors of importance for scientific cooperation between Europe and Southeast Asia, we decided to use the year 2020 as a horizon and to adopt a two-stage approach in carrying out the analysis. The decision to invite the stakeholder groups to look at a 2020 perspective is motivated both by the current policy framework and by methodological considerations. Following the Lisbon Strategy, the Europe 2020 Strategy² and more specifically the Innovation Union flagship initiative³ are the most relevant guiding framework for European-level S&T policy and explicitly focus on international S&T cooperation as relevant for Europe's smart, sustainable and inclusive growth. Moreover, the 8th Framework Programme for Research and Technological Development, currently being in its early preparatory phase, will cover the period from 2013 to 2020. Besides the policy framework pointing to the 2020 horizon, 10 years is also a time span that can reasonably be reflected upon in a foresight exercise without a need to include big systemic change, usually occurring over longer periods of time. To look at Europe's S&T cooperation in 2030 or even 2050 would have been both a much more difficult endeavour and would require a different methodology, taking broader and more long-term trends into account in a discussion of visions rather than concrete intelligence for present action. Finally, the policy-makers (whom we were able to address and whose opinions we aimed to include in our study) are currently at a level in the hierarchy that allows them to have in-depth knowledge of S&T cooperation matters, but they are not tasked to stir Europe's longer term future beyond the mentioned policy framework set by their highest-level superiors.

As regards the two-stage approach, we assumed that two major groups are instrumental in developing and sustaining scientific cooperation: The policy-makers and programme owners that set the frame for S&T cooperation and develop and fund specific programmes for cooperation, and the scientists that actually live and conduct the cooperation, resorting or not to the funds provided by science policy-makers.

In order to gather data and opinions from both of these groups as well as to include and engage them in the process of thinking about the future S&T cooperation between the two regions, we decided to approach the stakeholder groups in different ways: in one case by means of a physical workshop, in the other case via an online Delphi survey with a preceding open email consultation.

The main reason behind this different ways of approaching the stakeholder groups is the fact that policy-makers concretely concerned with (and thus knowledgeable about) this form of cooperation are few in number. These few, however, seemed to have a good overview on the current state of programmes and on the future plans, according to our preparatory analyses and project experience. Thus, it makes sense to try to investigate their expertise in more depth and engage them personally, not least because they have a major stake in designing the political framework conditions for the future they are reflecting upon with us in the foresight analysis. The scientists, however, are a much larger stakeholder group. We decided not to randomly approach large groups of European or Southeast Asian scientists, nor to invite small groups to give us their individual and, given the large size of the population, unrepresentative views. Instead, we considered it most reasonable to approach those scientists who already have cooperated. We decided to revert to co-publications as a proxy for cooperation experience, i.e. we looked for scientists from each of the regions who have already published with scientists from the respective other region, and engaged them via an online consultation and Delphi survey.

² <http://ec.europa.eu/eu2020/>

³ <http://ec.europa.eu/research/innovation-union/>

The whole exercise has been dealing with the constraints proper to International S&T Cooperation Foresight⁴ exercises: increased complexity due to the bi-regional perspective (set however within a global network of cooperation relations) with, at the same time, very limited time resources of and difficult access to policy-making stakeholders. Moreover, members of this stakeholder group are in positions not only to assess, but to significantly shape the future the exercise is dealing with, which again adds complexity to the process as few relevant variables can be considered totally external. Regarding the scientific community, it is not easy (due to time constraints on their side, negative experiences with policy consultation processes or simply disinterest) to attract those scientists to the foresight exercise, who are actually cooperating and, at the same time, knowledgeable about science cooperation.

A success scenario based foresight process

Over the years, social scientists and policy-makers have used several methodologies to gain insights into the future and develop action-orienting conclusions according to a desired version of the future. When it comes to international S&T cooperation policy, however, the approach of scenario building based foresight has shown to be popular⁵. An exemplary effort in this direction can be seen in the SCOPE2015 foresight project conducted for the INCO⁶ directorate of the European Commission's Research Directorate General by PREST/Manchester⁷. Currently, several INCO projects⁸ or, for example, the International Council for Science (ICSU)⁹ are using or planning to use scenario techniques for S&T cooperation relevant foresight exercises. It is not surprising that in the pre-foresight phase of this exercise, desk research and consultations with project partners in Southeast Asia and Europe have equally shown that scenario techniques seem most appropriate for the data generating, networking and strategy development¹⁰ part of the foresight process. It became also clear, however, that S&T cooperation foresight has characteristics and needs that are different from national technology foresight or scenario planning in corporate strategic thinking.

Scenarios are built up from collective visions of the future by a group of experts and should help decision-makers and other stakeholder groups to simplify "the avalanche of data into a limited number of possible states"¹¹. Scenario building efforts often start with the clarification of the setting, the identification and analysis of driving forces ("drivers") that are considered to influence how the present will be transformed in the future in specific areas of interest, and a subsequent importance ranking of the identified drivers as well as of uncertainties that become apparent during the process. Then, the scenario logics are defined, scenarios fleshed out and their implications discussed¹². Thus, generic scenario building exercises comprise an exploratory

⁴ Foresight has recently emerged in several EC funded projects as an important tool in structuring the thinking and discussion about future S&T cooperation and related activities. Due to several methodological issues that set this kind of foresight apart from, for instance, national technology foresight exercises (see reflections in our methodological chapter) the authors of this report decided to coin this new appellation „International S&T Cooperation Foresight“.

⁵ Scenario techniques are also used in thematically much broader foresight exercises as the recent European Commission (2009) report "The World in 2025. Rising Asia and Socio-Ecological Transition" shows.

⁶ International Cooperation

⁷ For the final report see: European Commission (2006): Scenarios for future scientific and technological developments in developing countries 2005-2015, EC DG Research: Brussels.

⁸ Next to SEA-EU-NET: EULAKS, New INDIGO and ERA-Net RUS to name but a few.

⁹ ICSU Foresight Analysis on the potential development of international science, online at: http://www.icsu.org/1_icsuinscience/PDF/ICSU_Foresight_summary.pdf, most recent access date: 3 March 2010.

¹⁰ Van der Meulen, Barend (2007): Looking Beyond the Endless Frontier. ESF Forward Looks Scheme: Analysis and Recommendations, European Science Foundation: Strasbourg, 10.

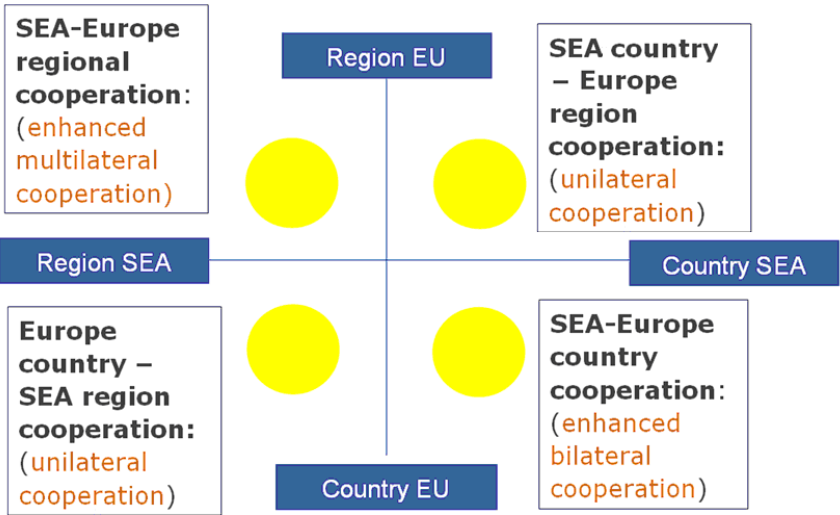
¹¹ Schoemaker, Paul J.H. (1995): Scenario Planning: A Tool for Strategic Thinking, in: Sloan Management Review, 36(2), p. 27.

¹² ipts/Joint Research Center of the European Commission (2007): Online Foresight Guide. Scenario Building, online at: http://forlearn.jrc.ec.europa.eu/guide/3_scoping/meth_scenario.htm, most recent access date: 3 March 2010

elaboration of several futures that range from desired developments to undesired futures that are better avoided.

In addition to exploratory scenario building processes resulting in multiple scenarios, another approach is outlined in literature, namely the “success scenario” method¹³. Therein, an effort is made to present an image of a desirable condition in form of one single scenario in order to help decision-makers reflect the current situation and identify crucial steps in view of a favourable future. A related scenario building exercise can then be used by decision makers to streamline their approach to the topic in question. As Vincent-Lancrin has put it: “Future scenarios do not aim to predict the future [...] but merely aim to provide stakeholders with tools for thinking strategically about the uncertain future before them, which will be partly shaped by their actions and partly by factors beyond their control”¹⁴. This “singular scenario” approach is also useful when it comes to structuring and guiding discussions so that underlying assumptions become clear and can be explicated¹⁵. Moreover, from our perspective and mandate we could expect that, by assigning importance to cooperation between specific regions, the consulted stakeholders from both sides, when answering our requests and offering their views and strategic thinking on a successful region-to-region S&T cooperation, would be induced to at least think about and maybe give importance to this specific kind of cooperation.

The SEA-EU-NET Foresight endeavour aims at involving S&T policy-makers and the scientific community in a dialogue reflecting upon the future of S&T cooperation between Europe and Southeast Asia in a year 2020 perspective. The project addresses Southeast Asia as a research (?) region as well as the European Research Area – thus, the bi-regional perspective is inherently part of the project’s analytical focus. Nevertheless, bilateral S&T cooperation or constellations bringing together one region and single countries are also within its reach. Thus, we could anticipate that the regional-country dichotomy appears as an axis for our scenario logics, resulting in 4 possible base scenarios (region-region cooperation, region-country, country-region and country-country), three of which seem principally relevant. However, given the severe time and resource constraints on the side of this exercise and the stakeholders as well as the mandate of the SEA-EU-NET project, we decided to focus first and foremost on the region-region multilateral cooperation setting.



¹³ Miles, Ian (2005): Scenario Planning, in: UNIDO Technology Foresight Manual. Volume 1 – Organization and Methods, 168-193.
¹⁴ Vincent-Lancrin, Stéphan (2009): What is Changing in Academic Research? Trends and Prospects, in: OECD (ed.): Higher Education to 2030. Volume 2. Globalisation, OECD: Paris, p. 173.
¹⁵ Miles, Ian / Green, Lawrence / Popper, Rafael (2004): FISTERA WP4 Futures Forum. D4.2 Scenario Methodology for Foresight in the European Research Area, European Communities: Brussels.

Going one step further in the anticipation of scenario logics, S&T cooperation intensity appeared as a natural additional axis in the deductively developed basic scenario matrix¹⁶. The most basic description of the success scenario we have been looking at would then be: In 2020, S&T cooperation between Southeast Asia and Europe has become more intense in view of a higher number of collaborations and in-depth forms of cooperation on a region-to-region level (i.e. not only as regards, for instance, Vietnam and Germany, Indonesia and the EU or France and Southeast Asia) in comparison to 2010.

Driver identification by policy-makers

One of the benefits of conducting this foresight exercise in the frame of the inter-regional cooperation project SEA-EU-NET was that the steering board that convenes once a year comprises most of the policy-makers that we wanted to include in our study. The *success scenario oriented driver identification workshop*, key to the policy-maker oriented part of this foresight exercise, was conducted in 2009 in Bogor, Indonesia as part of the steering board meeting during the annual week of cooperation.

The Bogor ‘drivers workshop’ offered the possibility to gather policy-makers and programme owners from different countries in both regions within a joint bi-regional event. The fact that the policy-makers knew they would attend a bi-regional event, facilitated focussing the drivers discussions to a region-to-region level (rather than a country-to-region or country-to-country level). Resource constraints (i.e. mostly time constraints) are always a pressing issue in high-level foresight processes, aiming not only at stakeholder participation, but also at creating commitment among the stakeholders to the discussions. While preparing the workshop, we realised that focusing on one perspective, namely the region-to-region level, was the most that could be managed with the allotted time. The region-to-region perspective on S&T cooperation seemed to be not only the most pressing one, but is also the one closest to SEA-EU-NET’s mandate. Actually, while it might be easier for single countries to arrange meetings with single other countries or join meetings of a regional party, SEA-EU-NET particularly has the role and potential to bring together S&T stakeholders from both regions to discuss the topic of cooperation. In addition, preparations showed that the question of the feasibility and necessary framework conditions of a dense and intensive cooperation scenario between both regions raises a high degree of interest among stakeholders. Another feature of the workshop setup was coming from cultural considerations: in the Southeast Asian context taking contrary positions within a group is sometimes thought of as impolite. However, by asking the experts to consider the region rather than the country perspective and by offering the possibility to anonymously opine for the region (e.g. by using flip charts and regional groups rather than single-country groups and/or verbal input), we could ignite motivated discussion and received a high degree of feedback from the group.

Given the above reasons, we opted for an extended single success scenario method engaging an expert panel¹⁷ with a pre-defined desired “summer” scenario (based on desk research) applying an inward bound perspective¹⁸. This means that we combined the scenario discussion with a backcasting¹⁹ element looking at the driving and shaping factors²⁰ for the scenario starting from

¹⁶ Schwartz, Peter / Ogilvy, James A. (1998): Plotting Your Scenarios, in: Fahey, Liam / Randall, Robert M. (eds.): Learning From the Future. Competitive Foresight Scenarios, New York: John Wiley, 64.

¹⁷ Expert panels are sometimes considered a technique separate from scenario workshops, but equally valuable for strategy development (cf. Van der Meulen 2007, 10).

¹⁸ Miles, Ian (2005), p. 169.

¹⁹ Popper, Rafael (2008): Foresight Methodology, in: Georghiou et al. (eds.): The Handbook of Technology Foresight. Concepts and Practice, Edward Elgar: Cheltenham, 54.

²⁰ For a definition and indicative listing of possible drivers and shapers, please refer to Miles (2005), p. 190 et seq. Our experience has shown that the concept of ‘drivers’ was much easier to explain to participants than the differentiation between drivers and shapers.

the desired future going backwards towards present times. Thereby, the procedure facilitates the translation of the scenario building effort into valid policy recommendations.

Besides the advantage to capitalise as much as possible from the available resources in terms of participating experts, this scenario planning design also offered the possibility to evaluate the “desirability” and “credibility” of the basic scenario which, according to Miles²¹, are considered important elements of a success scenario.

This workshop design has proven a successful adaption of standard scenario methods for

- a setting involving mid-to high-level participants,
- facing time constraints,
- when discussing the viability and surrounding of a specific and possibly successful scenario²² with the aim to sensitise for this possible future, create commitment for it and trigger a joint planning process.

The participants of the scenario workshop were the members of the SEA-EU-NET Steering Committee, as we assumed that the body (installed because of their bird’s eye view of EU-SEA scientific relations in order to steer the project) would also be the most suited one to take a look and think about future bi-regional cooperation. 16 experts from policy-making and programme-owner institutions actively participated in the scenario workshop, 7 of them speaking for Southeast Asia and 9 for Europe.

As a starting point, the participants were introduced to and confronted with the following basic “summer” success scenario that was deliberately limited in length and detail in order to allow participants to quickly and easily align to the envisaged perspective:

Basic scenario: In the year 2020 the cooperation in S&T between the EU and ASEAN had reached a level of importance that some years before was hardly to be expected. Major development was the rise of ASEAN as a regional power, as the countries in the region decided to put importance to and budget into this umbrella organisation. In this way, ASEAN could initiate symmetric cooperation partnerships with the other major global players, the EU, the USA, and major S&T powers. Consisting also of countries that differ quite a lot in their economic development, the European Union was considered an important cooperation partner, and with dedicated programmes including joint programming and funding from both sides, the cooperation in the area of S&T grew ever more intense.

We asked the participants of the workshop to project themselves 10 years into the future and “inside” a scenario where regional scientific cooperation between Europe and Southeast Asia has come to be very active, very successful and intense.

