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The changing approach towards developing countries in international STI cooperation



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Summary

Most international Science Technology and Innovation (STI) cooperation takes place among actors with equivalent capacities. Research cooperation between researchers from developing and developed countries is less common and used to be regarded as a knowledge flow from North to South. However, the scale and scope of the co-authorship network is changing. More players are involved, the network is more decentralised and more links occur between players. These patterns of increasing international cooperation can have implications for the role of developing countries. Authors in the research field of international cooperation have suggested that researchers from developing countries could be involved in more equal research relationships and developed countries should learn more from developing country researchers. This study examined the change in the Dutch researcher and policy approach to STI cooperation with developing countries and how this change could be characterised. A literature review provided the input for a framework that contained the dimensions of a changing approach and the possible outcomes of STI cooperation. The framework was guiding in the case studies on Indonesia, China and Africa. The findings from the case studies provided the input for an enhanced framework to study a changing approach to STI cooperation. Furthermore, the study characterised the differences in approach between the case study objects, Indonesia, China and Africa.

It is concluded that in all cases the approach is changing to some extent. At the Dutch policy level there is a clear tendency towards Top Sector policy, which implies an increased focus on the Dutch benefits of the cooperation and private party participation. At the researcher level the changes in approach are more dependent on the development of the partner country. Over the years 2000-2012, it seems that Indonesia and China have gone through significant economical and scientific developments. For researchers this has made capacity building less relevant and flows of funding more even. Also, cooperation was perceived as more equal by the Dutch researchers. In Africa the major developments are still to come. Cooperation with African partners is still characterised by inequalities in capacities, resources and funding.

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Foreword

This thesis is written for obtaining the Master's degree in Science and Innovation Management, at Utrecht University. Harro van Lente, associate professor at the department of Innovation and Environmental Sciences, has been my supervisor from the Utrecht University in this research. I would like to thank Harro for his guidance in conceptualising the relatively unexplored field of research into of the approach to Science Technology and Innovation (STI) cooperation, his open mind in discussing the direction of the research and for the pleasant interaction.

I conducted my research primarily during a research internship at Technopolis in Amsterdam. Technopolis facilitated my research with a workplace, supervision and access to their data and network. When I joined Technopolis, they had just started a study commissioned by the Directorate General Research and Innovation of the European Commission on international cooperation (INCO) in STI between EU Member States and countries outside the EU. Related to the topic of this study, I was provided the freedom to relate this to my personal interests of developing countries and sustainable development. I would like to thank the team of Technopolis and especially the members of the INCO project team, Wieneke Vullings and Jon van Til, for supervising my research, providing me with feedback and involving me in the project. Writing the thesis in the professional environment of a consultancy firm contributed to the development of this thesis as well as to my personal development.

For my research I had the pleasure of interviewing policy makers at relevant ministries and implementing bodies who often expressed the mutual interest in the subject of changing relationships in cooperation with developing countries. Their reflection on the policy documents as well as their personal perspective on the matter was a very valuable input for this thesis and the understanding of the dynamics of STI cooperation with developing countries. The same holds for the interviewed researchers who told vividly about their bio-fuel related research projects in cooperation with partners from developing countries.

Writing this master thesis was the largest individual research project that I performed up to this point, however it has never been a solitary process because of the people mentioned above and the friends and family who provided me with feedback or supported me otherwise. I would particularly like to thank Ingrid van Prooijen for her unconditional and uplifting support, Benjamin van der Hilst, Mathijs Harmsen and my family, Pieter, Ellen and Manon Steinz.

1. Introduction

Major global challenges highlight the need for effective global cooperation in Science, Technology and Innovation (STI). Climate change affects the whole world, growing populations put pressure on food security and resources; and the increased mobility of people and goods means that infectious diseases can readily spread worldwide. Individual countries have too little capacity to solve these problems individually and increasingly look for partners to cooperate with to create solutions.

The countries most affected by certain global challenges are the lower income countries which usually also have lower STI capacities (OECD, 2012). The OECD therefore stresses the importance of the inclusion of countries with less developed STI capacities in international STI cooperation:

“International collaboration in STI mostly occurs among actors with equivalent capacities and seeks to avoid duplication. This means that actors with lower research capabilities may be excluded from the priority setting and collaboration process. However, the inclusion and integration of countries with weaker STI capacities is indispensable to achieve the goal of such collaboration – to find and implement solutions to challenges that affect the nations of the world, regardless of their STI capacities.” (OECD, 2012).

In 1992, Luukkonen, Persson and Sivertsen regarded the collaboration between advanced and developing countries as a knowledge flow from ‘North to South’. At that time the international collaboration network was mainly shaped by historical colonial ties and the reason for advanced countries to collaborate with developing countries was mainly to help and support them in terms of capacity building (Luukkonen, Persson, & Sivertsen, 1992).

There are however signs that not only the scale, but also the scope of the network is changing. Bibliometric data shows that the global co-authorship network has expanded, i.e. more players are involved. It is also becoming more decentralized with regional hubs such as South Africa and more interconnected, i.e. more links occur between players (Wagner & Leydesdorff 2005a, 2005b). The share of publications co-authored by researchers from two or more different countries is increasing across all fields of science. It is even growing at a faster rate than nationally co-authored publications (Georghiou, 1998; Luukkonen et al., 1992; National Science Board, 2010; Okubo, Miquel, Frigoletti, & Dore, 1992). These trends in cooperation appear to be increasing, mostly with regards to cooperation between advanced countries, but also in partnerships between advanced and less advanced countries (Wagner, Brahmakulam, Jackson, & Wong, 2001).

Cozzens et al. (2011) argue that the emerging patterns of increasing international research cooperation can have implications for cooperation between developing and developed countries. They conclude that in certain fields of science, global learning relationships could be shifting.

“New opportunities could be opening up for reciprocal learning involving researchers in the global South, through more equal research relationships and ones that go beyond historical colonial ties. [...] The historic scientific powers of the North can no longer assume that others will come to them to learn forever. They must begin to develop the habit of learning from the rest of the world.” (Cozzens et al., 2011).

This is a study on the changes in the Dutch approach to STI cooperation with developing countries¹. Some authors suggest that the cooperation between the Netherlands and developing countries might be changing from development aid to competition (AWT, 2010; Wiedenhof & Molenaar, 2006). The drivers of this change include the search for new modes of developmental aid (AWT, 2010) and, in line with Cozzens, the insight that developed countries may also learn from developing countries (Wiedenhof & Molenaar, 2006). However, little work has been carried out on assessing whether learning relationships are actually shifting, and how this trend can be characterised. This study should add to the existing body of knowledge and fill the identified gap. It therefore examines the characteristics and trends of the Dutch approach in international STI cooperation with less developed countries.

Along with Germany and the United Kingdom, the Netherlands is one of the top three most active EU27 countries in international research cooperation based on the countries internationalisation strategy, actors, agreements, instruments and outputs. The Netherlands has STI agreements with the 'historic scientific powers' as well as with countries with lower STI capacities including Indonesia, with which it has historical colonial ties. (Technopolis & ErawatchNetwork, 2012). The relations between developing and developed countries have always been characterized by large inequalities in contrast to the relations between developed countries. This study aims to find out whether the research relationships between the Netherlands and countries with lower STI capacities are indeed shifting. Or to use Cozzens' words, whether 'more equal research relationships' are established and more 'reciprocal learning' takes place.

These issues lead to the main research question:

- *How has the Dutch approach to STI cooperation with developing countries changed from 2000-2012?*

To answer this question the study is structured as follows. After the theoretical framework in Chapter 2 and the methods in Chapter 3, the body of this study will consist of two parts. Part one provides an overview of Dutch STI policy and STI cooperation with non-EU countries, in general and with specific focus on developing countries (Chapter 4). The second part presents a multiple case study of three Dutch research-funding programmes with a focus on cooperation with Indonesia, China and Africa (Chapter 5, 6 & 7). The results of the qualitative study will indicate how apparent the change in cooperation is and how it can be characterised. The first part will answer the first sub-question: How has the Dutch policy approach in STI cooperation with developing countries changed over the years 2000-2012? Subsequently, the case studies form the basis for the analysis (Chapter 8) and answer to the question how the approach on the policy level, as well as the researcher level, has changed for the cooperation in the respective case. The conclusion and discussion are presented in Chapter 9, which will also present the implications for researchers and policy makers that follow from the study.

¹ "There is no established convention for the designation of 'developed' and 'developing' countries or areas in the United Nations system. In common practice, Japan in Asia, Canada and the United States in northern America, Australia and New Zealand in Oceania, and Europe are considered 'developed' regions or areas." (United Nations, 2012). This is also the classification that will be used in this study. This classification is narrow enough since most literature is also on 'North-South' and 'developing-developed' relations. The state of development of the studied countries will be discussed in more detail.

2. Theoretical framework

To answer the question what *has* changed over the years, better understanding is needed of what *can* change. The approach is studied by using the concepts found in the literature review. For that reason this section sets out to build a framework that enables a structured study to the changes in the Dutch approach to international STI cooperation. The first part of this chapter provides a literature review wherein important aspects of international STI cooperation are identified. Concepts that prove relevant based on the literature review are taken up in the conceptual model, which is presented in the second part of this chapter (section 2.2).

2.1 Literature review

First the literature that relates to the approach to international STI cooperation is reviewed, which leads to a division of the approach into two levels, the policy approach and the researcher approach. The subsequent section is on the outcomes of international STI cooperation. These two reviews will form the basis for the framework to study the approach.

2.1.1 The approach to STI cooperation

The approach to STI cooperation from a developed country perspective can depend on whether the partner is in an advanced or a developing country. There are several *rationales* mentioned in the literature for an advanced country to cooperate with developing countries, such as the access to unique sites and populations. However, as already mentioned in the introduction, from the literature the most important reason seems to be to help the developing country with capacity building (Basu & Aggarwal, 2001; Kretschmer, 1999; Luukkonen et al., 1992). This reflects the unequal STI capacities and the skewed relation between the two countries.

A theory that is often used in describing international cooperation and unequal relations is Wallerstein's world system framework. In this framework the world network is seen as cores and peripheries linked to each other by unequal economic exchange. Collaboration between advanced and developing countries is then seen as a core-periphery relationship characterised by inequality in resources and capacity. Schott (1998) uses Wallerstein's world system framework for his theory on the organization of world science. Working together with scientists from the core or centre can solve a lack of access to resources, opportunities and information in peripheral countries. Hwang, (2008) and Schubert & Sooryamoorthy (2010) use the framework to analyze patterns of collaboration, recognising the semi-periphery as the periphery for the core as well as the core for more peripheral areas. This is consistent with the upcoming of regional hubs that Wagner & Leydesdorff (2005a) mention in their study.

In the same study Wagner & Leydesdorff (2005a) consider the theories that account for the structure of the network in terms of centre-periphery relations, internal disciplinary differentiation and big science and find that these cannot explain the growth of international co-authorships. They conclude that the growth of the network can be contributed to a self-organising phenomenon based on preferential attachment, i.e. researchers prefer co-authors with a central place in the network in order to raise their own visibility. Individual researchers work in self-interest in search for recognition and reward.

In their turn, Cozzens et al. (2011) disagree with the notion that the growth of the network can best be explained by preferential attachment. They build on a distinction that is made between the types of the cooperation by Thakur, Wang, & Cozzens, (2011). Overall collaborations are made up of a combination of the following three types:

1. Career-oriented collaborations, initiated by graduate students or junior professionals to visit in the laboratories of more senior people in the field.
2. Research project-oriented collaborations, with a primary focus on producing research, usually involving two senior researchers.
3. Sponsor-initiated collaborations, in response to a government funding program or the request of a particular industrial sponsor.

From this distinction follows that the funding, or *financial agreements* and the *initiative* to the cooperation are dimensions to consider when studying the approach.

Cozzens concludes that it is not a single self-organising system driven by preferential attachment. Career-orientated collaboration may fit into that system, but project-orientated cooperation less so, and sponsor-orientated collaboration, by definition, even less.

Cozzens et al. (2011) do not give an alternative or a better theory to explain the growth of the network. However, they stress the importance of the different fields of research the cooperation is in. They compare neutron scattering with bio-fuels and find important differences. For example, in the field of neutron scattering they found a classic pattern of interdependence on the basis of complementary skills. This field shows high collaboration levels but there is almost no increase in the percentage of collaborations and the role of the developing world is small and not growing very fast. On the contrary, in the field of bio-fuels the developing world is fast growing and collaborations with advanced countries are increasing significantly. An important finding is that commercial interests and opportunities are more important than career advancement in the latter field. Cozzens et al. (2011) point out that industrially relevant fields like bio-fuels are particularly interesting to study, since this represents what is changing in the system instead of what is staying the same.

The indications that developing countries can play a more equal role in international STI cooperation shows resemblances with the Base of Pyramid (BoP) ideology as elaborated upon by Prahalad (2006). This is the concept where developing countries are no longer seen as victims or as a burden, but as resilient and creative and most of all, as an opportunity. The BoP concept finds more and more followers in the economic world and in research attention. Western governments increasingly tend to move away from bilateral aid and towards investing in private sector development in and for BoP markets. This study sets out to look further into the trends of a growing international research network and the opportunities for advanced and developed countries to establish more equal research cooperation where there is more chance for reciprocal learning. In this study the different ideologies will be regarded as a *division of roles*. This is relevant at both the policy and the researcher level.

Another aspect of the approach that is linked to the division of roles, but also to several other aspects of the approach, is the symmetry of the cooperation. The other dimensions also give insight in the symmetry or asymmetry of the cooperation e.g. symmetry of rationales, symmetry of flows of funding, symmetry in initiative, symmetry of roles. Therefore the dimension used in this study is the *perceived symmetry* of cooperation.

Authors that have studied the reasons to cooperate include: Archibugi & Lundvall, 2003; Boekholt et al., 2009; Bozeman & Corley, 2004; Cozzens et al., 2011; Edler & Flanagan, 2011; Georghiou, 1998; Luukkonen et al., 1992; Persson et al., 2004; Schott, 1998 and; Wagner & Leydesdorff, 2005b. The reasons they found are listed in Table 1 under *rationale*.

Moreover, Table 1 summarises the findings in literature. The literature identified a number of dimensions for each level of the approach. The dimensions are parts of the approach that can change, which are used to make the approach more tangible. For instance the researcher's rationale to cooperate is a dimension of the researcher approach that can change over time or differ per partner. There are no hard indicators for a changing rationale. In this study the possible rationales found in literature are

therefore used to guide the study. The rationale will be used as a narrative and this asks for a different approach than for example quantitative indicators. The same holds for the other dimensions.

Table 1 Approach, Dimensions and Findings in the literature

	Dimension	Findings in the literature
Dutch Policy Approach	Rationale	<ul style="list-style-type: none"> • Access to foreign markets • Diplomacy • Scientific advancement • Addressing global problems • Historic ties • Capacity building
	Division of roles	<ul style="list-style-type: none"> • Sponsor push • Demand driven • Look for mutual benefits (including BoP ideology)
Dutch Researcher Approach	Rationale	<ul style="list-style-type: none"> • Sharing of the costs and risk • Access to complementary knowledge • Access to complementary expertise • Access to complementary skills • Addressing global problems • Increase own impact and visibility through research partner (preferential attachment) • Network building • Access to unique sites and populations • Increase scientific quality • Access to funding • Help the partner with capacity building
	Initiative	<ul style="list-style-type: none"> • Initiative to cooperate comes from most developed country • Initiative to cooperate <u>not</u> only comes from most developed country • The paying party has the initiative (Sponsor initiated)
	Financial agreements	<ul style="list-style-type: none"> • Both parties contribute equally • Sponsor-recipient division
	Division of roles	<ul style="list-style-type: none"> • Complementary skills • Sponsor push • Demand driven
	Perceived symmetry	<ul style="list-style-type: none"> • Instrument intensity of the research • Cooperation perceived as symmetric

2.1.2 Outcomes of international STI cooperation

Besides the literature that relates to the approach of cooperation, the body of literature on the outcomes of STI cooperation helps to better understand the approach.

The political influence and special programmes seem to have had an effect on the scale and scope of international cooperation in research. Wagner & Leydesdorff (2005a) for instance find a change in the linkages in the network between Scandinavian countries, and Latin America and Africa that might be due to the Scandinavian development aid programme. Although, they conclude that “*Overall, political influences continue to operate but at a lower order of influence as the global system emerges.*” (Wagner & Leydesdorff 2005a. p.5). In this section the focus will not be on outcomes that are due to political interference, such as the growth of the global network, but rather on the literature on the outcomes of international STI cooperation itself.

The quantifiable outcome of STI cooperation that is used most often is the *output* in terms of *co-publications* and *co-patents*. Other outcomes are of a more qualitative nature. These are discussed below.

Naturally, the benefits of cooperation are interwoven with the reasons to cooperate. The limited literature on the actual perceived benefits of international STI cooperation shows little difference with the rationales to cooperate. Cozzens et al. made a summary of the perceived benefits of research collaboration found in other literature. These are: the increased diffusion of information, the obtained access to knowledge and resources, and the increased scientific productivity and innovative capacity (Cozzens et al., 2011). How much the perceived benefits differ from the expected benefits will have an influence on the *perceived success* of the cooperation.

An indicator for the perceived success of cooperation can be the *willingness to participate again*. Schuch, Wagner and Dall (2010) carried out a survey amongst researchers to their experience in international research cooperation. The willingness to participate again was lower for collaboration with third countries², indicating negative experiences or lower than expected effects. But for some aspects the survey had a positive outcome for the collaboration with third countries. For instance the 'organisational knowledge gain' was higher for collaboration with third countries than for collaboration with central European countries.

An aspect that can have a positive influence on the outcome of cooperation with developing countries is the 'weak tie' between the two researchers. Granovetter stresses the importance of 'weak ties' in learning already in 1973. The *strength of weak ties* is that one can learn more from the weak ties in their network than from stronger ties. So-called weak ties, such as ties with researchers from more geographical and cultural distant countries, are more likely to bring other knowledge because they have a different position in the knowledge network and approach problems from a different cultural angle. Stronger ties, or researchers closer to one another in a knowledge network have a more similar knowledge stock. (Granovetter, 1973). Nooteboom (2000) agrees that one can indeed learn more from someone who is more distant, but adds that there is an optimum in '*cognitive distance*'. Two parties can also become too 'cognitive distant', i.e. start to differ too much in culture, knowledge background, etc., to effectively learn from each other. This means the optimum is passed and the barriers to learn from each other become too big and the process becomes harder and less productive.

In Table 2 the dimensions and findings in the literature summarised. The possible perceived benefits are not included as findings for the perceived success because this would be virtually the same list as the policy- and researcher rationales to cooperate.

Table 2 Outcome Dimensions and Findings in the literature

Dimension	Findings in the literature
Output	<ul style="list-style-type: none"> • Co-authored scientific paper • Co-patent
Perceived Success	<ul style="list-style-type: none"> • Perceived benefits in line with expected benefits • Willingness to cooperate again • Strength of weak ties strengthens the research • Cognitive distance makes cooperation difficult

² Third countries are what the European Commission calls the countries that are not European Union member states.

2.1.3 The broader setting

The approach presumably has an effect on the outcomes of cooperation and probably even the other way around. However it seems that the approach and outcomes do not operate in an isolated system, but that there is a broader setting necessary to explain part of the approach and outcomes.

Boekholt et al. (2009)³ state that global challenges, as mentioned in the introduction, have increased the attention for international STI cooperation on policy agenda's. Other factors behind the growing attention mentioned by Boekholt et al. are: Globalisation of markets and R&D, fast emerging large economies such as India and China and the opening up of their STI systems, and the scarcity of human resources in research. This is the exogenous context of the approach and outcomes of international STI cooperation.