Then we asked the participants to identify the drivers that would have led to such a scenario (backcasting), i.e. forces that would have to be identified and taken into account 10 years before (i.e. now, in the present) in view of the scenario.

Due to the interaction dynamics in the brainstorming character of this session, we applied a rather broad definition of drivers. Sticking to a stricter definition would imply to interrupt and correct the flow of ideas at certain points, which we wanted to avoid as it could stop the creative process.

²¹ Miles, Ian (2005), p. 184.

²² Indirectly, the desirability of the scenario can be deduced from the reactions of the experts.

The drivers were structured along 5 policy areas²³:

- Higher Education Policy,
- Science and Research Policy
- Industry, Trade and Economic Policy
- Development Policy, Global Challenges,
- Diplomacy, Foreign Policy, Security Policy

In a second stage of the workshop we asked the experts to take a regional view depending on their origin, and to rate the importance of the drivers using a grade-like rating in relation to either Europe or Southeast Asia (after re-coding for visualisation reasons: 5 points express highest importance and 1 least relevance). It is important to point out that not all experts had to rate the drivers. The number of experts assigning grades to the drivers, thus, is an additional measure for the perceived prominence of this driver (in addition to the average grade, for sure). Section 3 will analyse the outcomes of this exercise.

Then the experts were asked to identify, which would be the most important shaping factors²⁴ for the desired scenario. In another subsequent step, the experts were asked to comment the proposed shapers (which are basically names without descriptions), so that everybody would know what is meant by a particular shaping factor. And then, thirdly, the experts were asked to once again rate the importance of the shapers in relation to their region by awarding “points”. Here, no grades from 1-5 were asked, but each participant had a maximum of 10 points to assign to all mentioned shapers. The experts were also invited to comment on the presented shapers.

Finally, it is important to highlight that in both parts of the workshop, participants were invited to consider and rate²⁵ a number of pre-given, indicator drivers and shapers (given to orient and stimulate the discussion by giving concrete examples), but then to go beyond and to add other drivers and shapers considered to be important. Experts have made extensive use of this possibility.

Methodologically speaking, we would avoid differentiating drivers and shaping factors if we were to do the exercise again. The added value that is gained by separating drivers from shapers is not substantial enough compared to the effort involved in clarifying the differences between the two concepts, not entirely clarified in literature, yet.

As indicated above, the results of the drivers workshop have subsequently been analysed by the authors (see chapter 3.) and have been translated into a series of policy recommendations (see chapter 7.). During the ASEAN COST meeting in May 2010 in Vientiane/Laos, they have also been parts of the discussions in a series of expert interviews held with key stakeholders from, among others, the Philippines and Laos. However, it has become clear during these interviews, that there is an inherent difficulty in approaching Southeast Asian policy stakeholders with questions on region-to-region S&T cooperation with Europe, while they are participating at an ASEAN COST meeting in a particular country-related role and following a particular country-related agenda. In most of the cases, the interviews offered very relevant background insights for the SEA-EU-NET project as a whole, but time was too short to present findings from the drivers workshop to additional stakeholders and subsequently focus on their comments regarding these results.

²³ Based on the simplification of a compilation of policy areas from a ppt-presentation by Callum Searle, DG RTD D2 International Co-operation, “Forward Looking Activities and International S&T Co-operation”, 2 June 2009

²⁴ Environmental conditions that are relevant, but cannot be influenced (in contrast to drivers that are also relevant and can more readily be influenced)

²⁵ Again, not all experts had to rate all shapers. They could select freely. As in the case of the drivers, this offered additional information for the interpretation and analysis of the importance of the shapers.

In terms of an overall methodological assessment of the first stage of the foresight process focusing on policy-makers, and from the very positive feedback we could collect subsequently to this workshop, we can state that the interactive workshop with at least half a day reserved explicitly for this purpose was a great success. The atmosphere has been open and productive, contributions were equally distributed among regions and the policy-makers reported that they gained some insights in the course of the workshop. Apart from the substantial results presented in chapter 3., the workshop was an important starting point for the methodological professionalisation of “International S&T Cooperation Foresight”. As a next step in the foresight exercise’s logics, it was necessary to tap into the knowledge, experience and needs of those actually involved in S&T cooperation, the actual target group of cooperation support.

Accessing scientists’ views and experience

For gathering information from the scientific community, we decided to follow a different strategy: We assumed that these scientist that had already cooperated through publishing would be the best suited sample group from the scientific community to provide us with answers to our query on how to step up S&T cooperation levels between the two regions in the future (thus, co-publication was used as a proxy for cooperation). Moreover, we reasoned that scientists active in the day-to-day practice of international collaboration would be able to come forward with very concrete bottom-up inputs probably interesting for our reports’ target audience: S&T policy-makers in Southeast Asia as well as at European and European Member State/Associate Country level.

From an analysis of Europe-Southeast Asian co-publications in ISI Web of Science, we derived a list of all scientists from both regions that have published articles at least with one author from the respective other region. Given that we wanted to reach out to researchers currently active in S&T cooperation between the two regions, we limited the data set to the period from 2005 to (May) 2010. Email contact addresses of authors from both regions publishing articles together with one or several authors from the respective other region could be extracted from the data set.

Because of the big number of contacts (around 12.000) we decided to use an online survey in two phases: In a first phase, we asked the scientists in an open question via email which driving factors for Europe-Southeast Asian scientific cooperation they deem most important and determining for future success. Around 300 partly extensive (up to 2 pages) and mostly relevant email responses could be gathered in this first phase. Apart from the content feedback we also got additional contacts to authors with co-publication experience. This was achieved by asking those authors, who were indexed in Web of Science as co-publishing with the other region, but without listing the emails of their coauthors, if they could provide us with further infos on their colleagues.

The second phase was a Delphi survey where we asked the same group of respondents (initial group plus additional contacts from the open consultation) for their views on the most important, most often mentioned and most interesting driving factors that were provided in the first round. These driving factors have been isolated by us in desk research in a bottom-up interpretation of the email texts, taking into account the frequency of occurrence in the open consultation or the novelty of the opinion. Due to the high number of drivers derived, the variables have been condensed to 39 drivers (a significantly higher number cannot be managed by respondents in an online survey) presented in the wording of the scientists’ responses (leaving the scientists’ original phrasings, though sometimes slightly shortened or amended to make them understandable out of the context of the full answers).

The scientists presented the drivers usually in form of concrete recommendations of instruments or activities. The advantage of keeping this framing was twofold: first, the drivers pointing towards a future success scenario were presented in a way that was accessible even when quickly going through the questionnaire; secondly, we used the opportunity to gain feedback on a series

of hands-on recommendations on how to step up cooperation coming out of the scientific community itself.

The Delphi method: “Delphi involves an iterative survey of experts. Each participant completes a questionnaire and is then given feedback on the whole set of responses. With this information in hand, (s)he then fills in the questionnaire again, this time providing explanations for any views they hold that were significantly divergent from the viewpoints of the others participants. The explanations serve as useful intelligence for others. In addition, (s)he may change his/her opinion, based upon his/her evaluation of new information provided by other participants. This process is repeated as many times as is useful. The idea is that the entire group can weigh dissenting views that are based on privileged or rare information. Thus, in most Delphi processes the amount of consensus increases from round to round”.²⁶

In order to get the feedback we were looking for, we decided to use (two-stage²⁷) Delphi methodology because of two issues.

- First, the idea behind Delphi is rather straightforward and easy to understand: In a first round, a questionnaire is sent out containing question types that allow for easy statistical analysis (in our case, we asked for an estimation of the relevance of each of the drivers on a four-point scale). The easy-to-handle question type is important not only in view of the large amount of data and time constraints in the analysis, but also to feed back the answers from the first round to the same respondents in a second round. In this second round, the same questions as before are presented again, but allowing the respondents of the survey to see their original answers compared to the global averages of answers from the scientific community and to re-assess their original answers in light of their peers' opinions. This will give more reliability to the (after the second round usually more consensual) answers.
- Secondly, the methodological approach of using Delphi style survey allows us to ask for answers from the whole scientific community as derived from the co-publication analysis. Therefore, by not selecting a part of a whole based on some indicators of relevance, but asking the whole concerned population, we assume that the results of our survey will have more relevance in terms of representing a good overview of the actual opinions of the respondents.

As already said, the goal of the Delphi analysis was to let the whole group of scientists already engaged in co-publication activity decide upon which statements from the open email consultation were relevant. After the first Delphi round, we had not only a look at the overall results, but also tried to group answers by a procedure minimising variances within the respective group (i.e. deviations from the means of a specific subgroup must be smaller within the group than between the group and other cases or other possible groupings). By this means, we found out that scientists from Europe, from Singapore and from Southeast Asia excluding Singapore were the three most suitable groupings (we did not want to have more than three groups). To give an example: The difference in relevance ratings (of all drivers) between Indonesian scientists and Thai scientists was smaller than between Indonesian and Singaporean or Indonesian and European scientists.

The motivation for using an inductive grouping for the respondent's group in the second stage of the process, which is not utilized in “normal” Delphi queries, was that we assumed that scientists

²⁶ Slocum, Nikki (2003): Participatory Methods Toolkit. A practitioner's manual, Brussels: viWTA/UNU-CRIS/King Baudouin Foundation, p. 75.

²⁷ A Delphi-style survey is normally done with the same respondents group in the two or more rounds (more than 3 rounds are usually not considered as fruitful).

from Europe and Southeast Asia would not necessarily share the same motivations (drivers) for starting and continuing the cooperation.

Given the difference between the regions and the fact that Singapore is materially the wealthiest country in the ASEAN region, the groupings seem quite natural. This being true, as we shall see in chapter 5., the grouping still gives interesting and in some cases unexpected insights.

We have already seen that the first stage of the scientist consultation by email has gathered significant feedback. The response rates in the second stage, i.e. the Delphi, have also been very impressive: Out of the 12.000 email addresses initially gathered, slightly less than 10.000 were actually active and functioning. Around 1.200 scientists have completed the online survey in the first Delphi round. The second Delphi round, presenting the average relevancies assigned to the identified instruments in the first round and offering each participant the possibility to adapt one's initial answers or comment upon them, has been completed by 48% of the respondents from the first round. The overall response rate throughout the whole Delphi process is around 5,7% (very high according to independent experts; similar exercises normally attract answers from only 2-3 % of the persons contacted), which turns the set of concrete instruments identified into a reliable source of bottom-up recommendations. Moreover, answers were equally distributed among the two target regions²⁸ (for the second round: 254 complete answers from Southeast Asia and 301 from Europe).

The goal of using the open email scientist consultation process before starting the Delphi was to ensure that the driving factors that we would later ask the scientists to evaluate in order of relevance would come directly from the concerned scientific community and would not be “invented” by us. A nice side-effect was that we got very positive feedback from scientists that mention explicitly their approval of this approach, and that the incoming completed surveys were more numerous than usual in comparable exercises. Moreover, the results gained display both the scientists' ideas regarding relevant drivers of future S&T cooperation between Southeast Asia and Europe and concrete recommendations on how to achieve an increased cooperation intensity. Critical remarks within the consultation process concerned mainly the transparency of the follow-up process (which we will tackle by sending this report to all contacted scientists) and the question of science policy to take and implement advice derived in the process. In this regard, the authors of this report can only recommend to strengthen the link between science policy and science by acknowledging the importance of scientists' advice in the development of science policy. Taken together, the respondents for our queries have invested a huge amount of working time and they would probably appreciate if this contribution could be made explicit in the further development of science policy.

After this detailed account of the methodology forming the basis of this foresight study, we can now focus on the results, starting with the policy-makers and then moving on to the scientists' views before finally contrasting and combining both with the goal to generating a set of fruitful insights on how to go for a 2020 S&T cooperation success scenario for Southeast Asia and Europe.

²⁸ Respondents were asked to state for which region (Southeast Asia or Europe) they feel most suited to answer. We did not decide regional affiliation ourselves based on the Web of Science data because we thought that in case of double affiliations or mobility (e.g. a Southeast Asian scientist currently affiliated in Europe or the US), it's best to let the respondents decide on what their perspective is.

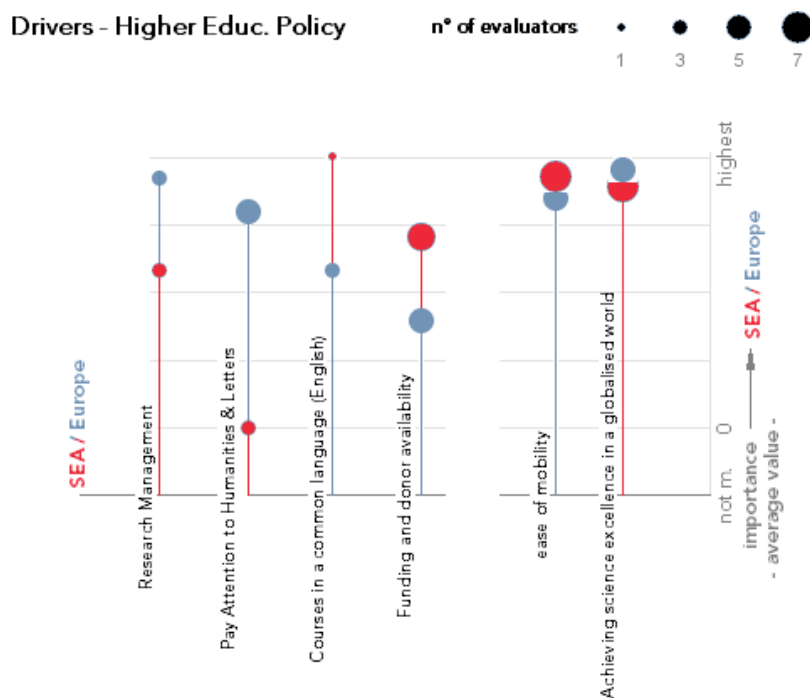
3. Policy-makers' views

As said before, policy-makers from Southeast Asia and Europe were invited to consider driving forces for an increased S&T cooperation between the two regions in five policy areas. For each of these areas, we will highlight the major driving forces that were identified in the workshop. Subsequently, we will highlight interesting differences between the regions before, finally, moving on to the results of the identification of environmental factors that are considered relevant for the future of S&T cooperation, but cannot or hardly be influenced ('shapers').

Higher Education Policy

In the field of higher education policy, *facilitation of mobility* and *achieving science excellence in a globalised world* were identified by experts from both regions as the most important driving forces for achieving a high level of region-region cooperation between Europe and Southeast Asia. The far-ranging driver *favourable policy background* was slightly more important for the SEA experts, whereas *internationalization of education* was highlighted mainly by Europeans. SEA experts take very different stances towards this issue among them.

Discrepancies between the two regions are most prominent, however, in the rating of the importance of drivers like *funding and donor availability* (more important for SEA experts), *research management* (more important for European experts) and, most notably, *humanities and letters*, with good support from the European side and none from Southeast Asia. The following diagram shows a selection of drivers that were estimated as highly important by both regions (right part of the diagram) and where views differed significantly (left part of the diagram).



Science and Research Policy

In this policy area we have one driver that experts from both regions consider outstandingly important, which is *Joint Agendas for common challenges (schemes such as ERA-NETs)*. Participants from both regions, furthermore, agreed upon the relevance of *maintaining a competitive edge in global*

innovation, tackling global challenges and support for research infrastructure as factors that can drive (or hinder) the development of a successful bi-regional high intensity S&T cooperation scenario. One additional driver should be highlighted as it complements the last-mentioned support for research infrastructure: *Schemes for joint usage of infrastructure, such as 'Centres of Excellence'* were also perceived as quite relevant by the whole group of experts.

As can be seen in the following diagram, less consensus prevailed regarding a set of five other drivers: European experts emphasized *Achieving science excellence in a globalised world*²⁹, while SEA experts assigned more prominence to *Leveraging Research Funding, Funding and donor availability* and *SEA Integration*.