The science remuneration system is increasingly based on the number- and impact of publications. Internationally co-authored papers seem to have a bigger impact since they are cited more often than nationally co-authored publications, possibly because they are more visible, of better quality or a combination of both. As already mentioned in the introduction, the share of internationally co-authored papers is increasing. (Glänzel, 2001; Narin, Stevens, & Whitlow, 1991; Persson, Glänzel, & Danell, 2004).

2.2 Conceptual model

The previous section provided an overview of what aspects of STI cooperation can change. A number of authors mention the influence that the changes in the broader setting have on international STI cooperation. Only a limited number of authors examine the outcomes of cooperation. The work done on the approach of the research cooperation and notably the reason to cooperate is most comprehensive. However, from the literature review it becomes clear that there are many different influences, reasons and outcomes of STI cooperation, so an open view is maintained in order to not exclude other findings that come up during the study. This section summarises how the literature review is translated into a conceptual model that is represented in Figure 1.

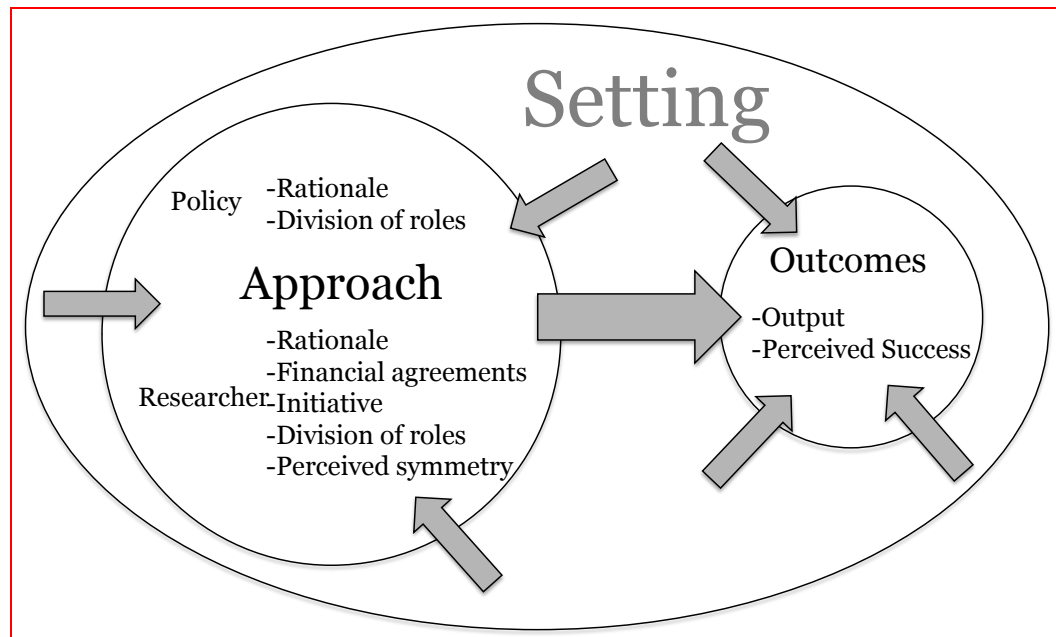
The focus of this study is on the change in the Dutch approach to STI cooperation with developing countries. To understand the change in approach, a better understanding of how it is influenced and what the effects of an approach are, is needed as well. The conceptual model in Figure 1 shows how the approach is interconnected with both the broader setting and the outcomes of international STI cooperation. Here below the different elements of this model will be further explained.

The approach is studied by using the concepts found in the literature as described in the previous section. When zooming in on the approach, this consists of two levels that together make up the Dutch approach. This is the level of Dutch policy makers, including the policy implementing bodies, and the level of the Dutch researchers that are active in international cooperation. In this study, the STI cooperation approach is regarded as 'the way these two levels are organised and implemented'.

The policy level is divided in two dimensions; the *rationale* the policy makers have in supporting STI cooperation, and the *division of roles*, or the ideology behind the cooperation, e.g. is it a sponsor push, or demand driven cooperation, or are the partners striving for mutual benefits?

³ This study relies on a scan of all EU Member States and ten in-depth case studies (Estonia, Finland, France, Germany, Ireland, Poland, the Netherlands, Spain, Sweden and the United Kingdom).

Figure 1 Conceptual model



The dimensions at the researcher level of the approach derived from literature are: *Rationale*, *Financial agreements*, *Initiative*, *Division of roles* and the *Perceived symmetry* of the cooperation. *Rationales* are the reasons researchers have for doing the research and cooperating with their partners. The *financial agreements* or funding schemes are the ways the research is funded⁴. For example 'is the research funded entirely by the Dutch parties, or do both sides make financial contributions to enable the research?' The *initiative* relates to the question 'which party had the initiative towards the cooperation?' The *division of roles* relates to the question 'whether researchers cooperate on the basis of complementary skills, or whether there is another division of roles'. And finally, the *perceived symmetry* of the cooperation refers to the extent to which the researchers themselves see the cooperation as symmetric and how they act to this.

The outcomes of the STI cooperation can be diverse and indirect and they can differ from what is mentioned in the literature. Outcomes can be *output* such as a scientific paper or a patent, but also less quantifiable outcomes such as increased STI capacities and access to new markets. Outcomes can in that sense be different for the Netherlands and the developing country, as well as can be the *perceived success* and perceived benefits of the STI cooperation. The outcome of the cooperation is also expected to have a feedback effect on the approach. Negative experiences can for instance change the approach of cooperation in the future. The broader setting also has a direct influence on the outcome. For instance Brazil's growing expertise in bio-fuels has a direct influence on the strength of the outcome of the cooperation.

The broader setting is the external structure that contains heterogeneous factors that might have an effect on the approach and outcomes of STI cooperation. This can for instance be oil prices, economic growth, cultural and normative values and environmental problems, but also other factors can be found during the study.

⁴ Financial agreements could also fit under the policy approach since funding mostly comes directly from the programme. However, the researchers might get additional funding for their research from other sources as well. The funding arrangements are placed under the researcher approach to take in to account other funding for the same or other research projects as well and to identify possible trends in the way the researchers and their partners are funded.

Therefore the influence of the broader setting is of another nature than the approach and outcomes. The broader setting, as it is used in this study, is a reminder that there are broader aspects that can somehow influence the approach and outcomes of international STI cooperation. For instance, rising oil prices and environmental problems could have an effect on the approach to bio-fuel research.

3. Methods

This section summarises the methods used in this study. The research has an explorative character, since not much work has been done in this field. The study roughly consists of two parts: the study of the policy level and the study of the researcher level.

The dimensions and findings that follow from the literature review are the guiding concepts for the study at both levels, in order to make a possible change in approach more tangible. However, it is not purported that these findings are exhaustive, i.e. during the research an open vision is maintained for other findings that are indicative for a change in approach. This characterises the qualitative research: with this conceptual model not quantitative change is measured, but the dimensions in the model guide the qualitative research and support a better understanding of the processes involved in international STI cooperation, both on the policy level as well as on the level of the individual researcher. Based on the study of the processes and changes in all dimensions, a characterisation and judgement is made of these changes.

3.1 Policy level

The first objective of the study is to make an overview of the current situation and the trends of Dutch STI policy and cooperation with non-EU countries, with a focus on developing countries. The main research methods are desk study and interviews. The desk study consists of a study of relevant policy documents. A main source is the recent country study of the Netherlands and an attached background report prepared by Technopolis and the Manchester Institute of Innovation and Research (MioIR) (Technopolis & ErawatchNetwork, 2012). Furthermore Erawatch and other existing databases are consulted.

Seven semi-structured interviews are held with a seven organisations responsible for cooperation policy and platform organisations for international research cooperation. See Table 3 for a list of interviewees. The interviews serve to validate and give complementary insights to the outcomes of the desk study.

Table 3 - Interviewees Dutch STI policy

Interviewee	Organisation	Function
Rudi Trienes	KNAW	Team Leader International Relations Department
Francien Heijs & Janna Hensing	Ministry of OCW (Francien is ex BuZa)	Research and science policy
Jan Karel Koppen	NWO	Director Policy development and Support
Jaap Broersen	Ministry of EL&I	Unit manager 2g@there
Jeroen van Oort	VSNU	International
Beer Schöder	Nuffic	Head of department expertise development
Henk Molenaar	WOTRO (ex BuZa)	Executive director

The top five interviews as presented in Table 3 are combined with the interviews held for the Dutch country report (van Til & Steinz, 2012) that serves as input for the report on international STI cooperation commissioned by the European Commission. Both studies are written simultaneously. Chapter 4 will therefore to some extent rely on the Dutch country report.

The second part of the study covers the researcher level. To give insight in the dynamics of the researcher level of the approach of international STI cooperation, a number of cases were selected. This will be discussed in the next section.

3.2 Case selection

In this section the cases that were selected for this study are presented. For the case selection a distinction has to be made between research-funding programmes and research projects. The first selection is that of three research-funding programmes out of the set of Dutch instruments for international STI cooperation. The criteria for the case selection are further elaborated upon later this section. Within the selected research-funding programmes a number of joint research projects is selected of which the Dutch researchers are invited for an interview.

The research-funding programmes were selected based on the following criteria:

- Objective (they should stimulate international research cooperation)
- Length (they should exist 10 years, or longer)
- Geography (they should focus on a specific developing country or region)
- Budgets (They must be of a considerable magnitude)
- Importance of the partner country for the Netherlands
- Level of development of the partner country
- Domain / topic (research projects are in the field of bio-fuels)

These criteria are further explained below.

Since the Dutch STI cooperation with less developed countries is the subject of this study, the cases selected should be research collaborations between Dutch researchers and researchers based in developing countries. Another criteria is that present as well as past research cooperation should be part of the case study, since this study is aimed at characterising the changes over the years 2000-2012.

The programmes were furthermore selected on the basis of their geographical focus and the magnitude of the programme. For the case selection an overview was made of the Dutch instruments that support international STI cooperation. This table is displayed in Appendix A. As can be seen, not all the instruments that promote or facilitate international STI cooperation also directly fund research. Only the instruments that fund joint research projects are useful case studies. Of these instruments three of the most extensive (measured in available budgets, all >1.0 m€) and long running instruments were selected for case study. These are:

- Joint Scientific Thematic research Programme (JSTP) – Funding programme for research cooperation with China.
- Scientific Programme Indonesia-Netherlands (SPIN) – Funding programme for research cooperation with Indonesia.
- WOTRO Science for Global Development – Funding programme for research on global issues, notably in cooperation with African researchers.

An exception is made for the Joint Scientific Thematic research Programme (JSTP) with China. This Programme is relatively new (2009) compared to the other instruments. This instrument is selected because of its size (>M€1.0/y), the Dutch interest in China and its uniqueness: it involves seven Ministries and Science Academy stakeholders, three in the Netherlands and four in China. In international STI cooperation there is much attention for China. Twelve out of thirty-seven instruments are specifically aimed at cooperation with China.

The three programmes are different in a number of aspects. Most prominent is the geographical focus. JSTP and SPIN focus on China and Indonesia respectively. These countries are still considered as developing economies by the UN (United Nations,

2011). The World Bank (2012) rates Indonesia as a lower middle-income country. China is now considered upper middle-income. These countries are however also fast growing economies and are part of the BRIICS⁵. WOTRO also focuses on developing countries, however usually on countries with lower income levels than the other two cases, notably African countries. This selection of cases provides an insight into whether the approaches differ between the countries and what the possible differences are.

Cozzens et al. (2011) state that dynamic fields such as bio-fuels represent what is changing. In this study and within the cases the focus is predominantly on research projects in this field. This includes bio-fuel, biomass and adjacent research themes with a social, economical and/or chemical prospective.

Since global challenges and bio-fuel research are relatively modern research topics the research collaborations of the past will automatically have a different focus. Therefore, the selection of past research projects has less emphasis on the research topic.

In Appendix B the interviewees for this study are listed, including their institution and the research theme or title of their research. In total 11 interviews with Dutch researchers are held. In addition to those interviews a number of informal talks and interviews with programme leaders Henk Molenaar and Rudie Trienes are held. The research programme and the period to which the interview applies are displayed in Table 4.

Table 4 Researchers and the time span of their research projects for each case⁶

Case	2000	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	
SPIN-Indonesia							Researcher A							
	Researcher D													
	Researcher F													
											Researcher G			
	Researcher K													
					Researcher L									
			Researcher M											
JSTP-China											Res. B			
										Researcher C				
								Researcher E						
	Researcher D													
WOTRO-Africa									Researcher H					
											Researcher I			
											Researcher J			
	Researcher D													

3.3 Data collection

The data is collected through desk study of relevant documents and interviews with the parties discussed here above. The desk study covers the relevant recent as well as relevant older documents. Relevant documents are policy or strategy documents from the ministries and implementing bodies.

In addition, publications that mention interviews with researchers involved are used when available. For instance, the publication on the occasion of the celebration of 10

⁵ BRIICS is a term introduced by the OECD, adding Indonesia and South Africa to the list of new high growth economies.

⁶ On request, the researchers are made anonymous (except for the three boxes in the case studies) to ensure that their statements on the cooperation do not negatively influence their relation with their partners. The names, institutions and research subjects of the interviewees are provided in Appendix B, without mentioning the relevant case and time of cooperation.

years SPIN (KNAW, 2012a) contains interviews with researchers that contributed to the research projects.

Both the interviews at the policy level, as the interviews with the researcher level add to what is found in the desk study. The interviews are, semi structured, face-to-face interviews and one 'Skype'-interview. The dimension and findings that follow from the literature study act as guiding concepts in the interviews. How this is done is further elaborated upon in the following section.

3.4 Data Analysis

Interviews are held simultaneously with the analysis using directed content analysis. This is a form of grounded theory where theory is simultaneously tested and build. According to Hsieh & Shannon (2005), a directed approach to content analysis is useful when existing theory is incomplete or would benefit from further description. Following the methodology of Hsieh & Shannon, in the practice of this study the findings from the literature review are used as initial codes. Data that cannot be coded with the initial codes is identified and analysed to determine if they represent a new category or a subcategory of an existing code. For example, a reason to cooperate mentioned by a researcher is either a derivative of a rationale found in the literature or a 'new' rationale. In the latter case, the 'new' rationale is added to the findings of the rationale dimension at the researcher level. That makes it possible to bring new information to the following interview.

The data analysis of the relevant documents has a similar approach as the analysis and categorisation of the interview data. The data is analysed and coded using the findings from the literature. 'New' findings, which cannot be categorised under findings from the literature, are added to the existing set of codes. This way the framework to study a changing approach to international STI cooperation that is developed on the basis of the literature review is enhanced and improved with data from this study.

Interviews are held until data saturation is reached, i.e. the collection of data stops when new interviews stop bringing new insights. Although no two research projects are the same, the last couple of interviews are the ones where the relative newness of the data on rationales, financial agreements etc. is less than the preceding couple of interviews.

3.5 Quality of the data

All the interviews are recorded with the permission of the interviewees. This leaves no room for mistakes in interpreting the notes taken during the interview. On the basis of these recordings, detailed interview reports are written. The reports enable a thorough interpretation of all the information available. Whenever new aspects of a changing approach appear from newer interviews, the reports make it possible to check whether or not this is not already mentioned earlier, although less explicit.

Data triangulation is applied by doing desk research on relevant documents preparatory to the interview. Ambiguities and disparities with interview answers can be clarified during the interview. Also doing interviews at different levels and comparing the answers is a form of quality assurance.

According to Yin (2003), the external validity indicates to what extend the research conclusions can be generalised towards other populations. The conclusions of this study relate to the Dutch STI approach for the selected cases. The conclusions cannot be translated one-to-one to other countries, however the characteristics and dynamics in the Netherlands are indicative for other developed countries as well since they are placed in a similar broader setting. This is especially true for other EU member states with advanced STI capacities, since they benefit the same EU regulations.

4. Dutch Policy Approach in STI cooperation with developing countries

To study a possible change in the Dutch approach to international Science, Technology and Innovation (STI) cooperation, it is important to know how this is organised. Before moving to the cases in chapters 5,6 &7, this chapter presents the study on the Dutch policy approach. This chapter gives an overview of the Dutch organisation of international STI cooperation with third countries in general and more specifically with developing countries within the Dutch STI policy framework. It presents general trends that influence the Dutch policy approach. It also will give an overview of the relevant policy actors such as ministries, their implementing bodies and the instruments that are used to stimulate international STI cooperation. First some relevant background on the Netherlands and its international relations will be given.

As already mentioned in methods section, this chapter, the first part of the study, mainly relies on a number of relevant policy documents and the seven interviews held at the relevant ministries and their implementing bodies.⁷

4.1 Background

This section will present an overview of the Dutch STI cooperation in terms of research output and partner countries, and the importance of developing countries in relation to all international STI cooperation policy. First a bit of STI cooperation related background is provided to better understand the Dutch policy approach in the Dutch context.

The Netherlands is a prosperous, densely populated country with almost 16.8 million inhabitants in 2012, which amounts to 3.3% of the total EU27 population. It is among the better-performing countries in terms of STI-output as well as economic output. (Deuten, 2011; CBS, 2012). The Netherlands is a small and open country; therefore, international cooperation in general and more specifically in STI is of high importance. Close relationships between Dutch institutions and researchers are a strong element in the Dutch STI system. For these relationships, countries at close proximity (both geographic and cultural) are by far the most popular partners. (NOWT, 2010). The relatively international character of STI in the Netherlands is reflected in the international activities. Most prominent is the co-operation within the European Framework Programmes of the European Commission. The Netherlands obtained already €1.6b from the Seventh Framework Programme in 2011 (NL Agency, 2011); which represents a high return of 6.7% of the total project budget, while The Netherlands covers 4.4% of total EU GDP. Moreover, the Netherlands ranked fifth in countries with successful applications for the European Research Council in 2008⁸. (NOWT, 2010). From interviews with policy makers it became clear that the bottom-up process is the most important for international STI cooperation, i.e. cooperation organised by universities, research institutes and researchers themselves.

4.1.1 Research output

51% Of Dutch publications between 2007 and 2010 are international co-publications. The share of international co-publications in the Netherlands increased by 80% over the years 2003-2011. (Ministerie van OCW, 2012a). 51% is an about average share compared to other 'smaller' countries such as Finland and Ireland, and relatively high

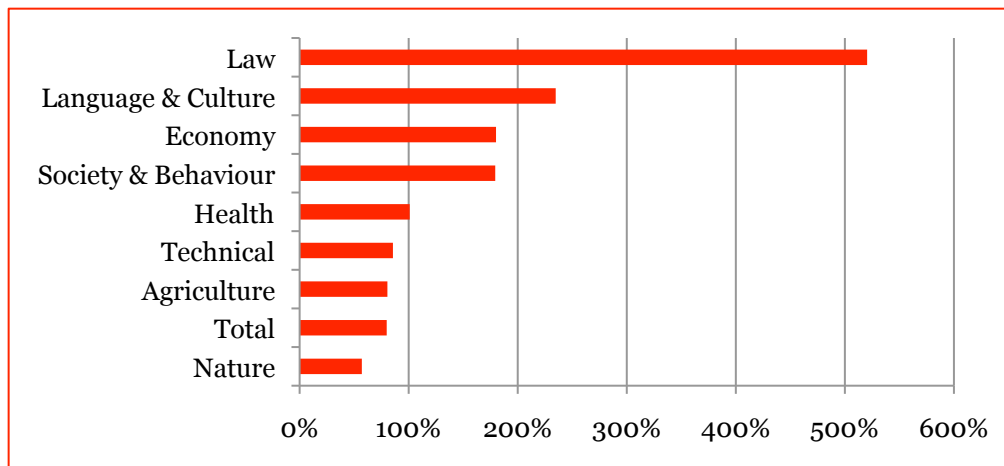
⁷ Thereby this chapter is partly based on the ERAWATCH Network country report for the Netherlands written by Jon van Til and Henk Steinz. (van Til & Steinz, 2012)

⁸ Which is remarkably high when considering the population of researchers. The Netherlands ranks after the UK, France, Germany and Italy

compared to large countries such as China, Japan, Korea and the US. (Jager, Veldkamp, Sivertsen, & Aksnes, 2011).