Industry, Trade and Economic Policy

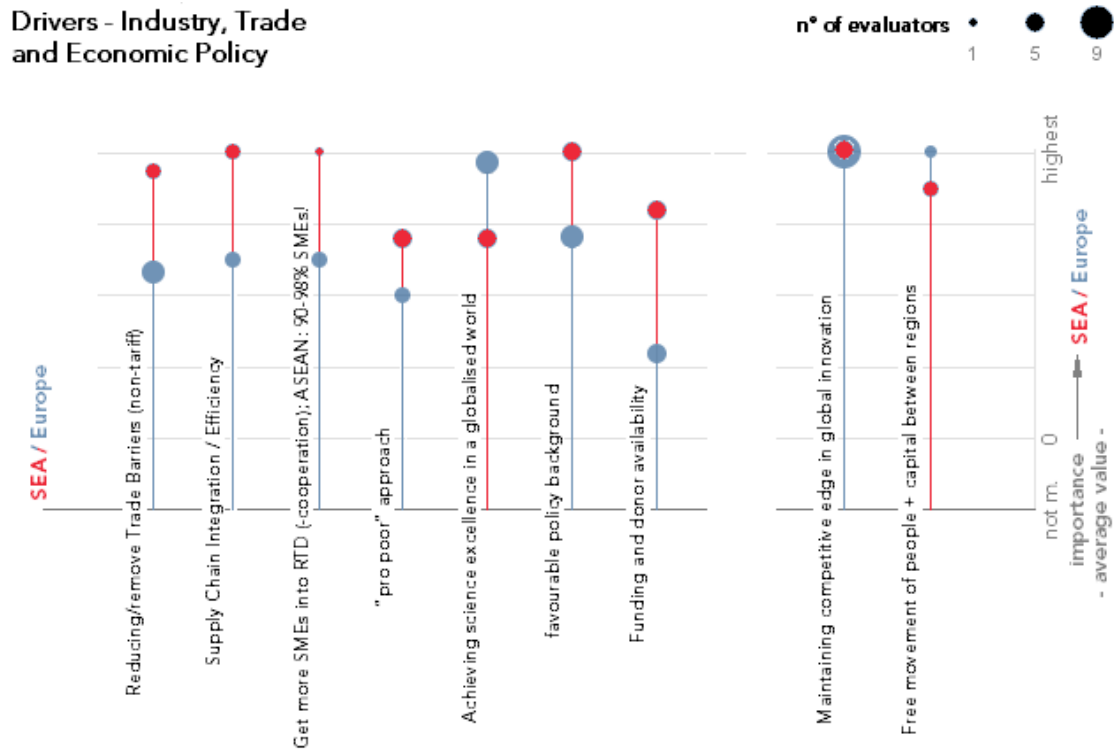
The discussions around the policy fields of Industry, Trade and Economy resulted in the most diverse workshop results. The participants from Southeast Asia and Europe agreed in assigning outstanding importance to *maintaining a competitive edge in global innovation* and, to a lesser extent (less experts giving a grade, however with a similarly high average grade) to the *free movement of people and capital* between regions.

Regarding a set of other drivers that were proposed for considerations or that popped up during the discussion, considerably discrepant views prevailed, most notably when it comes to trade and economic factors. *Getting more SMEs into RTD cooperation, supply chain integration/efficiency* (average of 5 points from SEA against 3,5 points from Europe in both cases) and *reducing/removing trade barriers* (4,75 against 3,33 points average) were all regarded as much more important by SEA experts than by European experts.

An additional fact can be seen as enclosing the aforementioned list at a superordinate level: A *favourable policy background* in this policy area was considered absolutely crucial (average of 5 out of 5 points) by the SEA experts participating (with 5 out of 7 giving grades). Two thirds of the European experts considered the issue an important, but not crucial driver (3,83 points out of 5).

²⁹ As we have seen, in the field of Higher Education Policy, experts from both regions agreed to science excellence as a crucial driver. In the field of Industry, Trade and Economic Policy, it is rather like in the case of Science Policy: European experts emphasize this point more than SEA experts do.

One third of the European experts did not vote on this aspect. While not all SEA experts considered these issues worth expressing their opinion on, those who did (between 2/7 and 5/7) underlined the importance of the trade and economic policy background drivers. Apart from these, as mentioned already, *science excellence*, here, is seen as a most important driver by European participants, while a “*pro poor*” approach and questions of *funding and donor availability* are considered important drivers by Southeast Asian experts rather than by Europeans.

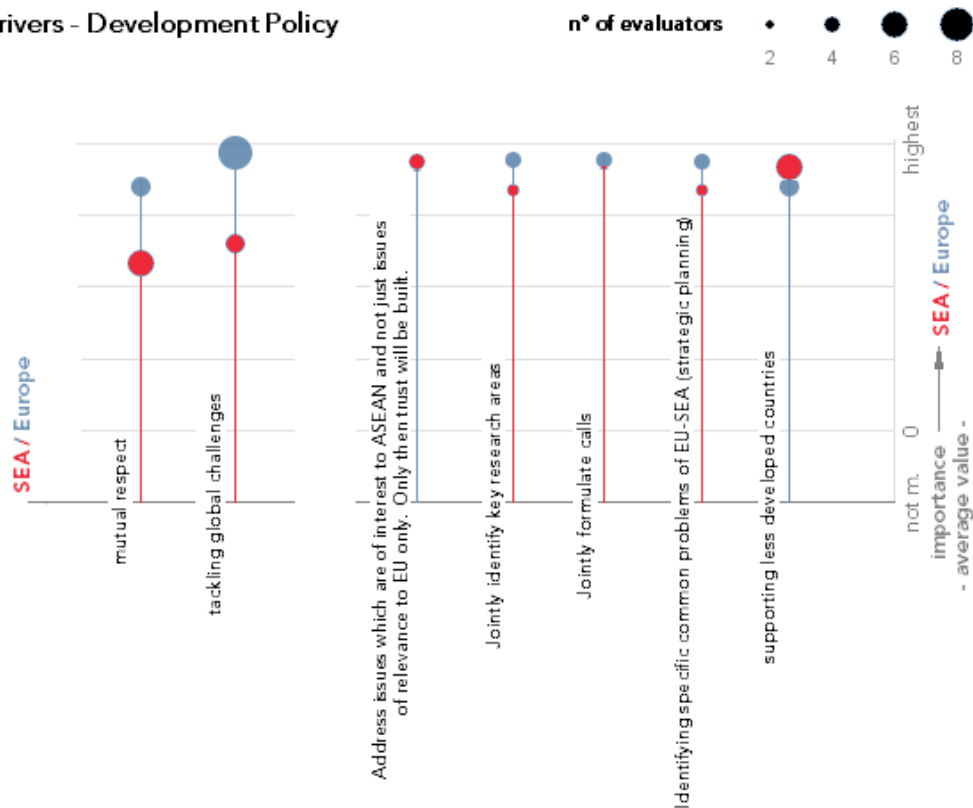


Development Policy and Global Challenges

In contrast to Trade and Economic Policy, Southeast Asian and European experts showed rather similar views on the important drivers for bi-regional S&T cooperation between the two regions in 2020 in view of Development Policy.

Only with regard to *mutual respect* as a driving force and the *tackling of global challenges*, the assessments differed, with European experts assigning more importance to both of these drivers. A series of related drivers like *supporting less developed countries*, *identifying specific common problems of EU-SEA S&T cooperation*, *jointly formulate calls*, *jointly identify key research areas* and trust aspects (“Address issues which are of interest to ASEAN and not just of relevance to EU. Only then trust will be built”), are considered equally important by participants from both regions.

Drivers - Development Policy



Diplomacy, Foreign and Security Policy

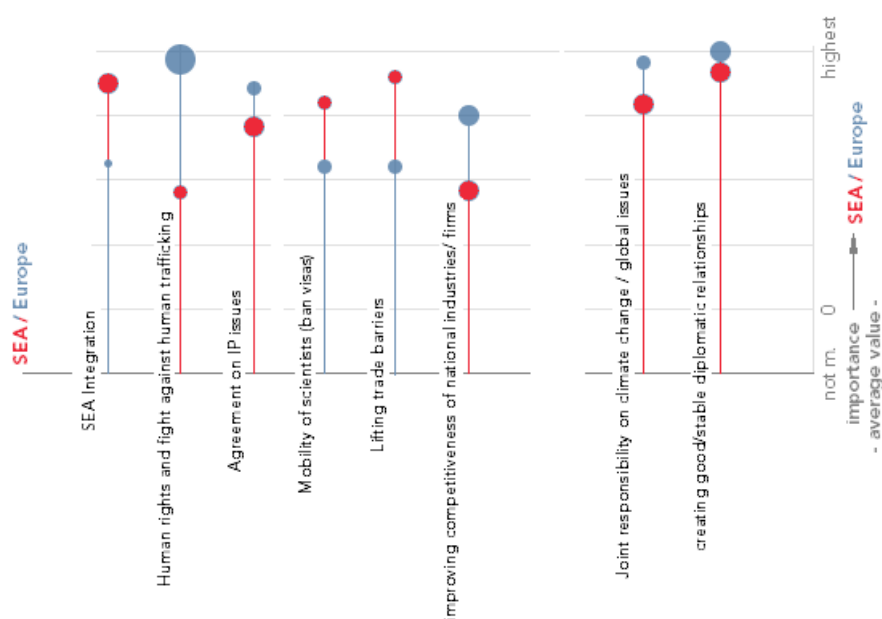
Finally, in the area of Diplomacy, Foreign and Security Policy, *creating good/ stable diplomatic relationships* and a joint responsibility on climate change / global issues were regarded as highly relevant drivers for a successful future S&T cooperation scenario by experts from both regions. Interestingly, particularly regarding the above mentioned views in Economic Policy, in the context of Foreign Policy, Southeast Asian experts considered improving the competitiveness of national firms a moderately relevant driver, while Europeans considered this aspect quite central. Southeast Asian participants, however, in contrast to their European colleagues, perceived the *lifting of trade barriers* a highly relevant driver, which is consistent with the results in the field of Trade and Economic Policy.

Considerable differences exist in the views on *Human Rights and the fight against human trafficking* as a relevant driver: 7 out of 9 European experts saw it as a totally crucial aspect (4,85 out of 5 points) while 5 out of 7 SEA experts assigned moderate relevance (2,8 out of 5 points). An agreement on *intellectual property issues* was considered slightly more important by European participants.

As in the field of Science and Research Policy, *SEA integration* is seen as an important driver by SEA experts and as a moderately relevant one by Europeans. The question of scientists' mobility and, more concretely, the abolishment of visas shows similar results: Southeast Asian experts consider it a more important driver.

Drivers - Diplomacy,
Foreign and Security Policy

n° of evaluators ● ●
5 7



Diverging views within regions

Besides examining consensus and diverging views on the importance of certain drivers between the two groups of regional experts, taking a look into the difference of views expressed within each region also promises to disclose meaningful insights.

In the case of Southeast Asian experts' answers, a series of driving forces was considered by some as crucially important and by others as rather irrelevant. This is shown in the following table using each of the experts' grades given to the specific driver as well as the variance and average of the given points (answers with a variance of more than 1 are highlighted).

Policy area	Driver ³⁰					
	Estimated Relevance Europe			Estimated Relevance for SEA		
Higher Education Policy	Support for Co-Authored Papers (Co-Funding Schemes)					
	4, 4, 4, 3	s ² =0,25	Φ 3,75	5, 3, 3, 2, 4	s ² =1,3	Φ 3,4
	Internationalisation of Education					
	5, 5, 4, 4, 5	s ² =0,3	Φ 4,6	1, 4, 4, 5, 4, 5	s ² =2,2	Φ 3,83
Science and Research Policy	Diversification of partners					
	5, 5, 4, 3, 3	s ² =1	Φ 4	5, 2, 1, 3, 2, 3, 3	s ² =1,6	Φ 2,71
Industry, Trade and Economic Policy	Achieving science excellence in a globalised world					
	5, 5, 5, 5, 4, 5	s ² =0,17	Φ 4,83	4, 4, 5, 2, 4	s ² = 1,2	Φ 3,8
Development Policy / Global Challenges	Link DEV-Programmes stronger with S&T programmes					
	3, 4, 4, 4, 4	s ² =0,2	Φ 3,8	4, 5, 2, 2, 4	s ² = 1,8	Φ 3,4
	SEA integration					
	3, 2, 2, 4	s ² =0,92	Φ 2,75	3, 4, 5, 2, 3	s ² = 1,3	Φ 3,4
Diplomacy, Foreign Policy, Security Policy	Improving competitiveness of national industries/firms					
	5, 4, 5, 3, 4, 3	s ² =0,8	Φ 4	1, 2, 2, 4, 5, 3	s ² = 2,2	Φ 2,8
	Supporting less developed countries					
	3, 3, 3, 5, 2, 5	s ² = 1,5	Φ 3,5	1, 3, 3, 3, 5, 4	s ² = 1,8	Φ 3,2

s²... variance
Φ... average

³⁰ Most important = 5; least important = 1

Southeast Asian experts, for example, had no corresponding views among themselves to the question whether the support for co-authored papers would be relevant as a driving force for S&T cooperation between Southeast Asia and Europe.

In the area of Higher Education Policy they disagreed even more about the possible role of an *internationalising education* for boosting bi-regional S&T cooperation. EU policy-makers decided to address the goal of an intense bi-regional science and technology cooperation through enhanced higher education internationalisation. This aspect, for instance, might need clarification and further consultation with the Southeast Asian partners.

In Science and Research Policy, there was no consensus among Southeast Asian experts regarding the question whether a *diversification of partners* drives bi-regional S&T cooperation between Southeast Asia and the EU forward or not. As seen above, this point is in average considered less important by the Southeast Asian attendees. The opinion of the participants regarding the possible driver *science excellence* also varies strongly within the group of Southeast Asian participants and among the regions.

By contrast, as regards the role of support to less developed countries, the rating was moderately positive on both sides, while answers vary significantly within each group of attendees.

These aspects exemplify the diversity of the Southeast Asian region, which will have to be taken into account in any effort to strengthen bi-regional S&T cooperation. This was also expressed by workshop participants from both sides in the final discussion round.

In addition, views on the significance of *integration processes within Southeast Asia* for S&T cooperation with Europe also differed, although not as strongly as other issues. It might be appropriate to keep these different estimations of the role of SEA integration in mind when approaching the goal of a strengthened bi-regional S&T cooperation at the political level. When there is no consensus among Southeast Asian stakeholders that SEA integration is helpful in this account, it might be difficult to get substantial political support at regional Southeast Asian level. The issue of the driver *supporting national industries* was already discussed above. Southeast Asian experts offered different opinions and valued this driver less than other economy-related issues. This might be explained by either a trust of Southeast Asian stakeholders in their economic landscape, the experience that national industries are not that important for S&T endeavours or the perception that national industries are central for competitiveness and thus too critical to be subsumed under shared regional responsibilities.