Much of the Dutch top cited research publications are the result of international cooperation. (NOWT, 2010) Thereby the Netherlands is also very productive for its size (0.2% of world population); 2,5% of all publications in the world are Dutch publications and the citation impact is 33% higher than the world average. (NOWT, 2010). The mobility of Dutch scientist is above average with over 25% working abroad. Only Indian and Swiss scientists are more “mobile”. Inward mobility is average with 27,7% of the scientist working in the Netherlands coming from abroad. (Franzoni, Scellato, & Stephan, 2012).

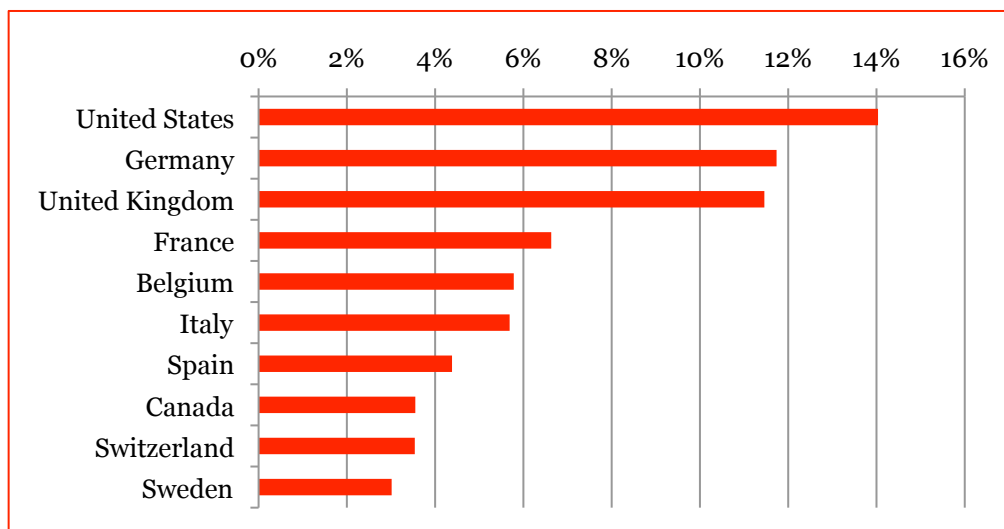
Figure 2 Percent increase of Dutch international co-publications (2003-2011)



Source: (Ministerie van OCW, 2012b)

Figure 2 shows the increase in international co-publications of Dutch researchers and their partners, per cluster. ‘Nature’ is the cluster with the smallest growth (57%). However, this cluster traditionally has a large share in international co-publications and, for instance, ‘Law’ has not (Ministerie van OCW, 2012b).

Figure 3 Main research partners (2008-2011)



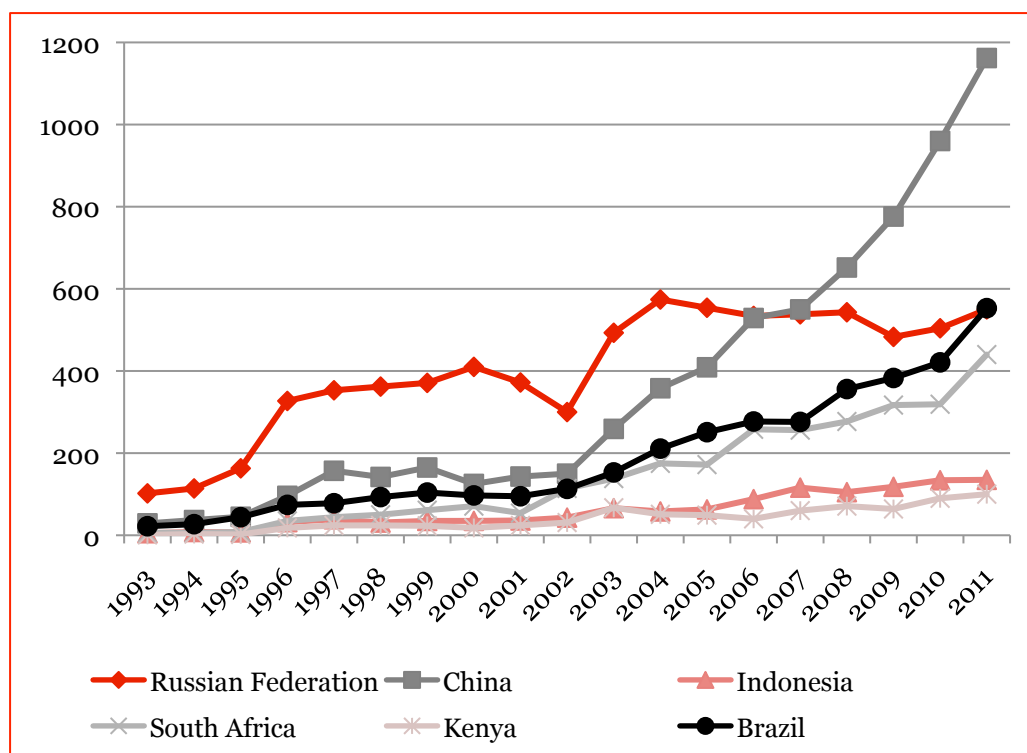
Source: Scopus (2012)

The most Dutch international co-publications are written with researchers based in the US, closely followed by Germany and the UK (see Figure 3). Over the years 2008-

2011, China ranks 13th in the top co-publication partners of the Netherlands. China is the first BRIC country with a co-publication share of 2,1% of Dutch publications⁹.

In Figure 4 the growth in Dutch co-publications is displayed for a selection of developing partner countries. The Sino-Dutch co-publications show a remarkable increase from 2002 onwards. The number of Russian-Dutch co-publications per year stagnates and even shows a small decline after 2004. Brazil and Africa show more or less the same pattern of steady growth and Kenya and Indonesia likewise, however at a lower level.

Figure 4 Dutch co-publications in all fields of science



Source: Scopus (2012)

4.1.2 Relative importance of developing countries in STI policy

From the interviews it became clear that due to the relative high level of internationalisation and international collaboration there is only priority to further increase international collaborations in STI if there is a specific strategic or diplomatic interest. Examples of such interest include strengthening the relationships with emerging science systems and economies, sourcing of (excellent) human resources, but may also have a more historic nature. These strategic interests are reflected in the instruments, which display an orientation towards (a) excellent science nations, notably the USA, (b) emerging economies, notably China, (c) historic ties, notably Indonesia and (d) developing countries such as African countries. The latter three are of interest to this study and selected for further case study. The strategic interests are translated in actual strategies and policies and the set of instruments, which will be discussed in more detail in the following sections. As can be seen in Figure 3, most of the international science cooperation takes place with excellent science nations.

⁹ With 51% of Dutch papers internationally co-published, that is 4% of Dutch international co-publications.

However, since cooperation with excellent science nations usually requires less policy intervention, the majority (32 out of 35) of the instruments aimed at third countries have a focus on developing and emerging countries (see the overview of instruments in Appendix A).

4.2 Trends

This section discusses some of the trends in international STI cooperation as the interviewees at the policy level identify them. Identified trends include the change in research focus, the increasing importance of the private sector and the ‘well-understood self-interest’.

As mentioned in the literature review of this study, one of the main drivers of international STI cooperation is the globalisation of markets and R&D. Partly related to globalisation but with an inverse effect is the financial crisis that started in 2008. According to the interviews this has led to a stronger national focus and budget cuts in all policy domains including STI. This causes more stress on current cooperation and opportunities to explore and set up new cooperation is limited, especially if the link to the Dutch ‘Top Sectors’ is weak.

The focus on the ‘Top Sectors’ increased in almost all policy domains. Dutch government has formulated the following nine top sectors: High Tech Systems & Materials, Agro-Food, Water, Energy, Horticulture, Chemicals, Creative Industries, Logistics and Life Sciences. These are the sectors in which the Netherlands excels globally and are a government priority. All top sectors have a strong international position. Industry and science share a wealth of knowledge and jointly develop innovations. The top sectors have their effect on all relevant ministries, including EL&I, OCW and Foreign Affairs (see section 4.3). Each Top Sector is managed by a so-called ‘Top Team’. According to the interview with EL&I each Top Team is developing or has its own, but still quite similar, internationalisation strategy.

The creation of the top sectors is also a trend to a more integrated approach of science and innovation. Policy makers feel they are frontrunners in the so-called ‘cluster thinking’, in which STI cooperation is approached by looking at the whole chain from cooperation in research to new business opportunities.

Related to this is the focus on Public-Private partnerships (PPPs). The interviews with the policy makers generally mention two reasons for fostering PPPs. One is the decrease in public budgets for scientific research and the need for other finance structures. The second reason is the increase in innovative power by a stronger link between knowledge production and business opportunities. This trend is noticed in national- as well as international research cooperation. The influence of private parties also entails a gradual shift towards applied research. Jeroen van Oort (VSNU) as well as a VSNU report state that the research society in the Netherlands traditionally has a strong focus on fundamental research, although ‘today’s’ universities also work closely with the private sector (VSNU, 2007). The shift towards more applied research is likely to be strengthened by the increase in cooperation with countries as the USA and China, which always had a stronger focus on applied research.

From the interviews at the ministries it became clear that there is a geographical focus shift from inside Europe to third countries. International cooperation used to be very Eurocentric. The focus is gradually shifting to third countries now cooperation inside Europe is well established and important tasks that stimulate inter-European cooperation are taken over by the European commission.

A ‘popular’ term in international STI cooperation policy that was often mentioned in the interviews as gaining importance is ‘het welbegrepen eigenbelang’, which can be translated as the well understood self-interest. Which implies that the cooperation has to be beneficial for the Netherlands as well and generally this means that there has to be a connection with the Top Sectors. The important question hereby is: what do we

gain from engaging in the cooperation? Another translation of 'het welbegrepen eigenbelang' is the enlightened self-interest. The meaning is subject to interpretation, however, in enlightened self-interest the own gain is probably less direct. For example, helping a developing partner country with their sustainable energy production is advantageous for the Netherlands as well, because we also suffer from global warming. For Dutch internationalisation policy, the well understood self-interest is probably the most applicable translation.

The interviewed policy makers suggest that the political situation in the Netherlands is currently characterised by a strong national focus. As a result, the international policy domain is not very attractive for policy makers and no major progress has been made the last few years. For instance, newly introduced regulations only hamper inward mobility of foreign knowledge workers¹⁰. With regard to the other activities in STI internationalisation, interviews suggest that the current situation only led to fewer policy publications and public statements on international collaboration. Nevertheless, activities have proceeded.

The Netherlands has had and will have to deal with a shortage of knowledge workers – the share of R&D personnel and researchers is relatively low and decreasing (Deuten, 2011), while (especially in engineering and sciences) there will be a shortage of highly skilled and knowledge intensive labour force (Ministerie van OCW, 2008). This poses a challenge to the Dutch STI system where internationalisation and international collaboration seem to offer opportunities via inward mobility incentives. (AWT, 2012a)

Summing up, the following trends in the policy on international STI cooperation can be identified:

- Development and increased focus on Top Sectors
- More Public-Private Partnerships
- Upcoming of cluster thinking
- Increased focus on applied sciences
- Increased importance of the well-understood self-interest

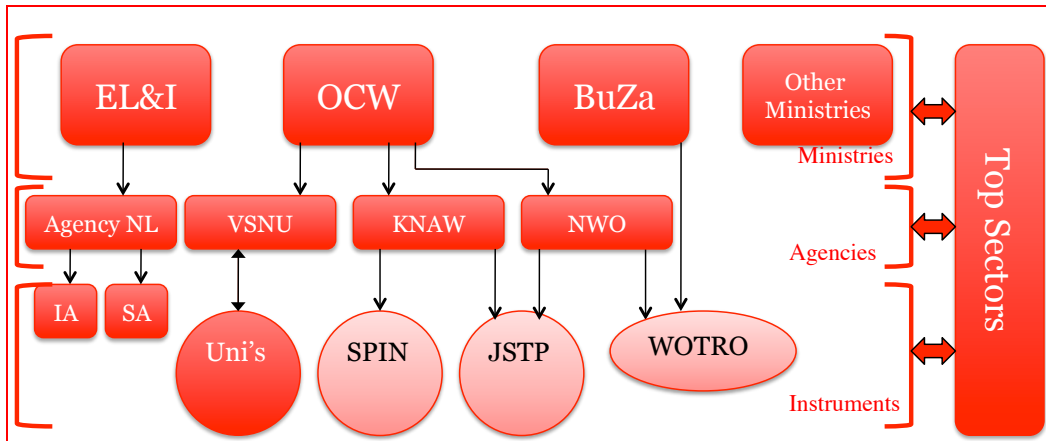
4.3 Policy level actors goals and trends

The following section presents an overview of the most important policy actors and their implementing bodies in international STI policy.¹¹ For each actor, the role and goals in international STI cooperation is described. Were possible additional trends to the previous section are included. As described in the methods section, the data is obtained in the seven interviews held with the different policy actors and implementing bodies, and a desk study of relevant policy documents. The ministries, implementing bodies and the programmes that are selected for further case study, including their relations, are displayed in Figure 5.

¹⁰ E.g. there are sharper restrictions to inward knowledge migrants.

¹¹ This can be said with reasonable certainty, because every interviewed actor was asked to identify the other actors in the field of international STI cooperation policy.

Figure 5 The governance of the Dutch STI internationalisation policy



International STI cooperation is part of three ministerial portfolios and their implementing bodies (see Figure 5). The most prominent is the Ministry of Education, Culture and Science (OCW); their international focus is on science cooperation. Their main implementation agency is NWO, the Netherlands Organisation for Scientific Research. Other bodies are the Royal Netherlands Academy of Arts and Science (KNAW), which is an independent organisation but implements grants for OCW, and the 14 research universities in the Netherlands, joined in the Association of Dutch Universities (VSNU). The second is the Ministry of Economic Affairs, Agriculture and Innovation (EL&I). Their contribution to the internationalisation of STI is focussed on innovation. The main implementing body in this policy domain is the NL Agency (AgentschapNL). NL Agency, supports technology, innovation and business development cooperation, primarily via technology attachés. The third is the Ministry of Foreign Affairs, which has a modest role in international STI cooperation, but has big influence in development cooperation and other international relations. The strategies, objectives and rationales per ministry will be further discussed below, followed by the implementation bodies.

4.3.1 Ministry strategies, objectives & rationales

Ministry of Education, Culture and Research (OCW)

The most recent formal policy document is the Internationalisation Agenda Higher Education, Research and Science Policy “Het Grenzeloze Goed” (Ministerie van OCW, 2008). This document is written by the former Minister of OCW in proper consultation with other ministries (Agriculture, Economic Affairs (now EL&I) and Foreign Affairs), and the other relevant organisations including VSNU, NWO and KNAW. The four main policy objectives mentioned in this document are to 1) increase the mobility of Dutch students, 2) stimulate an international orientation of education institutes, 3) increase ‘brain circulation’ and 4) improve the location climate for education and research institutes. Although this document is fairly old, interviews showed that the agenda is still providing guidance and is still being implemented. The implementing bodies have their own policies and strategies, which are in line with “Het Grenzeloze Goed”. These will be further discussed in the “policy implementation” section.

From the interviews at the Ministry of OCW as well as with NWO and KNAW it became clear that increasing the quality of higher education and scientific research in the Netherlands is the main rationale for international STI cooperation. Therefore the primary focus and most activity is in European countries and the most scientifically advanced third countries, being primarily the Anglo-Saxon countries. This does not reflect in most policy documents, which tend to be more focussed on emerging science

nations (KNAW, 2010; Ministerie van OCW, 2008; NWO, 2011). The reason scientifically advanced countries are not often mentioned in policy documents is - according to the interviewees - that these are often countries in which Dutch scientist and researchers are already very active and additional stimulation is superfluous.

For the Ministry of OCW the rationales for international STI cooperation mentioned in the interview and/or found in the strategy document (Ministerie van OCW, 2008) are:

- Obtaining scientific excellence through big research infrastructures.
- Research is inherently international
- Improve and increase scientific quality
- Diplomacy
- Historical ties
- Human resources (talent spotting)

Concerning cooperation outside the European Union, the cooperation with Russia is discontinued. Those budgets are now made available for India. The cooperation with China is said to be very stable, much mutual trust is build up in the last thirty years. The budgets are continued, but not the MoU's (see instruments) since this is more complex due to the fact that all the parties have to give their individual fiat. The same is true for Indonesia. The ministry of OCW is now also associated with the Innovation Attaché network, which used to be only the ministry of EL&I/NL Agency. OCW introduced the first Science Attaché who is stationed in China. The cooperation with China and Indonesia is said to have become less focussed on capacity building and more based on reciprocal learning and mutual benefits.

The Ministry of Economic Affairs, Agriculture and Innovation (EL&I)

In the innovation policy domain the Ministry of EL&I uses international STI cooperation for their main goal, which is promoting the Netherlands as a country of enterprise with a strong international competitive position and creating the right conditions for innovation. Working together with the strong partners contributes to the knowledge base in the Netherlands and the high level of innovation. Other than that STI cooperation is used to a better positioning of the Netherlands and creating markets. For example in the cooperation with India the knowledge on water management is shared to improve the Dutch position as a preferred partner to collaborate with and do business with. Human resources are another goal of international STI cooperation. The strategy is to attract high quality researchers so that they can add to the Dutch scientific research and when they go back they serve as ambassadors for the Netherlands in the rest of their professional career. The network also works the other way around. Dutch researchers that have worked abroad will keep those international connections in their professional career. The 'knowledge migrants scheme' was an important breakthrough for the inward mobility.

The ministry of EL&I, just like the ministry of OCW, only focuses on those countries or themes where extra government stimulation is necessary. These are for example the BRIICS-countries where new networks need to be built or where access for other parties is difficult without government interference. For example the water-sector in the USA has enormous potential for Dutch businesses but is impossible to enter without the help of the ministry.

The Ministry of Foreign Affairs (BuZa)

BuZa has no specific policy on international STI cooperation; this is a part of the development cooperation policy, which falls under the Directorate General International Cooperation (DGIS). The financial crisis also puts pressure on the development aid budgets of the Ministry of Foreign Affairs. New policy has more focus in countries and themes; this means that the number of countries that receive

development aid is reduced to 15 countries in the period 2011-2015. This used to be 33 partner countries in the period before 2011. BuZa DGIS has four priority themes in their development cooperation: Water; Food Security; Reproductive and Sexual Health; and Rights, Safety and Legal Order. (Min. BuZa, 2011)

The partner countries are selected on the prospects of achieving the best results, the income- and poverty level, the link to the priority themes, the opportunities and interests of the most closely involved ministries and the level of good governance (Min. BuZa, 2011). The 15 partner countries in development cooperation are classified in three profiles. The first profile fits the countries with an insufficient income to meet the millennium goals independently (Benin, Ethiopia, Mali, Mozambique, Uganda and Rwanda). In the second profile are the countries with a fragile rule of law (Afghanistan, Burundi, Yemen, the Palestinian territories and South Sudan). The countries with a healthy economical growth form the third group (Bangladesh, Ghana, Indonesia and Kenya). Colombia, Vietnam and South Africa -three of the countries with whom the development cooperation is phased out- still receive temporary assistance to transfer from development cooperation to financial cooperation. (Min. BuZa, 2011).