In the case of the European group of experts³¹, there was diversity with regard to a greater number of possible drivers (answers with a variance of more than 1 are highlighted):

³¹ Which was slightly bigger – 9 participants compared to the 7 SEA participants

Policy area	Driver ³²					
	Estimated Relevance Europe			Estimated Relevance for SEA		
Higher Education Policy	Competition for scarce (human) resources					
	5, 3, 5, 1, 4	s ² = 2,8	Φ 3,6	3, 3, 4, 4, 4, 3, 4	s ² =0,3	Φ 3,57
	Diversification of partners					
	2, 4, 3, 5, 3, 3	s ² = 1,1	Φ 3,33	2, 3, 4, 4, 3, 3, 4	s ² =0,6	Φ 3,29
Science and Research Policy	Brain gain					
	5, 4, 4, 1, 3	s ² = 2,3	Φ 3,4	3, 3, 2, 5	s ² =1,6	Φ 3,25
	Competition for scarce (human) resources					
	1, 5, 3, 4, 4	s ² = 2,3	Φ 3,4	5, 4, 3, 3, 3, 4, 4	s ² =0,6	Φ 3,71
Industry, Trade and Economic Policy	Bi-regional “Science Days” (events)					
	5, 3, 2, 4, 4	s ² = 1,3	Φ 3,6	4, 3, 2, 2, 2, 2	s ² =0,7	Φ 2,5
	Competition for scarce (human) resources					
	3, 1, 5, 4, 5	s ² = 2,8	Φ 3,6	4, 3, 4, 4, 4	s ² =0,2	Φ 3,8
Development Policy / Global Challenges	Favourable policy background					
	2, 4, 3, 5, 4, 5	s ² = 1,4	Φ 3,83	5, 5, 5, 5, 5	s ² = 0	Φ 5
	“pro poor” approach					
	1, 5, 3, 3	s ² = 2,7	Φ 3	3, 5, 5, 3, 3	s ² = 1,2	Φ 3,8
Diplomacy, Foreign Policy, Security Policy	Support for research infrastructures					
	3, 5, 5, 1, 4	s ² = 2,8	Φ 3,6	4, 4, 3, 3, 2	s ² = 0,7	Φ 3,2
Diplomacy, Foreign Policy, Security Policy	Supporting less developed countries					
	3, 3, 3, 5, 2, 5	s ² = 1,5	Φ 3,5	1, 3, 3, 3, 5, 4	s ² = 1,8	Φ 3,2
	Mobility of scientists (ban visas)					
	3, 1, 4, 5, 3	s ² = 2,2	Φ 3,2	4, 3, 4, 5, 5	s ² = 0,7	Φ 4,2

s²... variance
Φ... average

We do not want to pick out each single item here, but extract some of the most interesting findings relevant for policy recommendations.

As can be seen, the *competition for scarce (human) resources* as a possible driver for bi-regional S&T cooperation provoked strongly different reactions among European experts in all three policy areas in which this driver was indicatively raised for discussion. European workshop participants disagreed about possible *brain gain* as a driver in the scenario.

Whether or not the organisation of *bi-regional science days* can advance S&T cooperation, was also an ambiguously evaluated issue. Accordingly, if such events should take place in the future, policy-makers, programme-owners and organisers cannot expect unanimous support from stakeholders.

Supporting less developed countries, *supporting research infrastructures* and *adopting a “pro poor” approach* are possible drivers that are very diversely reflected upon by the European participants. Likewise, European experts did not agree upon the importance of *mobility* with the explicit hint to possibly *banning visas for scientists*. Further research in form of follow-up and additional interviews is needed in order to give valid interpretations of these findings.

Shapers and additional drivers for SEA-EU S&T Cooperation 2020

In this section, we shortly highlight the most important shapers of the future of bi-regional S&T cooperation between Southeast Asia and Europe that were identified by the scenario workshop participants.

In methodological terms, as described above, participants were asked to consider a list of indicative shapers and add new ones. Subsequently, every expert could both vote the relevance of each of the shapers by distributing 10 relevance points over the whole set of shapers and add qualitative comments and further explanations.

³² Most important = 5; least important = 1

As will be seen, while in theory and definition it might be possible to draw a line between driving and shaping forces as directly influencing or indirectly conditioning factors, in a dynamic workshop setting, it might not always be easy to maintain this separation proposed by the UNIDO foresight manual³³. Several of the shapers that will be presented here, can or even must actually be interpreted as drivers.

The shaper that by far raised the biggest interest among experts in both regions was *focusing common R&D areas on Food, Energy and Water*. While this can also be understood as a driver, here it is also to be interpreted in terms of the general relevance of food, energy and water issues in the region in the not-so-near future. A corresponding commentary of an expert justifying the impact of this shaper on Southeast Asia: “F, E, W are the main issues in ASEAN countries. Although there have been a lot of approaches and achievements [...] still in the upcoming years (up to 2020), people in ASEAN [...] are very concerned on these three issues”. Similarly another expert: “It is important for ASEAN countries to have a regional food product or a regional proven technology for ensuring energy resources”.

Another expert addressing the impact of this shaper on the EU recurs to a different reading: “[C]ommon R&D programmes will have an effect on the future EU scientific programmes”. He/She means that, as more money will be allocated to research activities focusing on these issues, this will shape the bi-regional S&T cooperation.

It becomes clear that the differentiation between drivers and shapers is not intuitive and not easy to maintain in our scenario workshop setting with policy-makers and programme-owners.

The external influences of *global issues* as well as *financial and environmental crises* are related to the driving and shaping *focus on common R&D areas* are. Here, the experts agreed that global challenges “will affect [the] amount of R&D funding to support international collaboration”. Moreover, it was highlighted on both sides that these challenges could lead to competition for resources and conflicts. “CO2 will decide upon the ‘language’ of S&T cooperation”. However, it is also highlighted that global challenges might turn into an opportunity for cooperation in a focused thematic approach – this reading suggests that if there is a pressing need, bi-regional cooperation will function well.

According to the participants’ views, *intellectual property issues* will shape the form of future bi-regional S&T cooperation between Southeast Asia and Europe. Weak IPR regimes could discourage international collaboration. IPR are said to be especially important for the EU – the reason for this appraisal might be that the workshop participants doubt that the European scientific community will share significant research efforts and outcomes without having the property rights clarified. Southeast Asian experts share the view of the opportunities included in IPR systems and state that the countries in the region will further develop the IPR culture. However, they also point to the adverse effects of an IPR system: these could lead to competition and impose barriers. As the IPR system can actively be influenced by policy making, it can also be a driving force.

The *availability of technical and scientific skills* as well as *existing management capacities* are also mentioned as relevant context factors for bi-regional S&T cooperation. The latter are considered essential for participation in EU-funded schemes. An expert opined that increased management capacities in Southeast Asia will lead to an increase in S&T absorption capacity which, in turn, increases cooperation with Europe. The former point of technical and scientific skills also has to be seen as relevant for S&T absorption capacity.

Interestingly, the *support to regional S&T institutions* in Southeast Asia is not considered to have a significant impact on SEA in terms of bi-regional S&T cooperation with Europe. On the other hand, European experts expressed the need for regional centres of excellence. We discuss this point in more detail in the recommendations section.

³³ UNIDO (2005): Technology Foresight Manual. Volume 1 – Organization and Methods.

The development of common and harmonised planning, monitoring, evaluation and impact assessment methodologies was determined to be a crucial shaper for bi-regional S&T cooperation, specifically as regards Europe. Southeast Asian experts assign much less impact to this point and, thus, less relevance in the SEA case.

Before turning to the policy recommendations that can be extracted out of the aforementioned views on drivers and shapers of a high-intensity bi-regional S&T cooperation between Southeast Asia and Europe, we will give a brief overview of the factors directly and indirectly influencing the future scenario.

The following points call our attention:

- There is a common concern for global challenges among both groups of experts which becomes apparent both in the identification of drivers and shapers.
- The needs for supporting research infrastructure and for technical and scientific skills were nominated important factors in terms of drivers and shapers. We observe a diverse picture regarding possible ways to address this issue (development assistance for S&T capacity-building, “pro poor” approach in S&T cooperation programmes, etc.). Further discussion and consultation processes are needed, which would contribute to networking and trust-building goals among the regions and stakeholder communities.
- Southeast Asian experts consider economic and trade factors as important drivers, while they do not insist on the improvement of national firms’ competitiveness as a central driving force. Their European peers assigned opposite relevancies to these two drivers.
- European participants, by comparison, were more concerned about the protection of intellectual property rights as a necessary precept for successful and far-reaching S&T cooperation.
- In the context of S&T, Southeast Asian experts are less concerned about the relevance of human rights and are less convinced of the usefulness of taking into account subject areas like humanities in the bi-regional cooperation.

After having presented the policy-makers’ views on important driving factors of the future of S&T cooperation between Southeast Asia and Europe, we will now turn towards the insights of those involved in actual scientific collaborations. The simple idea behind approaching a broad segment of the scientific community was that scientists would know both what their reasons are for collaborating and what they would need in order to collaborate more.

4. Driving factors – perspectives from an open email consultation

As indicated in the chapter on methodology above, we started to reach out to a part of the scientific community that has already been co-publishing in a Southeast Asia-Europe setting with the respective other region. Concretely, we started addressing scientific authors who have co-published in the course of the last five years with a simple and open email consultation. The scientists were asked the following:

Dear [...]

The European Union aims to intensify S&T networking with the countries of Southeast Asia and tasked our project SEA-EU-NET with identifying the most important driving factors for science cooperation between the two regions.

We have already asked for the opinions of science policy-makers, but we think that the views of scientists from both regions are an at least equally important factor when planning for future actions. As you have already published in this bi-regional setting (we made an ISI Web of Science search for co-published papers with authors from both Europe and Southeast Asia) we kindly ask you

- *to reply to this email with your view of important driving factors that support the build-up and strengthening of scientific relations between the two regions from the scientists' perspective (post-doc; working scientist; science manager). We kindly ask you to reply within one week.*
- *to participate in a two-stage rating process of these drivers (using the Delphi methodology; 10min for each stage) to assess the importance that the targeted scientific community as a whole poses on those driving factors (for this we will contact you via email, as soon as we have analyzed the proposed drivers).*

At the end of the deadline, after sending out the email consultation question to additional contacts indicated by the respondents, and after several reminders, we have received the considerable amount of 280 qualitative answers of a length between several lines up to two pages. In some cases, short discussions evolved on the basis of our responses to requests for clarification or opinion from the respondent scientists.

In the following analysis of the data gathered in the course of this open email consultation, we do not discriminate between responses from Southeast Asia and responses from Europe. Given that especially in the case of co-publishing scientists multiple affiliations and bi-regional biographies are common, we have to leave the decision, out of which regional perspective they are talking, to the scientists. The discrimination between the regions can only be done in the subsequent step of the Delphi survey. Hence, the following are the driving factors for S&T cooperation as identified by scientists with recent co-publication experience from both regions³⁴.

We will start with looking at what tools and support mechanism can, if available, drive international cooperation before having a look at the scientists' personal and institutional motivations for international cooperation that can also be considered as drivers.

Naturally, **financial resources** to support international S&T cooperation (in dedicated programmes, but also bottom-up as top-ups to existing research funding schemes) have been highlighted as a basic prerequisite for stepping up international cooperation. Analysing the qualitative material, one gets the impression that scientists are keen on international cooperation as soon as they discover joint interest in a common research topic or other mutual benefits like laboratory access, technology transfer and access to the field. If they do not come across possibilities to identify joint topic interest or mutual benefits (at conferences and other workshops, field visits, but also dedicated international cooperation support programmes), then they will not look after cooperation just for the sake of cooperating, unless they follow other related goals (like technology transfer for humanitarian reasons). In some cases, personal interest (ranging from friendship to touristic interest, concern for global challenges and ideals of supporting countries in their economic development) might push scientists to look for cooperation actions (with varying sustainability). However, in both cases (personal interest or joint topic interest and expectations of mutual benefits), cooperation is not likely to happen if specific resources (ranging from money for proper S&T cooperation projects to small add-ons to existing projects in terms of travel money and equipment support) are not available either in the form of dedicated international cooperation support programmes or as part of regular research budgets.

A task for science policy, thus, might be to “**anticipate development**”, as a scientist respondent called it, **make scientists aware of possible joint interests** and offer the **right amount of appropriate resources** while at the same time “mak[ing] sure to effectively **support actual cooperation** in training and research and not only external appearances” (another scientist respondent).

One scientist put the issue of funding as follows:

³⁴ Methodologically speaking, these are the codes inductively identified in the open email consultation answers.

“The funding of research projects is not organised for collaboration, and one project is usually built on at least 4 research programmes: to finance research in both laboratories, to finance students (grants) in both laboratories, and mission/travel funding. Moreover [...] it is usually difficult to obtain money to buy research equipment and without equipment, this can not be a real collaboration”

The wider problem of lacking research infrastructure has been voiced by a number of respondents.

As resources are limited, some balance will have to be found between explicitly supporting international cooperation for specific groups of researchers or specific thematics and supporting collaboration as soon as it appears as a beneficial option in ongoing nationally or regionally funded research.

International S&T cooperation is still often not rewarded by the scientists’ university or wider academic environments in terms of scientific career development. Thus, resources could not only be used to support international cooperation activities *ex ante*, but some funds could be employed to establish **reward structures for successful cooperation** between Southeast Asia and Europe. Interestingly, a respondent has also pointed to possibly rewarding scientists willing to engage with their community through international peer reviews. While this debate sounds slightly misplaced at first sight, in view of the fact that a number of co-publications and subsequent cooperations originate from authors’ including their reviewers as co-authors, it is reasonable to discuss reward structures for high-quality reviewing supporting international cooperation.

The financial and reward aspects bring us to one of the specific driving factors of international cooperation that are related to, but not only determined by the availability of financial resources (the empirical material gathered throughout our email consultation pinpoints a rich range of modalities, going far beyond simply stating that money is needed): the question who decides in which thematic areas S&T cooperation takes place, i.e. is supported and rewarded. Respondents identified a combination of **bottom-up and limited joint top-down priority setting** as necessary in the context of international cooperation. While most of the respondents highlighted that it is indispensable to have thematically open support for international S&T cooperation in order to make it function (the argument being that scientists just will not search for partners as long as they do not feel that it adds to the content of their research), a few respondents also opined that top-down priority setting would in general help to drive cooperation levels. For them, top-down thematics indicate political backing for this kind of research, a frame that has been mentioned by several Southeast Asian scientists as a pre-requisite for successful cooperation. Assessments have not been univocal in this regard. However, a solution to possible resource dilemmas has been mentioned by the scientists themselves several times: Support for cooperation on jointly defined subject areas relating to global challenges or other areas of common interest could be combined with thematically open bottom-up support.

Regardless of the thematic focus, respondents unambiguously voiced that international S&T cooperation can only function over a **longer term**³⁵. When long-term support for exchange and subsequent cooperation is available without too quickly looking at quantifiable results (or looking at them with suitable metrics), trust and personal relations can grow, which in turn help develop a joint understanding of research problems and the development of joint research interest.

³⁵ Maybe the only exception have been some scientists from Singapore. The lower relevance these scientists assigned to long-term cooperation might be explained by the fact that the Singaporean research community is highly internationalised and mobile.

Relatedly, **exchange of researchers**³⁶ was also among the most frequently highlighted driving factors. Most respondents underlined that exchange of personnel is a very efficient and indispensable driver of long lasting collaborations. Regarding the details, most scientists propose long-term exchange themes for PhD-students and short-term exchange schemes (visits) for Post-Docs and senior scientists. Rather few respondents proposed undergraduate exchange as driving S&T cooperation levels.

It was mentioned that for PhD-exchange to function efficiently and to the benefit of both sides, the selection process has to be fair, open and has to offer exit strategies in case the collaboration does not prove to make sense (e.g. because of differences in thematic interest or research excellence not discovered before, or because of insufficient graduate education levels). As a participant in our email consultation said, in Asia

*“it is equally or even more difficult than in Europe to get good PhD students. The best graduates immediately get **lucrative positions in industry**. That’s why the applicants [for university PhD positions] are often not the best in their year”.*

One possibility that was mentioned to mitigate damage of unsuccessful exchange agreements was to have a six-month introductory stage with the PhD candidate. In case both sides agree and consider ongoing cooperation fruitful, the exchange can then be extended to the full length of a PhD programme. Another option for overcoming uncertainties was to combine prior senior scientist short-term exchange with personal meetings with PhD candidates and a joint selection process. In both cases, combining exchange and visits with training (might be language, but also subject area specific scientific training) was also identified as probably beneficial to sustainable cooperation via exchange. Additional **training**, for instance at the beginning of a long-term stay, could in general be wise in order to integrate foreign PhD students or Post-Docs into new university and lab environments. **Regional training networks** could be set up build research capacity, to develop and implement joint curricula and to ensure comparability of degrees and education.

Respondents also mentioned the improvement of **quality control metrics** as essential, both in view of selecting candidates for exchange schemes and collaboration, and in view of evaluating the success of S&T cooperation.