From the interviews it became clear that the well-understood self-interest (het welbegrepen eigenbelang, see Trends section 4.2) has become more relevant, also in development cooperation. This means that a cooperation is entered with the goal of helping the partner, while not overlooking the own agenda. From a traditional perspective on development cooperation, or development aid, the self-interest is almost politically incorrect. However, in the newfangled development cooperation, that has become more relevant since the second half of the 00's, the well understood self-interest is more important. In this respect, cohesion with the top sectors has become increasingly important since their introduction in 2010, specifically with the sectors Water and, Agro-food and Horticulture. These two Top Sectors overlap with DGIS priority themes Water and Food Security. Consequently, these are the sectors NWO-WOTRO focuses on since this is financed 50-50 between OCW and BuZa (see Case study NWO-WOTRO, Science for development). Capacity building in the partner country and making an impact on development issues are the main rationales for BuZa to finance NWO-WOTRO.

President Truman's inaugural address in 1949 is seen as the origin of the term underdevelopment and the practice of development cooperation. In his speech he announced a 'bold new programme' that was focussed on helping less fortunate countries with the blessings of our scientific advances and industrial processes. This was very much a 'sponsor push' type of cooperation. Trough the years the approach in Dutch development cooperation took different forms. In the period 1989-1992, the flagship initiative 'DGIS research programme' was launched, which has been acknowledged for *"its bottom-up, integrated and multidisciplinary approach to research programming, and for its adherence to the principles of empowerment and local ownership."* (Koenders, 2009). In 2009 Minister of Foreign Affairs Bert Koenders calls for an *"...innovation systems approach that combines scientific excellence and societal relevance in one coherent framework."* (Koenders, 2009). From the interview with WOTRO executive director and former policy maker at BuZa, Henk Molenaar, it became clear that the demand driven approach gained popularity during the 1990s. This was followed by 'local ownership' and the Dutch researcher was more or less banned from the research cooperation in order to ensure that the developing country was not exploited. In more recent development cooperation the mutual benefits became more important. Since 2011 Top Sector policy is gaining influence in the direction and character of the cooperation. In a nutshell the driving ideologies, or the division of roles can be scaled as follows: Sponsor Push / Demand Driven / Local Ownership / Mutual Benefits / Top Sectors. (Also see: IOB, 2007; Molenaar, Box, & Engelhard, 2009; Wiedenhof & Molenaar, 2006)

Summing up, the following policy rationales for STI cooperation of the relevant ministries can be identified:

- Improving the Dutch STI-system
- Creating new business opportunities in new markets
- Mobility of students and researchers
- Diplomacy
- Capacity building in partner country
- Addressing transnational problems

4.3.2 Policy implementation

The previous section discussed the three ministries that together make up the Dutch STI approach at ministerial level. In this section the implementing bodies and their (changing) approach to STI cooperation is set forth for a more complete insight in the Dutch policy approach. The responsible actors for the implementation of STI policy are NWO, KNAW, VSNU, Agency NL and Nuffic. The first three are also cooperating together as the 'tri partite'. The organisations will be discussed in further detail here below.

NWO

NWO, the Netherlands Organisation for Scientific Research, is an independent administrative body of OCW. NWO funds researchers at universities and institutes and steers the course of Dutch science by means of subsidies and research programmes. NWO has an important role in increasing the attractiveness and competitive position of Dutch science, internationalisation is therefore one of the six focal points of NWO (NWO, 2011a). The rationales that follow from the strategy document (NWO, 2011a) and the interview at NWO, is that science is inherently very international and should not be hindered by borders. International cooperation is also important for attracting and retaining international talent. But the most important reason is scientific quality. If there is high quality research, good infrastructure or better facilities abroad the Dutch research benefits from cooperation.

The NWO programmes with third countries are displayed in the table in Appendix A. These are all the bilateral collaborations with countries outside Europe. In the interview it was mentioned that the primary focus is on countries that are scientifically interesting and intervention from NWO is needed. For instance, researchers know their way to the USA, an extra incentive from NWO is not necessary thus the actions are limited to the alignment of programmes in the USA and the Netherlands. The focus is on the emerging science nations; this is translated into an emerging science nations policy, resulting in a programmatic cooperation with Brazil and India. This cooperation support takes place without the support of OCW. Other bilateral programmes are in place with China, Indonesia, Taiwan, South Korea, India and South Africa and other African countries in general. Jan Karel Koppen (NWO Director Policy Development and Support) stated: *"The countries that are growing and investing are at the scientific top in ten years time. We need to invest in the networks with those upcoming countries."* This was mentioned as a driver, although he also stated that this was not yet at the basis right now, due to limited investment capacity. Budget cuts make self-preservation currently more essential.

In cooperation with KNAW, NWO houses the Joint Scientific Thematic research Programme (JSTP), which is aimed at the cooperation with China and will be further elaborated in the case study on JSTP. NWO also houses WOTRO, which is an independent foundation originated from NWO and focuses on science for development. WOTRO's activities will be further described in the WOTRO case study. WOTRO also participates in two programmes in Indonesia within KNAW's SPIN, namely: Agriculture Beyond Food and the East Kalimantan Programme. These will be further discussed in the SPIN case.

There used to be a scientific cooperation with Russia that was supported by the Dutch Ministry of OCW, however this was ended in 2007 because the two government parties could not agree on the conditions of the cooperation. When OCW stepped out, NWO had to step out as well. The money that was allocated to Russia was then moved to China.

Next to these programmes, NWO also has several bilateral programmes with other EU member states and contributes to the European Research Area. NWO invests in an excellent research infrastructure in the Netherlands to attract foreign partners through several programmes (Huygens-supercomputer; BiG Grid, computing clusters; MESS, internet data gathering; 7-Teslascan). Lastly, NWO mediates for the use of large scale facilities abroad (James Clerk Maxwell Telescope in Hawaii and Isaac Newton Group of Telescopes on La Palma) and finances the contribution of NWO research institutes in transnational projects (HIFI Spectrometer on board of the European Herschel Space Observatory; PrepSKA-preparations for radio telescopic array Square Kilometre Array; STC Particle Detector for ATLAS Experiment in Geneva; Oceanic research with NIOZ research ship Pelagia).

NWO introduced, what they call, the square model (vierkantjesmodel) in a bilateral agreement with China. This is a form of a Public-Private Partnership in which four parties participate: a Dutch university, a Chinese university and a Dutch multinational that has an office in the Netherlands and in China. The advantage of working with one company is that intellectual property rights are not longer a problem. China also wants Chinese private parties to be able to participate; in this case the multinational can direct the collaboration. The expectations of all the participating parties are high. In China there is a now a smart energy call, in India the same is planned with a new materials call.

KNAW

The KNAW (Royal Netherlands Academy of Arts and Sciences) sees it as its task to encourage cooperation with rapidly developing countries, in particular China (in coordination with NWO) and Indonesia. Besides the actual STI cooperation the Academy also aims to contribute to capacity building and to improving the knowledge infrastructure in developing countries. It is concentrating on Africa in this respect, and in particular on cooperation with African academies of science. The three goals of international cooperation are: 1) To strengthen the research in the Netherlands; 2) Science for policy and 3) Capacity building. Also attracting excellent knowledge workers and retaining upcoming talent is a specific goal of the KNAW. (KNAW, 2010)

The OCW policy is guiding for KNAW, but because KNAW is an independent organisation they also have their own strategic agenda (KNAW, 2010) which is publically available and an internationalisation agenda for internal use only. From the interview with KNAW it became clear that the main points of the internationalisation agenda are also in the strategic agenda. These are:

- Participate selectively and actively in international network organisations
- Publish an IAC report on the topic of ‘water’
- Advise on ESFRI projects on the basis of the Dutch Roadmap for Large-scale Research Facilities
- Reinforce existing cooperation with China
- Support relations with Indonesia

KNAW is active in China since the 1980’s and according to the interview with KNAW Team Leader International Relations Department, Rudie Trienes, the cooperation with China is increasingly important because China aims to be one of the most innovative countries in the world by 2020. There is also a longstanding cooperation with Indonesia because of the historical ties between the Netherlands and Indonesia.

According to Trienes, the reason to cooperate with Indonesia is mostly the same as that with China; it is scientifically opportune. However in the cooperation with Indonesia, capacity building is still one of the goals. The relationship is changing in the sense that Indonesia is becoming more scientifically advanced and also looks beyond the Netherlands for STI cooperation partners. Moreover, both in policy and reality, according to the interview, the approach to the cooperation with China and Indonesia is changing from capacity building towards well-understood self-interest. The position and benefits for the Netherlands have become more important. This is partly reflected in the budgets. China now has large budgets to support their international activities. Indonesia is only recently matching some of KNAW's budgets. They have some budgets and they spend them on very specific goals, such as the support of PhD mobility. The programmes on China and Indonesia will be further elaborated upon in the case studies.

According to Trienes the KNAW strives for scientific excellence in their cooperation, however the social relevance of research projects should always be taken into account. For instance their Indonesian partners tend to choose technologic research projects, because they want to acquire a certain technology. Although this is interesting for the KNAW and the Netherlands as well, the KNAW always tries to include a social economic or religious aspect. They strive for projects that cover the whole terrain.