In terms of the PhD projects and their subject areas, most respondents emphasised that these issues should be defined bottom-up.

An interesting related driving factor was pointed out in several email responses: **co-supervision of PhD students**. This is normally combined with some exchange schemes of a longer or shorter length and formalised joint PhD programmes, joint projects involving a PhD or rather informal agreements with PhD students admitted to regular national PhD programmes of the target country.

In any case, the core idea is that co-supervision drives collaboration between senior scientists from two regions via the intermediary of the young research with all sides benefitting. The PhD student gets to know different research and lab cultures, benefits from higher exposure to his/her research field and from complementing the knowledge base of both of his/her supervisors. The supervisors can meet irregularly on short-term basis, e.g. during the usual conferences of their scientific field, but are connected during a longer time-period via their joint PhD student. The returning PhDs bring along with them networks, expertise and fresh ideas to his/her original working environment.

Above, we mentioned that most scientists do not share the conviction that international S&T cooperation is beneficial merely for political reasons, long-term economic prospects or for the

³⁶ Not surprisingly, respondents exclusively referred to scientist exchange as driving S&T cooperation. Programme owner exchange was not considered relevant. As a respondent put it: “[T]hey lack scientists, not managers”.

sake of cooperation itself. In this regard, exchange and co-supervision can prove very helpful, as well, as people are brought together over longer periods of time, thus enabling them to identify and develop joint research interests.

Notwithstanding the possibilities of long-term exchange of junior scientists, most respondents also mentioned that the classical fora for scientific exchange, namely the disciplinary and interdisciplinary **conferences**, are highly relevant drivers for international S&T cooperation, at least for those scientists that are not already connected extensively on a global scale. In addition to usual support schemes like reduced fees for younger researchers or scientists from developing country, support schemes might be envisaged to **support** the disciplinary associations **in case they want to hold a conference in a Southeast Asian country**.

Several respondents agreed that, in addition to scientific conferences, **other types of meetings** like dedicated matchmaking events or smaller problem-centred scientist meetings are also greatly helpful to generate cooperation possibilities.

The following more specific, but very relevant innovative exchange-related tools and driving forces for S&T cooperation have also been identified by the scientists responding to our open email consultation. Some of them point towards innovative approaches of nurturing and benefitting from exchange for cooperation:

Some respondents observed that it is relatively easy to convince Southeast Asian scientists to visit European labs for short or long-term research stays. Mobility in the other direction is less frequent, but would be particularly important in view of above mentioned aspects like PhD exchange, training, but also in view of technology transfer. **Outgoing funds for European scientists** willing to go to Southeast Asia might be helpful, here. These can address European PhDs and long-term stays as well as the short-term exchange of senior scientists already mentioned. Another very concrete proposal made by the respondents was to offer **sabbatical schemes** for senior scientist's long-term exchange. Such a measure can, for sure, work both ways for mobility from Southeast Asia to Europe and vice-versa, but might especially be attractive for established European scientists whose institutions often offer sabbatical schemes (but often without related mobility support). Alternatively, **retired senior scientists willing to take part-time positions** at partner universities in third countries could be approached. Even if they might (for good reasons) not be any longer at the cutting-edge of scientific development, younger generations of scientists could greatly benefit from their accumulated networks and expertise, which they, in turn, can more easily share as they are no longer part of the everyday routines of their universities and disciplines. Research institutions and the local private sector could benefit from contacts, training, technology transfer, etc.

As important as it is to leverage senior scientists' knowledge and networks, once exchange schemes have been used at whatever level, it is also very important to **keep the contacts alive**, possibly also to advance them on an institutional level. Programme owners of exchange programmes might consider the idea of reserving some funds for this.

Not only in order to maintain contacts, but also in view of the goal of establishing new contacts and future cooperation, Southeast Asian **diaspora communities** in Europe (or **Southeast Asian scientists with European PhDs**) might be helpful. A lot of especially second generation migrants in European countries have studied, and still have contacts in Southeast Asia, know the languages and sciences cultures of both regions.

Most of these exchange-related aspects focus on personal contacts. However, they can receive significant support from institutional contacts, e.g. university collaboration agreements involving joint university campuses, third country campuses, exchange schemes or joint events. Several respondents indicated institutional contacts as being particularly relevant for international cooperation. However, the majority rather underlined single personal contacts as relevant. Given

the variety of answers, we conclude that the scientific community acknowledges both **personal and institutional contacts** as supportive for S&T cooperation.

Institutional contacts might be relevant for another driver identified by the respondents: partner identification must be easy, if it is not “just happening” at conferences or during exchange schemes. Institutional contacts might help as well as virtual **databases** of institutions and researchers.

Information and Communication Technologies (**ICTs**) also help in identifying topic interest and keeping contact: While practically all scientists insist on the importance of regular physical meetings,

“international cooperation can [also] be done in a virtual manner [as] current information and communications technologies allow for high levels of interaction and cooperation”.

Given that an internet connection is provided, ICTs can also greatly help in providing **access to literature or sample databases** or by allowing **joint and cloud computing**. This access is a precondition for participating in global state-of-the-art science. The more familiar scientists from both regions are with the literature bodies the respective other region is referring to the easier will be the identification of joint interests, topics and approaches. This facilitates cooperation.

It might also lead to a standardisation of the pool of knowledge, research questions and research designs applied, which could be critically acclaimed. However, it is indispensable for cooperation to unite two or more parties working on a joint research problem. In order to avoid turning regional science traditions into abstract international elite discourse without impact, another driver for international cooperation identified by the respondents could be of use: **Results of joint research should be made available within the regions**, not just in international journals. By this means, it can be linked back to the regional and local sets of problems the research is aimed at addressing.

Bridging institutions to support international S&T cooperation (by linking partners through organising events, making knowledge available, etc.) have been recommended in a series of answers to our email consultation. They could also serve the goal of linking joint international research with regionally relevant issues. In addition, **regional, supranational research institutions** (like the International Rice Research Institute) or **long-term international research centres** could excel in this function. They have the mandate to bring together researchers from different regions of the world, usually in order to engage them in work towards the solution of a global problem or the investigation of a phenomenon or resource of joint interest.

Red-tape and bureaucracy has been highlighted by several respondents as hindering cooperation efforts. They referred to different kinds of bureaucratic obstacles, though. Concretely, the **avoidance of administrative difficulties** in view of (according to the scientists)

- Material exchange (plant material, human tissue, etc.)
- Field access
- Visa issues
- Financial accounting

was identified as driving cooperation between the two regions. Science cooperation management guidance (financial aspects, visa support, etc.) has been considered potentially useful by the respondents, in this context.

Some respondents pointed to industry involvement and technology transfer from (applied) science to the private sector as “cementing” cooperation. In order to make that happen, another factor has to be taken into account: intellectual property rights (IPR). Clear IPR guidance was

mentioned by some participating scientists as helping S&T cooperation to grow into concrete results with local impact.

Finally, soft factors like mutual respect, openness to differences among cultures, a non-arrogant attitude, but also language skills, communication skills (e.g. in order to clarify what can reasonably be expected from the cooperation), etc. have been considered as relevant for the facilitation of S&T cooperation between Southeast Asia and Europe.

Regarding the **personal or institutional motivations** that drive international S&T cooperation, respondents mentioned the following drivers (no ranking of importance):

- the goal of doing good state-of-the-art science
- reputation
- the feeling to be able to contribute (to the development of a country or a scientific discipline)
- the ideal of helping to solve of global challenges; while this appears first and foremost to be a personal or institutional motivation, if one considers that cooperation in the fight against global challenges produce cooperation patterns, it also is a tool
- getting field access; here, some kind of international cooperation is quickly established given the interest and needs of one party. The relevant question, then, is not so much how to establish S&T cooperation, but how to establish it on an equal footing.
- exchanging empirical data and materials
- getting access to expertise and knowledge pools
- getting access to human resources (e.g. motivated PhD students)
- getting access to an economically important or increasingly important region
- tapping into potential for joint development of technologies; For sure, this driving factor appears as more or less relevant according to the research subject area and mode of investigation
- love for the culture(s)
- tourism
- keeping friendship alive

As international cooperation activity is increasingly becoming an important performance indicator for individual scientists and scientific institutions, the quest for international projects and publications will have to be added to the above list as an increasingly relevant institutional motivation for S&T cooperation.

This driver becomes particularly relevant as it might come into conflict with personal needs and motivations: For instance, while one might expect that a mobile research career in Europe or Southeast Asia might be interesting not only in terms of intellectual, but also financial reward, some negative aspects of researcher mobility (as a tool for and itself a form of international cooperation) have to be kept in mind. Working abroad for a while could cause problems when the positions at the home institution cannot be kept meanwhile (**reintegration grants** and/or -assurances could prove useful, here) or when a return is difficult or unattractive for other reasons. While abroad, the family is either left behind or brought along, which causes considerable financial strain, especially when one partner has to leave his or her job in order to be able to follow.

“Supporting exchange between scientists [...] requires good funding to also support family travel [...]. The cost of this is difficult to compensate, especially when one partner has to stop working for that period. For the own work and career planning such a stay might be good but financially it can be a disaster”

Conditions might also not be that favourable at all:

*“I have looked into coming to Europe but the **labor market conditions** in research and academia are too bad for me to do so, relative to the US market”*

Naturally, scientists will have potential trade-offs in mind when considering to engage in international cooperation

These personal and institutional motivations are inherently driving international cooperation to a certain extent, whatever the framework conditions are. However, as mentioned at the beginning of this overview of participants’ responses, motivations can (to a higher or lower degree) be transformed into action by the availability of tools driving international S&T cooperation between Southeast Asia and Europe. As to policy-makers’ scope of action, personal and institutional motivations can and should be addressed, but can hardly be changed. Policy-making can make sure, however, that the tools for transforming motivation into action are suitably available.

Specifically with regard to the tools that might drive international S&T cooperation, we wanted to make sure that we did not only gather individuals’ opinions, which would be worthwhile but not representative. This is why we fed back the qualitative material from this open email consultation to the entire target respondent group of approximately 10.500 scientists with Southeast Asia - Europe co-publishing experience in form of a two-stage Delphi survey.

5. Global assessment of important driving factors – Delphi survey results

In order to let the entire target group evaluate the individual assessments of driving forces of international S&T cooperation between Southeast Asia and Europe, the set of “drivers” (tools and personal motivations) was presented to the group of 10.500 scientists in the form of the following 39 statements:

motivations - general

- From an academic viewpoint, the possibility of interacting with people coming from a culture so different, yet sharing the same scientific interest and working in similar topics is stimulating.
- If we do not act immediately, we will be soon lagging behind. Strong and early partnerships might help Europe keep up with the tumultuous growth of the S&T potential of the SEA countries.
- Driving factors for cooperation are mainly to share our knowledge with a developing country
- In order to engage in S&T cooperation, a love for Southeast Asia / Europe and its people and cultures is necessary.

motivations - scientific

- The motive for cooperation is a shared interest and expected mutual benefits among all partners.
- The motive for cooperation is the global scholarly reputation of the institutions within which cooperative activities are housed.
- The motive for cooperation is to get access to high-tech labs.
- I cooperate because I think my partners can benefit from my institutions' excellence.
- Working together promotes not only scientific results, but friendship that is likely to lead to further joint studies.

information

- Scientists in each region must be familiar with the other region's scientific institutions, science policies, and scientists.
- A permanent bridging institution should be established to accelerate knowledge exchange between the two regions (e.g. by helping with partner search, mastering administrative burdens, helping with proposal writing, ...).
- Networking events should be available (separate from or in addition to thematic academic conferences) where scientists from both regions can meet, discuss and build networks.

policy framework

- It is breaking through the political barriers that is most important.
- Thematic priorities for cooperation should be clearly pre-defined by policy-makers and funding assigned accordingly.
- Research grants should be awarded independent of governments' thematic priorities.
- The EU should reach out to facilitate the inclusion of Southeast Asian scientists in FP7.
- Joint programs should be set up, where each party can leverage funding from their own country to address an issue of direct concern to both.
- Thematic priorities and joint programs should be established with a long-term perspective.

programme setup

- At the end of each project cycle, separate funding should be allocated for publications and dissemination work.
- It would be good if EU encouraged the South East Asian countries to be the coordinators, and not just members of FP7-consortia.
- Industry and leading companies should be involved across various disciplines to work with and sponsor academic institutions in both EU and SEA.
- S&T activities should be supported by training the persons involved in "soft skills", mediating cultural differences (on top of the usual funding schemes).
- The countries should encourage their scientists working abroad to collaborate with scientists at home.
- The financial and auditing aspects of the EU grants are extremely confusing.
- Some incentives could be offered to scientists who work for the scientific community (e.g. offer support to conferences organised by scientists who review papers for international peer reviewed scientific journals).
- In cooperation, people should be of comparable rank within their organisations.
- Most of the SEA Countries are 'developing' ones with few (if any!) facilities to do scientific research. Therefore, in this kind of cooperation human resources are the key factor.
- One of the keys of success is technology transfer to our hosts.

programme components

- It would be beneficial to start some of the interactions at a lower level by providing internship opportunities to undergraduate students to foster a better exchange.
- Personal contacts of the supervisors are essential before PhD student exchange, to ensure the good quality of students.
- Support long-term exchange of doctoral students / pre-doctoral students and short-term visits of post-doc or working scientists.
- It should be considered to fund PhD students first for a period of 6 months; in case that they are excellent a prolongation to 3 years as recommended by the professor could be envisaged.
- The main driver is PhD scholarships awarded to graduates already employed for several years in scientific institutions, not to people who have just completed a degree.
- Training grants should be provided to young investigators – going in both directions, while travel grants should be offered to other investigators.
- Support should be given to post-docs to re-visit foreign host institutions to keep contacts alive.
- PhDs returning to developing countries should be given funds to set up their own lab in order to be able to continue their work.
- Cooperation can be very successful if you place motivated and highly trained foreign scientists in a country's laboratories for long term stays.
- I would advise to offer professors still active in research sabbatical-like periods and subsidies in exchange for this additional work as they are already overwhelmed with all kinds of duties so that very few can accept.
- Retired scientists should get a better funding to go to developing countries for mentoring their former students.

In the first round of the Delphi survey, around 1.050 scientists have estimated the relevancies of each of these statements (scale: strongly agree – agree – disagree – strongly disagree; not applicable) and around half of them have accepted the offer of having a second look at the overall relevance ratings in view of possible modifications and justifications of individual positions.

The answers of the first round have shown that it makes sense to discriminate “Europe”, “Southeast Asia excl. Singapore” and “Singapore”. Answers in the first round within each of these regions were more similar than answers between the region itself and the two other groupings.

a. Overall assessment

Regarding the following group of driving factors, there has been **extremely high agreement**³⁷ in all three regions:

- “From an academic viewpoint, the possibility of interacting with people coming from a culture so different, yet sharing the same scientific interest and working in similar topics is stimulating”.
- “The motive for cooperation is a shared interest and expected mutual benefits among all partners”.
- “Working together promotes not only scientific results, but friendship that is likely to lead to further joint studies”.
- “Support long-term exchange of doctoral students / pre-doctoral students and short-term visits of post-doc or working scientists”.

We see here that the whole group of scientists with co-publishing experience agrees on a series of “soft” factors that are key to cooperation as well as on a specific instrument of cooperation: the centrality of (short and long-term) exchange of senior scientists and PhD (or even undergrad) students.

Very high agreement³⁸ has been provoked by the following statements:

- “Joint programs [...], where each party can leverage funding from their own country to address an issue of direct concern to both”.
- “Thematic priorities and joint programs should be established with a long-term perspective”.
- “The countries should encourage their scientists working abroad to collaborate with scientists at home”.
- “Personal contacts of the supervisors are essential before PhD student exchange, to ensure the good quality of students”.
- “Support should be given to post-docs to re-visit foreign host institutions to keep contacts alive”.

Here, the scientists refer to the importance of joint programmes (based upon national funds, but with dedicated cooperation support), a long-term perspective and the inclusion of the diaspora communities. Moreover, it is indicated that personal senior scientist exchange can assist the task of ensuring exchange of suitable PhD candidates. Interestingly as well, the whole group agrees that it would contribute to ongoing cooperation to help scientists that have spent some time abroad to keep their contacts alive.

³⁷ The percentages of „strongly agree“ and „agree“ answers in the three regions in sum could theoretically reach 300 percentage points. “Extremely high agreement” refers to more than 290 percentage points.

³⁸ > 275 percentage points

Most of the other drivers have raised moderate agreement levels. The statements with which scientists of *all* regions mostly **disagreed** were:

- “In cooperation, people should be of comparable rank within their organisations”.
- “The main driver is PhD scholarships awarded to graduates already employed for several years in scientific institutions, not to people who have just completed a degree”.

However, for our analysis we believe that a look at the regional and hierarchical differences in the answers proves more interesting than going into more detail at the level of overall averages.

b. Regional differences

When looking at the answers from scientists speaking from a Southeast Asian point of view and comparing them with those answers made from a European perspective, some interesting and some less surprising differences catch one’s eye.

According to a t-test comparison of the sample means from the first round³⁹, Southeast Asian scientists showed significantly⁴⁰ higher agreement rates to the statement that “a love” for the respective other region and its cultures and people is necessary. The situation is similar with the statement that “driving factors for cooperation are mainly to share our knowledge with a developing country”. This means that more scientists considering themselves as talking from a Southeast Asian perspective (which does not mean that they are currently based in Southeast Asia!) are motivated by the goal of supporting developing countries than people with a European perspective.

Agreement rates for the following statements are also significantly higher in Southeast Asia than in Europe (but European scientists still agreed to these statements):

- The motive for cooperation is the global scholarly reputation of the institutions within which cooperative activities are housed.
- The motive for cooperation is to get access to high-tech labs.

Both issues are yet more relevant for Southeast Asian scientists than for Europeans.

- I cooperate because I think my partners can benefit from my institutions' excellence. It is noteworthy that compared to answers from a European perspective, a larger number of scientists from Southeast Asia consider their institutions' excellence as motivating their partners to cooperate with them.

- A permanent bridging institution should be established to accelerate knowledge exchange between the two regions (e.g. by helping with partner search, mastering administrative burdens, helping with proposal writing, ...).

While scientists in both regional groups agree that such a bridging institution would be useful, Southeast Asian scientists consider it even more relevant.

- Networking events should be available (separate from or in addition to thematic academic conferences) where scientists from both regions can meet, discuss and build networks.
- The EU should reach out to facilitate the inclusion of Southeast Asian scientists in FP7.

³⁹ We have chosen the first round, here, for two reasons: First, the geographic grouping in the second round was based on this analysis of the first round. Secondly, the sample sizes are bigger in the first round, results thus more reliable.

⁴⁰ „significantly“ refers to an α -level of 0,01.

- It would be good if EU encouraged the Southeast Asian countries to be the coordinators, and not just members of FP7-consortia.

While agreement levels with regard to the inclusion of Southeast Asian scientists in FP7 are very high in both regions, less Europeans (62% compared to 87% Southeast Asians) tended to agree that Southeast Asian partners should be encouraged to coordinate FP7 proposals.

- Thematic priorities and joint programs should be established with a long-term perspective.

Practically all (>95%) Southeast Asian respondents agreed that this is an important issue. In the case of the Europeans, agreement was lower, but still considerably high (87%).

- At the end of each project cycle, separate funding should be allocated for publications and dissemination work.
- Industry and leading companies should be involved across various disciplines to work with and sponsor academic institutions in both EU and SEA.

Scientists from Southeast Asia agree at a significantly higher degree to the involvement of industry. Between 90 and 100% of the responding scientists in Southeast Asia agreed to this statement, whereas in Europe “only” 75% did so.

- One of the keys of success is technology transfer to our hosts.
- S&T activities should be supported by training the persons involved in "soft skills", mediating cultural differences (on top of the usual funding schemes).
- Some incentives could be offered to scientists who work for the scientific community (e.g. offer support to conferences organised by scientists who review papers for international peer reviewed scientific journals).
- Most of the SEA Countries are 'developing' ones with few (if any!) facilities to do scientific research. Therefore, in this kind of cooperation human resources are the key factor
- Training grants should be provided to young investigators – going in both directions, while travel grants should be offered to other investigators
- I would advise to offer professors still active in research sabbatical-like periods and subsidies in exchange for this additional work as they are already overwhelmed with all kinds of duties so that very few can accept.
- PhDs returning to developing countries should be given funds to set up their own lab in order to be able to continue their work

Regarding the funds for returning PhDs, 75% of European respondents agreed, while in the case of Southeast Asian respondents, the overall average agreement rate was more than 90%.

European scientists did not agree to these statements that have nevertheless been agreed upon among Southeast Asian scientists:

- It is breaking through the political barriers that is most important⁴¹
- Thematic priorities for cooperation should be clearly pre-defined by policy-makers and funding assigned accordingly.

Interestingly, the only driver where Southeast Asian scientists agree to a significantly smaller degree (they still agree, however) is reflected in the statement that “the financial and auditing aspects of the EU grants are extremely confusing”. It might be that there is a bias because

⁴¹ However, in the open email consultation several scientists experienced in prolonged S&T cooperation also consider this a very important driver.

Southeast Asian respondents wanted to be polite in front of us (and we are and have been perceived as a European project). Otherwise, Southeast Asian scientists could simply be happier with FP7 also in terms of accounting and auditing or they are not so familiar with FP7 yet, as to have a critical opinion. In-depth qualitative analysis would be needed to present a definite answer, here.

c. Developed countries – developing countries?

As we hear, interestingly, respondents answering from a Southeast Asian perspective are more concerned about supporting developing countries than their European counterparts. What are the differences, now, within the extremely diverse ASEAN region, and between this group of countries that could be considered (more or less) consisting of developing countries and Europe or countries like Singapore?

As said, Southeast Asia is not only culturally, but also in terms of economic development a highly diverse region. Each clear differentiation of ASEAN countries into developed and developing ones is impossible.

What can be said, however, and what also has been shown by the comparison of answers from the first round (concretely, between which groupings differences has been biggest compared to the inner differences of each of the groups), is that Singapore is a separate case. We will, thus, now give some comparison between Europe, Singapore and the group of ASEAN countries excluding Singapore.

In almost all cases, comparing Southeast Asia *excluding* Singapore with Europe results in similar, but stronger differences than the ones mentioned under b. between Southeast Asia *including* Singapore and Europe. The only thing we want to explicitly mention, in view of this comparison, is that awareness regarding the following statement is higher among Southeast Asian (excl Singapore) scientists than among European scientists: “[i]f we do not act immediately, we will be soon lagging behind. Strong and early partnerships might help Europe keep up with the tumultuous growth of the S&T potential of the SEA countries”. Nevertheless, also around 85% of European scientists would agree to that statement.

When comparing agreement rates in Singapore with Southeast Asia excl. Singapore, differences appear again regarding almost the same set of drivers as mentioned above in b. when comparing Europe and Southeast Asia in general – with Singapore replacing Europe, here. Concretely, **agreement on the following driving forces for future S&T cooperation has been significantly higher in Southeast Asia excl Singapore than in Singapore** (however, most Singaporeans still agree):

- Driving factors for cooperation are mainly to share our knowledge with a developing country.

While only 58% of respondents answering from a Singaporean perspective agree to this statement, 84% from the other Southeast Asian countries do so.

- In order to engage in S&T cooperation, a love for Southeast Asia / Europe and its people and cultures is necessary.
- The motive for cooperation is to get access to high-tech labs.
- Working together promotes not only scientific results, but friendship that is likely to lead to further joint studies.
- It is breaking through the political barriers that is most important.

Singapore does not seem to suffer from any political barriers impeding cooperation: a majority of Singaporean respondents disagrees with the statement or considers it not applicable to their

situation. In the other Southeast Asian countries, 70% of the respondents agree with the statement.

- At the end of each project cycle, separate funding should be allocated for publications and dissemination work.
- S&T activities should be supported by training the persons involved in "soft skills", mediating cultural differences (on top of the usual funding schemes).
- In cooperation, people should be of comparable rank within their organisations.

Engaging people of comparable hierarchical rank is even less important in Singapore than in the other Southeast Asian countries. The majority (56%) of people answering from a Singapore perspective disagree that this is of any relevance.

- Most of the SEA Countries are 'developing' ones with few (if any!) facilities to do scientific research. Therefore, in this kind of cooperation human resources are the key factor.

Interestingly, around 40% of Singaporeans disagree with that statement and 15% consider it not applicable to their situation. Regarding the other Southeast Asian countries, 88% of the respondents agree to this statement.

- One of the keys of success is technology transfer to our hosts.

Agreement rates in Singapore are 15% less than in the other Southeast Asian countries (70% agreement vs 85% agreement).

- Support should be given to post-docs to re-visit foreign host institutions to keep contacts alive.
- PhDs returning to developing countries should be given funds to set up their own lab in order to be able to continue their work.

Regarding one driver, agreement in Singapore has been similar to agreement in Southeast Asia excl Singapore, but with much higher abstention in the case of respondents answering for Singapore: "The financial and auditing aspects of the EU grants are extremely confusing". However, 50% of Singaporean respondents do not consider this question applicable, according to repeated qualitative comments because Singapore is not allowed to receive FP7 funds⁴².

The following table summarises the above discussion:

Agreement \ region	Southeast Asia (excl Singapore)	Singapore	Europe
Strong agreement in all regions regarding the following drivers	<ul style="list-style-type: none"> • Interaction is stimulating • Shared interest and mutual benefits as motive • Friendship • Long-term exchange for PhDs, short-term for seniors • Joint programs based on national funds • Long-term perspective • Personal contacts of supervisors • Support to post-docs for revisiting 		
Higher agreement rates in: ... regarding the following drivers in	<ul style="list-style-type: none"> • Reputation • Access to high-tech labs • Partners benefit from my institution's excellence • Bridging institution • Networking events • FP7 outreach • SEA coordinators in FP • Separate funding for dissemination 		<ul style="list-style-type: none"> • Confusing FP7 financial auditing aspects

⁴² which is, strictly speaking, not true. It has only to be justified why the inclusion of a partner from Singapore is necessary for the success of the project.

	<ul style="list-style-type: none"> • Involve industries • Technology transfer • Soft skills training • Incentives for working for the scientific community • SEA countries are developing countries → human resources important • Training grants • Sabbaticals • Funds for returning PhDs to set up labs • Breaking through political barriers • Policy-makers could pre-define thematic priorities • Act, otherwise Europe will lag behind 		
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T-tests comparing samples based on different sets of Southeast Asian countries (e.g. ASEAN excl. Singapore, Malaysia and Thailand) have shown that the results are very similar: The differences in agreement occur in relation to precisely the group of drivers where differences in agreement also occur when comparing Southeast Asia as a whole or without Singapore and Europe or Southeast Asia excl Singapore and Singapore.

d. The different views from hierarchy

In the Delphi survey, we have also asked the respondents to specify at which hierarchical/career level they currently are (PhD, Post-Doc, Senior Scientist, Emeritus or Other). The complete answers in the first Delphi round came from 50 PhDs, 96 Post-Docs, 674 senior scientists and 42 Emeriti⁴³. As can be seen, the overall answers in our survey can be interpreted as reflecting the opinion of senior scientists.

In order to find out whether scientists of different career levels assess driving forces for S&T cooperation differently, we have compared the means of the most relevant subsamples. The results have been as follows:

There have been no significant differences (neither at 0,01 nor at 0,05 level) between the agreement rates of PhDs and Post-Docs. Regarding differences between the answers of senior scientists and emeriti, only one driver was agreed upon by significantly more emerit than senior scientists:

- Retired scientists should get a better funding to go to developing countries for mentoring their former students.

It seems quite understandable that retired scientists have an interest in the availability of such funds. Nevertheless, it is also a good sign that senior scientists would be interested in such schemes.

Significant differences can be recorded, thus, only between the younger and more senior cohorts of the scientific community. We have compared the answers of PhDs and Post-Docs together with those from senior scientists.

Regarding the following statements, **agreement among senior scientists is significantly (at 0,01 level) higher than among their younger peers:**

- From an academic viewpoint, the possibility of interacting with people coming from a culture so different, yet sharing the same scientific interest and working in similar topics is stimulating
- The financial and auditing aspects of the EU grants are extremely confusing.

⁴³ We have not discriminated regional perspective and career level at the same time as sample sizes would have become too small.

In the case of the following drivers, it is the opposite case, i.e. **younger scientists consider them more relevant**:

- A permanent bridging institution should be established to accelerate knowledge exchange between the two regions (e.g. by helping with partner search, mastering administrative burdens, helping with proposal writing, ...).

It would be an interesting question to follow up if this newer generation of scientists argues in favour of such a bridging institution also when they are already more established or whether this appraisal of such an institution is linked to their not yet fully developed academic networks.

- Networking events should be available (separate from or in addition to thematic academic conferences) where scientists from both regions can meet, discuss and build networks.

Younger scientists feel that networking events would help them in view of supporting their international cooperation activity. Their networks are still not as developed as those of their elder peers.

- It is breaking through the political barriers that is most important.

We assume that younger scientists with less visa and project acquisition, accounting and auditing practice still struggle more with political barriers.

- Thematic priorities for cooperation should be clearly pre-defined by policy-makers and funding assigned accordingly.

This might be the case because younger scientists are not yet so confident in deciding which topics could best be dealt with in an international cooperation mode.

- At the end of each project cycle, separate funding should be allocated for publications and dissemination work.
- Industry and leading companies should be involved across various disciplines to work with and sponsor academic institutions in both EU and SEA.
- S&T activities should be supported by training the persons involved in "soft skills", mediating cultural differences (on top of the usual funding schemes).
- One of the keys of success is technology transfer to our hosts.
- It would be beneficial to start some of the interactions at a lower level by providing internship opportunities to undergraduate students to foster a better exchange.
- PhDs returning to developing countries should be given funds to set up their own lab in order to be able to continue their work.

The latter two items are not surprising given that PhDs are not far away from their undergraduate past and given that the last driver proposes direct benefits for this group. Having in mind these and related contextualisations of the data presented here, in view of trying to shape the 2020 future of S&T cooperation between Southeast Asia and Europe, it is sensible to take into account the specific needs and thought patterns of younger generations of scientists, even as these might change with increasing seniority.

Besides the career level, we have also asked the respondents to specify whether they currently are in an administrative position or not. 438 first-round respondents answered with "yes", 590 with "no", which allows us, again, to look at significant differences in the agreement rates between two groups.

Agreement rates among researchers in administrative positions has been significantly (at 0,01 level) higher than among other researchers regarding the following six drivers:

- The motive for cooperation is the global scholarly reputation of the institutions within which cooperative activities are housed.
- The motive for cooperation is to get access to high-tech labs.
- I cooperate because I think my partners can benefit from my institutions' excellence.
- Working together promotes not only scientific results, but friendship that is likely to lead to further joint studies.
- Cooperation can be very successful if you place motivated and highly trained foreign scientists in a country's laboratories for long term stays.
- I would advise to offer professors still active in research sabbatical-like periods and subsidies in exchange for this additional work as they are already overwhelmed with all kinds of duties so that very few can accept.

Agreement rates among researchers in administrative positions have in addition been significantly (at 0,05 level) higher with regard to the following three additional drivers:

- If we do not act immediately, we will be soon lagging behind. Strong and early partnerships might help Europe keep up with the tumultuous growth of the S&T potential of the SEA countries.
- Networking events should be available (separate from or in addition to thematic academic conferences) where scientists from both regions can meet, discuss and build networks.
- Thematic priorities for cooperation should be clearly pre-defined by policy-makers and funding assigned accordingly.

For most of these bullet points the (necessary) management orientation of people active in science management and science administration positions helps to interpret the differences in agreement levels. The group of senior scientists in administrative positions is at the core of our target group for the scientist foresight – these respondents unite a scientist perspective with a more performance-oriented view on the practice of international S&T cooperation. Thus, they (together with programme owners with a scientist background) can probably best bridge science and science policy. As the resources of this SEA-EU-NET study have been limited both as regards time and finances, it was not possible to bring these two parts of the target group around one table in a physical meeting.

Rather, we have by desk research compared the results of the scientist email consultation and Delphi survey with those of the policy maker workshop. The next chapter presents some of the outcomes of this endeavour.

6. The views from the scientific community contrasted by views from policy-makers

In the preceding chapters, we have first presented the results of a scenario-based drivers workshop where policy-makers and programme owners from Southeast Asia and Europe have identified and discussed driving forces for the future of bi-regional S&T cooperation. Then, the results of an open email consultation and Delphi survey with a relevant part of the scientific community (namely the part that has recently engaged in joint publication activity) have been presented. In the consultation and Delphi survey, scientists have also identified a series of driving forces for the 2020 future of S&T cooperation between Southeast Asia and Europe.

We will now compare the results of both exercises in order to see where policy-makers' and scientists' opinions were similar, where they could complement and where they contradict each other.

Several supposed driving forces for S&T cooperation between Southeast Asia and Europe have been identified in both the policy-maker scenario workshop and the scientist consultation.

However, in these cases, the scientists' assessments tend to go into more detail as to what concrete operationalisation of the driver could actually support cooperation. This could be expected, given that in the policy-maker workshop we aimed at a broader discussion (stirred by listing five different policy areas) making use of the audience's wider expertise, while the scientist consultation was trimmed towards dipping into the experience of those that are actually doing science cooperation.

To illustrate the difference of broadness and depth to which we here refer to: *Funding and donor availability*, for instance, as well as *leveraging research funding*, two drivers identified by the policy-makers, clearly refer to the scientists' conviction that dedicated funds for cooperation activities have to be available (either in specific programmes or as add-ons to usual funding schemes). Policy-makers voice with another driver that the free movement of capital has to be guaranteed. They do not specify, however, whether funding of cooperation should be linked to dedicated international cooperation programmes or whether specific mobility, conference/workshop outgoing, return, sabbatical or retirement schemes should be financed. Regarding the question whether funds should be thematically focussed or bottom-up, the drivers of *joint agendas for common challenges*, *jointly formulate calls*, *jointly identify key research areas* and *tackling global challenges* suggest that a top-down priority setting combined with the instruction to cooperate is considered a viable option. As we have seen, most scientists rather think of international cooperation support of bottom-up initiatives as the most relevant driver. This driver is absent in the policy-makers' debate.

Similarly, where the policy-makers rather vaguely pointed to *facilitation of mobility* as a relevant driver, scientists underlined the importance of the availability of exchange support schemes (with tailor-made time frames and modalities of exchange, quality criteria, etc.) or support for international conference visits and organisation. The driver of facilitated visa procedures and conditions identified by scientists can also be grouped under this heading (or under the policy-makers' driver of the *favourable policy background*). Policy-makers have additionally considered the *free movement of people and capital* a moderately important driving force.

However, policy-makers did not share the concern of scientists in view of bureaucratic obstacles impeding mobility, the exchange of empirical material (biomaterials, etc.) and field access. Instead, trade liberation and free movement of capital have been identified by them (policy-makers from both regions) as facilitating S&T cooperation. This is a driver that has not been present in the opinions of the scientists.

The driver of *internationalisation of education*, identified by policy-makers, can be referred to scientists' hints to the relevance of joint PhD programmes, PhD and undergraduate mobility and exchange as well as regional training networks in order to ensure the quality of education and the comparability of degrees.

The driver of *schemes for joint usage of infrastructure, such as Centres of Excellence* appears in the scientists' assessments at three different occasions: once where they propose support to research infrastructure; secondly, where they pose the question of regional and/or supranational research institutes and/or bridging institutions; and finally, where the topics of joint databases and computing are raised.

One of the "soft" factors identified by the scientists as relevant drivers also has been highlighted by policy-makers: mutual respect. Others like a communicative, open and non-discriminatory attitude towards the other region have not been raised by policy-makers.

Apart from these corresponding drivers (or possible connections between more general and more specific, but related drivers), a series of factors brought forward by the scientists do not at all or not prominently appear in the policy-maker workshop material: The possibilities of co-supervision of PhDs discussed above have not been considered by the policy-makers. Similarly,

the involvement of scientific diasporas has not been discussed in the workshop, nor have favourable or unfavourable labour market conditions (co-determining, for instance, the possibilities of recurring to mobility schemes) been mentioned. Policy-makers from neither region insisted upon the relevance of long-term commitment as a driver for cooperation or upon the driver of connecting the research work with the local contexts. They did not come forward with an estimate whether personal or institutional contacts are more relevant.

Policy-makers seemed more reluctant to assign regional and supranational research and bridging bodies a role in stepping up international cooperation. At the same time, the *integration of Southeast Asia* has not been considered a driver for S&T cooperation by parts of the policy-makers, but not by the responding scientists. Scientists seem to think either in local/national or global networks. Correspondingly, the proposed bridging institution and research centres, in their view, are not explicitly linked to a regional ASEAN level. Rather, respondents seemed to suppose that these bodies will either be international or bi- or multilateral with involvement of Europe.

Similarly, the platforms providing access to data and literature, considered relevant among scientists, are not envisaged as region-specific, but global.

We have said above that the scientists' driver estimates go into depth in the area of scientific practice and that the policy-makers' proposals of drivers cover a broader range of areas. Among the drivers that have not been mentioned by scientists are, in addition to SEA integration, the *trade barrier abolition* and *supply chain integration* that policy-makers considered relevant for facilitating cooperation and linking S&T to innovation. Economic and trade factors are not considered by the scientists. A firm's or a country's competitiveness is not driving S&T cooperation, according to them. For scientists, the inclusion of industry and SMEs is rather relevant as a driver in that it can harness scientific results, link it back to a field of application and not let the impact stop at citation indexes in international journals. Moreover, scientists did not consider topics like human rights and the fight against human trafficking as a relevant driver for the future of S&T cooperation.

Regarding the question of personal and institutional motivation: So far, we have compared the sort of drivers of S&T cooperation that present themselves as supportive tools rather than motivations. In terms of personal and institutional motivations also being possible drivers of international S&T cooperation, policy-makers' assessments are again less detailed than scientists' accounts and reflect the formers' national economic perspective. *Achieving science excellence* might be translated into the scientists' personal motivation of doing good research in the preferred subject area. However, *maintaining a competitive edge in global innovation* is of no general concern to scientists. Some of them have pinpointed at industry and SME involvement as "cementing" cooperation and proving its success, but the scientists' approach is on a case-by-case basis related to scientific content (e.g. determining whether or not some sort of new knowledge in a specific field is to be commercialised and how), not to a country's overall innovation performance. Policy-makers should bear in mind that those actually conducting S&T cooperation might not share this preoccupation for an economy's innovation performance. Competitiveness and innovation performance might thus be an indirect or second-level driver: namely a motivation of those trying to motivate scientists to cooperate. It can be deduced that in case the policy-makers want scientists to engage more intensely in innovation practices, some specific funding programmes would probably be necessary. However, we might also have a small bias towards public research oriented scientists, as scientists related to or engaged with industry might not appear in databases of scientific publications.

Tackling global challenges, pro-poor approach or *supporting less developed countries*, by comparison, can be motivational drivers for both scientists themselves as well as science managers and policy-makers. Moreover, it is a motivation that can become a tool-like driver of S&T cooperation given that jointly working towards the solution of global challenges (e.g. in the framework of dedicated

calls) or towards a country's future can establish long-term cooperation partnerships reaching out to other subject areas and partners.

In concluding this chapter, we can summarise that a series of drivers identified by the policy-makers can reasonably be further specified with the data from the scientist consultation and Delphi. Both sets of drivers can be combined and, thus, result in a broader and, regarding the proper science cooperation activity (as done by scientists), more in-depth account of relevant variables or drivers influencing the future S&T cooperation between Southeast Asia and Europe.

7. Conclusions and recommendations

The preceding pages have shown that the SEA-EU-NET Foresight exercise has created extensive strategic intelligence on the question which variables influence the future of S&T cooperation between Southeast Asia and Europe according to key stakeholder groups. We believe that the findings can best be summarised in the form of policy recommendations resulting from the different components of the analyses. These are not to be understood as recommendations developed by and extensively discussed within the SEA-EU-NET consortium, but rather are summarised results of the foresight consultation phases presented above. These results and insights come from the policy-makers and scientists involved. Our role has been to structure them and pass them on, which we do in this chapter, after some general recommendations coming from the authors and foresight process designers rather than directly from the respondents.

In this understanding, the following general, but also drivers and instruments-related recommendations are addressed to policy-makers wishing to adopt possible action lines towards a 2020 success scenario whose possible core structure is outlined in the next chapter as a future-oriented planning tool.

We would like to advert, once more, that the recommendations refer to and address region-to-region cooperation. They do not take into account specifics of a country-region or country-country perspective. Due to the nature of this document, the recommendations are trimmed towards possible application by EU regional policy-makers. It is obvious that close cooperation with European and ASEAN policy-makers is necessary in order to achieve a successful bi-regional cooperation scenario.

General/process recommendations

1. **This report should be taken as a stepping stone within the process of policy development.** With the current study, an in-depth assessment of drivers of international S&T cooperation is presented. In order to harness the material's potential, this document should be discussed in the context of S&T cooperation planning exercises, further scientists consultations, etc.
2. **Keep engaging scientists in the dialogue on and planning of S&T cooperation.** We have seen in this exercise how rich the scientists' cooperation experience is and how insightful scientists' attempts to dissect their own motivations behind cooperation can be.
3. It would be useful for any attempt aiming at increasing S&T cooperation to **know when the windows of opportunity in the planning horizons of the cooperating regions' policy-making lie.** For instance, if university laws contain regulations on the formalities behind university's international institutional partnerships or when a third country is interested in project twinning, joint programming, etc., then it would be good to have a clear picture when a discussion would have to touch ground in order to be on time.
4. **Strive for policy coherence,** especially between S&T and innovation policy (harnessing the results of joint research), trade (free exchange of goods, but specifically of samples, biomaterials, etc.), visa policy (easy-to-obtain long-term visas for collaborating scientists),

development policy (possibility of using ODA money for the support for basic research infrastructure, global challenge related research and human resource development)

Drivers and support instruments for SEA-Europe S&T cooperation

In order to concretely step up S&T cooperation levels between Southeast Asia and Europe, providing resources for some or all of the subsequent instruments is recommended by a majority of the group of scientists we have approached and/or by the group of policy-makers and programme owners that have joined the process:

- Efforts towards **S&T cooperation should be sustained over a longer-term basis**. Cooperative research needs time to grow (the scientists estimated between 3-5 years) until it can bring quantifiable results. S&T cooperation support must, thus, be stable (in order to be trusted and to “survive” financial crises) and flexible (in order to react to new subject areas or forms of cooperation) at the same time.
- In terms of thematic areas of joint research, define a **suitable balance between flexible funding of international cooperation components of bottom-up defined research and dedicated calls and programmes for international cooperation in areas of joint interest**. It would have to be discussed in a separate occasion with the scientists to what extent the openness of the entire FP7 to third country participation meets the need for bottom-up priority setting.
- Define a **suitable balance between basic blue-sky research and applied research**, possibly even with industry participation. The outstanding prominence assigned by the policy-making stakeholders to the goal of *maintaining a competitive edge in global innovation* as a driver for bi-regional S&T cooperation (in view of Science and Research Policy, Industry, Trade and Economic Policy) might advise to thematically focus S&T cooperation efforts, at least in a short-term perspective, to innovation-relevant applied and basic research. However, the scientific community gave ambiguous answers: Some would like to see the early and tight cooperation with industry and SMEs, that possibly makes cooperation sustainable, others prefer research collaboration in the form of blue-sky projects.
- Regarding dedicated international cooperation calls and joint calls, make sure that the **priority-setting is organised as an open non-discriminatory process** with scientist involvement. Joint calls and joint programming have been highlighted as relevant drivers especially by policy-makers. They could be dedicated to address global challenges in order to suitably complement rather than counteract thematically open bottom-up support for cooperation. Throughout the scenario workshop, European experts have pressed much more for common and harmonised planning, monitoring, evaluation and impact assessment standards. If the EU wishes to get more active in standard setting in Southeast Asia, much lobbying and awareness raising would be needed, particularly of the latent and sometimes apparent perception that e.g. the Framework Programme is “complicated”. The opposite option would be to develop standards that are more flexible for cooperation with “third regions”. The development of joint calls could help a good deal in this dilemma, as it brings programme owners from both sides together with the concrete goal of setting up and committing to common standards. The idea of joint calls would also have to take into account the following to sets of recommendations.
- **Consider mobility and exchange of personnel a positive value, not only looking at it as increasing brain drain**. Interestingly, SEA experts were not so much concerned for brain drain/gain and brain circulation as drivers. Both were considered important, but less so than by European experts. In the scientists’ answers, neither brain drain nor brain gain have appeared as relevant concepts. For scientists, mobility and exchange are the relevant concept, instead.
- **Adopt measures to enhance mobility in both-directions (and circularly)** promises to contribute to scientific excellence. Apparently, it is not self-evident that scientist-driven

mobility is symmetrical. It is harder to find a European scientist going to Southeast Asia than vice-versa. → Support European scientists going abroad.

- **Make use of existing human and network resources.** The scientists engaged in the foresight process came forward with a set of specific ideas on how to capitalise on existing structures and human resources for increasing S&T cooperation. For instance, it was mentioned that long-established **regular scientific conferences** could be supported in their possible attempts of **holding sessions or entire conferences in third countries.**

In terms of human resources, offering **part-time positions to retired excellent scientists** to spend time in a cooperation partner's country can prove rewarding for them, personally, as well as for cooperation levels. Their networks can be kept alive and passed on. They can support their home institutions while abroad, etc. In the case of senior scientists who are still active, **sabbatical themes** with related exchange to partner countries might yield similar services to cooperation levels.

- When it comes to exchange and mobility of junior scientists, support **PhD exchange, joint PhD programmes** and **co-supervision of PhDs.** Particularly co-supervision can increase cooperation levels on a sustainable basis as the candidate produces cooperative output and, what is more, as he or she personally links two senior scientists over a considerable period of time.
- Ensure that junior and senior scientists spending time abroad find an easy way to **return and reintegrate** to their personal and professional surrounding in their countries of origin. Offering seed money for some lab equipment in order to keep working in a similar environment on the subject of interest has been considered an option, here, as has been the idea of including Post-Doc travel money in PhD grants to allow the PhDs to return to their partner institutes from time to time.
- **Engage diasporas:** Diaspora communities of Southeast Asian scientists and non-scientists exist in Europe in different sizes at different locations. These communities' scientists often speak both regions' languages, equally often have studied in both regions and know both scientific cultures. These contacts can be highly valuable for establishing and maintaining contact with S&T cooperation target countries. Groups of Southeast Asian Post-Docs and senior scientists having completed their PhDs in Europe should also be understood and approached as diaspora communities, in this context. Possible forms of inclusion could be: support the establishment of scientist diaspora organisations; invite representatives to key events; support visits of delegations, etc.
- In order to motivate scientists not currently engaged in (or willing to engage) in mobility schemes to cooperate, **reward successful cooperation.** Scientists will not think about cooperation unless thematically absolutely necessary (or interested in cooperation for personal reasons) if they are not able to get any reward for their careers out of it.
- The following recommendation is still related to the aspects of selecting cooperation candidates and rewarding cooperation, while not only human resource related: **Keep developing quality metrics assessing cooperative research.** The long-term perspective, the type of previous contact, the level of the researchers involved, the country context, etc. should be taken into account when selecting candidates or projects for cooperation support or when evaluating cooperation activities. Scientists insisted that it is key to make sure by appropriate metrics that actual research is supported.
- **Regional training networks** can help to ensure that (measurable) standards are met and that comparability is given.
- Such regional training networks are one example of what was also recommended to be supported: **joint research infrastructures.**

In this context, for instance, labs participating in joint or **cloud computing**, offering ICT infrastructure to other labs could be supported. Also the more traditional approach of actual **joint supranational bi-regional or regional research centres** has been mentioned. The role and importance of regional S&T institutes with a mandate of bringing together researchers from different geographic backgrounds, has been highlighted in several of the scientists' email responses to our consultation request. The existence of regional centres of excellence and other regional S&T institutions in Southeast Asia was also considered important for S&T cooperation between the regions by European experts, but not that much by Southeast Asian participants. This is interesting, as it suggests that SEA experts at policy-maker and scientist level do not consider formalised/institutionalised inner-regional cooperation as a precondition for inter-regional cooperation. Nevertheless, support for research infrastructures and schemes for inter-regional joint usage of these infrastructures were highlighted as very important drivers by both sides. From a European Union point of view, we can thus deduce the recommendation to consider inter-regional institutions rather than press for inner-regional S&T institution-building and afterwards connect inner-European with inner-Southeast Asian regional institutions.

Establishing awards for bi-regional S&T cooperation could be a first step towards bi-regional research centres.

- Some scientists recommending the support for joint infrastructures referred to joint **bridging institutions** rather than actual research centres. These bridging institutions could offer management support for international S&T cooperation projects, give administrative advice to scientists willing to cooperate or offer partner search tools.
- Finally, particularly the scientists consulted virtually by us, recommended to **work towards the abolishment of administrative burdens** (in view of visa issues, material exchange and field access) and, in parallel, to **work towards open source access** to literature and sample databases. Open source access has not only been considered relevant for the act of doing research, but also for the dissemination and usability of results: The related recommendation is to **make results of joint research available in the regions**, not only in international journals.

In this chapter, we have compiled variables and driving factors (expressed in the form of recommendations and recommended possible instruments) that policy-makers and members of the scientific community consider as possibly increasing the intensity of S&T cooperation between Southeast Asia and Europe in the future. Now, we will approach the set of variables and driving factors identified by stakeholders slightly differently, namely in view of a 2020 success scenario for bi-regional S&T cooperation.

8. The core logic of a success scenario

As presented above in chapter 2. on methodology, a basic success scenario⁴⁴ served as an initiating and inspiring input for our policy-maker workshop and as an underlying future scenario for the scientist consultation and Delphi survey. We will now revisit this success scenario and extend it by applying the foresight exercise's results to its inherent structure. Methodologically

⁴⁴ In the year 2020 the cooperation in S&T between the EU and ASEAN had reached a level of importance that some years before was hardly to be expected. Major development was the rise of ASEAN as a regional power, as the countries in the region decided to put importance to and budget into this umbrella organisation. In this way, ASEAN could initiate symmetric cooperation partnerships with the other major global players, the EU, the USA, and major S&T powers. Consisting also of countries that differ quite a lot in their economic development, the European Union was considered an important cooperation partner, and with dedicated programmes including joint programming and funding from both sides, the cooperation in the area of S&T grew ever more intense.

following the considerations of Ian Miles⁴⁵ and Bonnett/Olson⁴⁶, by taking into account and combining the most important variables and drivers identified, we will be able to sketch what the core scenario logic could be, i.e. the main axes to act upon and interdependencies to consider, of a possible 2020 success scenario of S&T cooperation between Southeast Asia and Europe. We do not aim at fleshing out the success scenario in any more detail as this would impose a reductionist approach using desk research instead of a scenario elaboration with the stakeholders in the process, as usual. Hence, instead of extensively describing a possible success scenario, we will combine those variables that, on the basis of the results generated so far, seem to be particularly relevant for the 2020 future of S&T cooperation between the two regions. Some of these variables are linked by synchronous interdependencies or a certain value of one (e.g. number of cooperation projects) is needed before another value of a second variable can be reached (e.g. high trust among the scientific communities). The variables, their interdependencies and related pathways are all relevant when trying to act upon the variables in order to reach a certain success scenario.

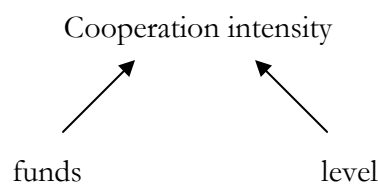
The following outline of the scenario logic is not to be considered final. It is one among a series of ways of approaching the interdependencies and pathways involved in a possible 2020 success scenario of S&T cooperation between Southeast Asia and Europe. The visualisations should inspire and help to structure the thinking about the future, not present ready-made and definite models.

First of all, the amount of funding explicitly available in both regions for S&T cooperation between the regions can be assumed as a highly relevant variable. A related variable is the amount of funding involved in actual cooperation (that might also stem from activities not dedicated to cooperation (e.g. usual FP7 projects), but still implemented in a cooperative manner).

A second highly relevant variable is the level of availability of funds: is a bi-lateral, country-region or bi-regional cooperation setting favoured in terms of available funds.

A first relevant interdependency appears, here: Funds and level of availability are related insofar as the bi-regional level can be relevant and substantially funded even when the bi-lateral funding is high given that the overall funding is sufficient (which, in turn, is strongly related with external variables like the worldwide economic situation).

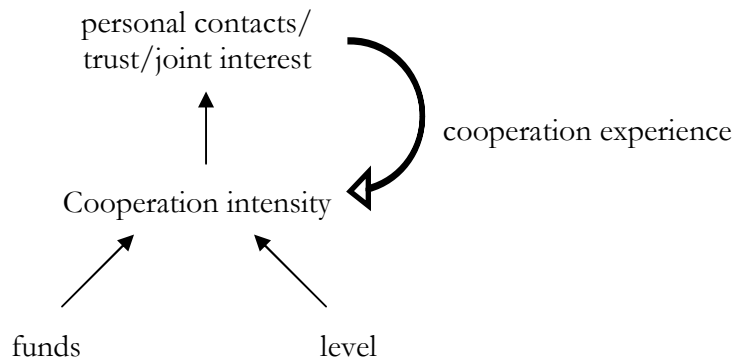
Both variables are strongly linked to a third one: cooperation intensity. The availability of funds does not automatically lead to interest in cooperation, but will still be strongly related. The availability of FP7-type bi-regional support will increase the amount of bi-regional S&T cooperation.



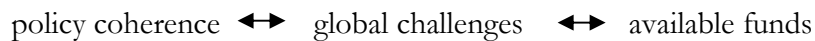
Particularly the scientist participants in the foresight process emphasised that personal contacts (leading to joint understanding, development of joint interests, friendship, etc.) are a crucial driving factor for S&T cooperation. This factor is related to the ones already presented in an asynchronous way: Higher cooperation intensity leads to the establishment of a higher amount of personal contacts, deepened over time. This higher amount of personal contacts, in turn, is likely to further increase cooperation intensity (given the availability of funds).

⁴⁵ Miles (2005), op. cit.

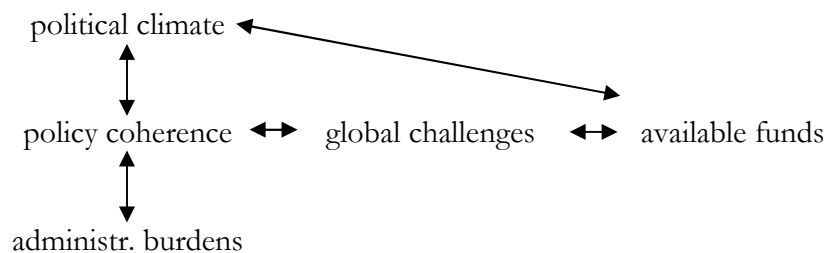
⁴⁶ Bonnett, Thomas W. / Olson, Robert L. (1998): How Scenarios Enrich Public Policy Decisions, in: Fahey, Liam / Randall, Robert M. (eds.): Learning from the Future. Competitive Foresight Scenarios, New York: John Wiley.



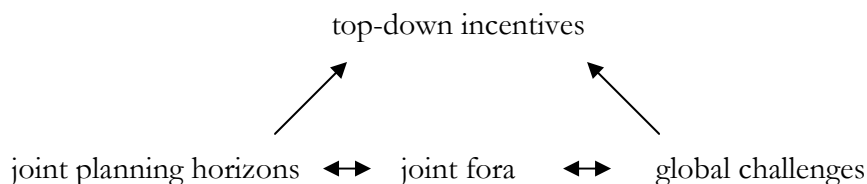
Moving beyond this very basic first component of the core success scenario logic, we would like to remember that particularly policy-makers in the foresight workshop at the beginning of this exercise have underlined that policy coherence is a relevant driving factor of S&T cooperation. Not only science and higher education policy have to be aligned towards reaching the goal of increasing S&T cooperation between Southeast Asia and Europe, but aspects of trade, economic, foreign or development policy are equally concerned. Relating this to the variable of available funding, given a specific limited amount of financial resources for Southeast Asia – Europe S&T cooperation, policy coherence is relevant to allow for a functional distribution of funds. This, in turn, leads to a third driving factor identified as highly relevant for S&T cooperation: the goal of tackling global challenges. Here, the link between S&T and development policy and the available funds becomes clear. Acting upon on of the following three variables will affect the other two.



Considering this set of drivers, there is a related series of interdependencies with the variables of the favourability of the overall political environment (of Southeast Asia – Europe relations, the global situation, etc.) and the role of avoiding administrative burdens of different type (personal mobility, material exchange, etc.). In order to achieve policy coherence and keep the administrative burdens for bi-regional S&T cooperation low, the political climate has to be good.



In order for the political climate to be good, despite favourable environmental conditions, discussion fora (for joint S&T agendas, etc.) are needed. The two variables are thus linked in our scenario logics. Having the possibility that policy-makers regularly meet at joint fora also allows to develop joint planning horizons, better tackle global challenges and give top-down incentives for related cooperative S&T (obviously, not all global challenge related research is motivated top-down).

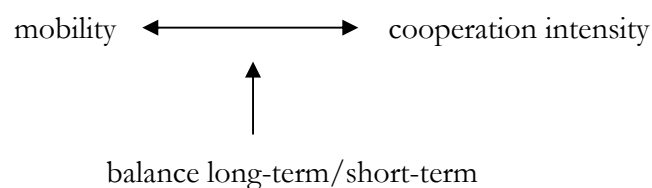


By involving the variable of available funding and limited resources, we see that there might be a trade-off between funds available for top-down inspired and bottom-up inspired global challenge related (or other) research. The variable of the balance between top-down support with given thematic priorities and thematically open support for bottom-up initiatives might best be separated into two variables, here.

It is similar with the variable of the balance between resources for applied and for basic cooperative research.

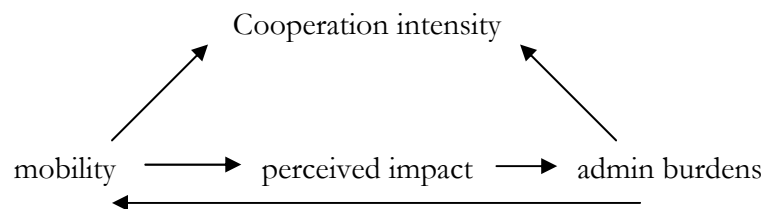
Joint fora involving or dedicated to scientists link the variable of the importance of personal contacts with the most important personal motivations of scientists for embarking upon S&T cooperation: working together on research problems considered relevant and interesting by both parties, doing state-of-the-art science; reputation; the feeling of being able to contribute. Cooperation intensity would, in this case, be increased via bottom-up initiatives in the case of unstructured scientist fora (e.g. scientific conferences, random meetings) and via top-down initiatives in case scientists are invited to an event for the explicit purpose of discussing cooperation on specific topics. In view of the funds and possible support, it is a strategic decision to take with what balance open scientist fora like the usual scientific conferences (maybe to be realised in new places) or dedicated subject-oriented matchmaking events are supported.

The important driver of the availability of **mobility** schemes is, according to our scientist respondents, intrinsically linked with the cooperation intensity. The form of this link might be different depending on whether resources are concentrated on long-term (e.g. PhD) or short-term (e.g. senior scientists) exchange. Long-term exchange has to rely on a stable political climate.



A better equilibrium between Southeast Asia-to-Europe and Europe-to-Southeast Asia mobility was mentioned by the scientist stakeholders as a relevant driving factor for future S&T cooperation. More precisely, scientists referred to the fact that while a considerable number of Southeast Asian scientists do their PhD in Europe, take part in mobility schemes, etc., a lower number of Europeans is involved in long- and short-term exchange and mobility with Southeast Asia. In order to act upon this driver, some incentive structures (money, prestige) might be needed. A more equilibrated scientist exchange pattern between the regions is said to increase cooperation intensity (as expressed in joint publications, technological development, etc.). There is also a relation with the driver of quality assurance and metrics and with the factor of brain drain / brain gain (not mentioned by the scientists, but by the policy-makers).

The aspect of brain drain or brain gain points to another interdependence of the core variables already introduced: If policy-makers and/or scientists determine that scientists' mobility proves to have either positive or negative outcomes on the long run, administrative burdens might be adjusted, which, in turn, would lead to more or less cooperation. Minor-level variables like the idea of the availability of reintegration schemes and some funds for returning PhDs would also be affected.



Mobility and its impact are furthermore related to the driver of open access to literature and sample databases as well as to a series of environmental factors, namely the availability of a common language and broadband internet access. While a common language is positively related with an increase of mobility-based and non-mobility based cooperation levels, broadband access and open access policies favour cooperation that does not necessarily rely on physical mobility.

Successful mobility schemes, together with increasing cooperation experience, can over time also be linked with, among others, the variable of the availability of suitable discussion fora for joint planning, priority-setting, etc. With a larger pool of scientists experienced in and committed to cooperation, the scientist stakeholder group is more readily available for participating in related policy-making discussions.

As said, this selection of key variables and driving forces as well as their integration is not meant to present a definite model of any sort. It is a proposal for structuring the most relevant variables influencing the future for thinking about a successful future scenario.

We would propose to use this core logic of a 2020 success scenario in order to re-enter discussions with policy-maker and programme-owner stakeholders (e.g. in a half-day event in each of the regions). Related events could be used both for presenting to stakeholders the results of the foresight exercise, for continuing discussions and, thus, for activating commitment shown and inviting to make use of the foresight results.

9. Outlook on further possible steps – scenario planning

With this set of concrete and general recommendations as well as the success scenario at hand, in addition to disseminating this report (in print and via the SEA-EU-NET website) and making it available to relevant stakeholders for further optional use, a series of activities would become possible that are, however, not in the original scope of the SEA-EU-NET exercise (which ends with the preparation and delivery of this “Delphi-based Futures Paper”).

Nevertheless, SEA-EU-NET will be able to advance the scope of the Foresight exercise and secure its usefulness by a workshop with Southeast Asian policy-makers scheduled to take place in May or June 2011 (tbc). In case this workshop can be held, the idea is to present the success scenario logic to the concerned policy-makers, request their opinions and feedback and at the same time, by discussing the scenario logic, working towards a full success scenario, creating commitment on the side of the policy-makers who are, together with their European counterparts and the European Commission, the beneficiaries of this Foresight exercise. Concretely, in such a workshop it will be possible to start from the proposed success scenario logic, possibly fleshing it out by discussing some of the identified driving forces. In a subsequent step, actions could be discussed that would have to be taken in the present and the near-future to stir bi-regional cooperation towards the success scenario (a second round of joint backcasting). Such an exercise not only inspires the policy-makers’ structured thinking about the future, but again creates commitment and ensures the usefulness of the Foresight exercise.

In parallel, we propose to the European Commission to present the results of the Foresight exercise at a convenient moment in Brussels. This could serve the purpose of getting the most out of the material and accomplished work on the European side. This text will also be published in this year's SEA-EU-NET booklet publication to be finalised for the 4th SEA-EU-NET Week of Cooperation in Hanoi.

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