A clear trend in KNAW's STI cooperation policy is a more integrated approach. The goal is more sustainability in their projects through long-term strategic cooperation. Cooperation in research is still the most important and this is also where most of the budget is allocated. However, the projects need to have other facets attached, such as guest professors and PhD mobility. Trienes: *"In the past we would grant individual researchers, nowadays it al runs in bigger consortia. This trend is fuelled by China, which sets up large PhD mobility schemes."*

NL Agency

NL Agency (AgentschapNL) is the policy implementation body of the Dutch Ministry of Economic Affairs, Agriculture and Innovation (EL&I). Its mission is the excellent implementation of international, innovation and sustainability policy. Their thematic and geographic focus is therefore similar to that of its ministry. Their interest in international STI cooperation is primarily business and innovation related. For instance the Innovation Attachés, stationed in several third countries (See table in Appendix A), serve as R&D liaison for international cooperation. Since 2011 there is also a Scientific Attaché stationed in China, who has better understanding about the research field than the Innovation Attachés. Also NL agency is facing cutbacks in their budgets.

VSNU

The Association of Dutch Universities, VSNU, represents the shared interests of the fourteen research universities in the Netherlands in different fields, including research, knowledge transfer and international policy. From the interview it became clear that the VSNU only acts where it has additional value as an umbrella organisation for the Dutch universities, for instance with difficulties in national or regional policy on immigration of knowledge workers. The Dutch universities also have their own internationalisation strategies and activities and are very active in this respect. According to the interview at VSNU the two most active, or successful, universities in terms of international students and researchers are the universities of Maastricht and Delft. Also from the interview, it became clear that although the internationalisation strategies differ per university, a common trend is that they focus more on the themes in the Horizon 2020 agenda (Also see European Commission, 2011).

The VSNU does not have any recent policy/strategy documents on internationalisation, however from the interview it became clear that informally VSNU does have the desire to internationalise more. This is reflected in their activities (see table in Appendix A). Strengthening the International position is also one of the three key objectives of the universities (VSNU, 2012). Developing countries are not specifically mentioned in the key objectives.

From the interview follows that the most important activities of the VSNU are those within the EU and other scientifically advanced countries. This is because that is where the most prominent universities are, their most important networks are and thus where the cooperation has the highest scientific quality. Since these networks and cooperation are long-lasting and fairly successful it is not high VSNU's policy agenda. The focus shifts to countries that still need the attention to build stronger networks. Scientific excellence remains the most important determinant for cooperation. The upcoming science nations are of particular interest to the VSNU, said Jeroen van Oort. Bilateral agreements are signed with Chile, China, India and Indonesia. These countries are not only interesting because of their current status, but also because they are expected to grow and cooperation with even higher scientific quality will be possible. New collaborations are also interesting from a financial perspective for business in the Netherlands.

Nuffic

Nuffic, or Nuffic/NESO, is the Dutch organisation for international cooperation in higher education. According to an interview with the head of the expertise department, Beer Schröder, Nuffic plays a role in the internationalisation of research but this is primarily in providing scholarships for students and to a lesser extends for PhD's. Nuffic also has a number of capacity building programmes, including the Netherlands Initiative for Capacity development in Higher Education (NICHE). NICHE is a Netherlands-funded development cooperation programme aimed at strengthening institutional capacity in higher education in developing countries. The country focus is adapted to the DGIS countries for development cooperation (see section o). Other programmes focus on capacity building by increasing the mobility and providing training, however the instruments are not specifically focussed on researchers and thus less interesting for this study.

4.4 Instruments

This last section of chapter 4 provides an overview and explanation of the set of instruments that are used by Dutch policy makers to promote international STI cooperation. The table in Appendix A provides an overview of the instruments aimed at STI cooperation with third countries that are mentioned at the websites of NWO, KNAW and VSNU and/or mentioned in the interviews held for this study, which are still effective in 2012. Internationalisation programmes of individual or groups of universities are not taken into account, except for those under responsibility of the umbrella organisation VSNU. Often, instruments combine more than one modality, such as in- and outward mobility measures combined with a joint-R&D project. The overview of the modalities per instrument is given in the table.

The total budget for measures aimed at extra-EU collaboration in STI, listed in the overview is between €9-15.5m. This includes all instruments implemented via NWO (between €4.5-8m), KNAW (between €2.5-4.5m) and joint implementations of KNAW and NWO (between €2-3m). This is however still excluding the investment in softer instruments of which budgets cannot be directly allocated to STI collaboration, such as the Innovation Attachés.

The most frequent incorporated modality is "Networking and Brokerage", which is a rather straightforward component of establishing relationships (checked 15 times for

34 instruments). “Joint R&D” is the second largest modality (14), closely followed by “in-” and “outward mobility measures” (both 10). These mobility and joint R&D efforts are the core of “hard” international collaboration and in general require larger investments. In several cases mobility and R&D projects are integrated in a larger project or Memorandum of Understanding (MoU). There are MoUs signed with five different countries, in some cases multiple MoUs per country at different policy levels. In addition, there are a total of ten Science and Innovation Attachés in non-EU countries. Capacity building is indicated less frequently in the table (6). Other instruments, which do not explicitly mention capacity building as one of their modalities, can however still contain a secondary element of capacity building.

The total set of instruments clearly displays a geographical focus. The largest number of instruments is aimed at China and Indonesia with respectively twelve and seven instruments specifically aimed at that country. Furthermore the focus seems to be at other South East Asian countries (India, South Korea, Taiwan) and South America (Brazil and Chile). The number of instruments aimed at the scientifically advanced countries is rather low. However, two instruments of NWO target to improve the collaboration with the USA.

The programmes have different modes of promoting international STI cooperation. In the following paragraphs the different modalities will be further elaborated upon.

Memorandum of Understanding

A Memorandum of Understanding (MoU) can be signed at different policy levels and with different contents. In the Netherlands the ministries of OCW and EL&I have signed MoUs with other ministries abroad, NWO with other research councils and VSNU with the Association of Indian Universities. It serves as a basis for further cooperation between the two countries or organisations. According to the interviews some MoUs are “empty” in the sense that no specific programmes are present, however a formal framework may provide opportunities for cooperation at lower levels. Recently signed MoUs are however increasingly containing specific programmes that translate the intention to work together into actual actions.

Mobility of researchers

Inward mobility

From the interviews and programme information provided by the respective institutes it became clear that inward mobility schemes are most often (co-)funded by the foreign partner. It is either an agreement to participate in a foreign instrument that funds their students and PhDs to study or work abroad (for instance with Chile and recently with Brazil) or a two-directional scheme where there is an exchange of students and researchers (For instance JSPS and CEP). The 1000 PhD-initiative, which falls under the Talent and Training China-Netherlands programme, is an interesting example of Dutch government (Innovation Platform) that tries to attract foreign PhDs with funding of the foreign partner. The Chinese Scholarship Council provides the scholarships. This specific programme however is not yet very successful since only 70 PhD-candidates came to the Netherlands.

Several instruments aimed at boosting the excellence of the science system may have an attractive force to foreign researchers and thus play a role for inward mobility. Notably, the creation of cutting-edge research infrastructures and renowned research clusters thrive inward mobility. Obvious examples include MIT and Silicon Valley. The Netherlands has a number of initiatives to reinforce its research infrastructures. It is co-founder and member of several large inter-governmental research organisations and gives researchers access to advanced research facilities. The concentration of researchers within these research organisations gives significant scientific added value. Most often, these initiatives operate in the EU framework. The Netherlands

participates in CERN, EMBL, EMBC, ITER, ESO and ESA. Via NWO, the Netherlands participates in several large research facilities, including the Dutch-Flemish synchrotron radiation research facility (DUBBLE) within ESRF (Grenoble), the James Clerk Maxwell Telescope (Chile) and the Isaac Newton Group of Telescopes (La Palma) (NWO, 2012a).

Outward mobility

Outward mobility is either part of an exchange programme as mentioned in *inward mobility*, or part of a matchmaking programme that enables researchers from Dutch Universities to visit fellow researchers abroad. The latter are usually funded by NWO's visitors travel grants (€370.000 in 2012). The objective is to promote and facilitate contact between Dutch and foreign researchers.

Joint R&D projects

Joint R&D projects are often framed in bi- and multilateral agreements. Most often, this type of cooperation are used to gain competitive advantages and is aimed at capacity building and innovation. This coincides with an orientation towards excellent (USA, Japan) or emerging countries (BRIC). In most cases it is obligatory to apply for research grants together with a foreign partner. To make this easier some programmes include matchmaking activities.

Attachés

There are two types of Attachés. There is a network of Innovation Attachés (IA), formally known as Technical Scientific Attachés (Dutch acronym: TWA) and since 2011 the first Science Attaché is stationed in China, who has better understanding about the research field than the Innovation. Innovation Attachés serve as R&D liaison for international cooperation. They are a gateway for technology transfer and thus have primarily a function in increasing the national competitiveness. The Innovation Attachés are stationed in several third countries (See table), including South Korea and the BRICs.

Capacity building

These instruments serve developmental priorities and not the Dutch STI system interest as first priority. The instruments that include an element of capacity building are aimed at developing countries, notably African countries and Indonesia. Capacity building can take different forms; this can be through a rotating academy-funded professorship programme; training of research staff in research institutes or science academies; workshops and seminars; or more implicit through cooperation with more junior researchers and simultaneously training them. The latter is not always explicitly mentioned as one of the goals or strategies, this has come to light in the different interviews for this study.

Networking & brokerage

The networking and brokerage instruments are the instruments that do not facilitate research cooperation financially, but aim to increase the research cooperation between two countries by organising seminars, having discussion groups and other activities that make cooperation easier or encourage researchers to cooperate internationally. Some of the programmes mentioned in the table in Appendix A also include either mobility or joint R&D, this is in addition to their other promoting and facilitating activities.

Opening up of instruments to foreign actors

An increasing number of NWO subsidies and NWO research programmes aiming at talented scientists are open for applications by researchers affiliated with universities and institutes from abroad. The demands for admission may vary for each subsidy. Usually, researchers must perform the research in the Netherlands. NWO wants to facilitate the attraction and retention of scientific talent from abroad.

5. Case study SPIN - Indonesia

In addition to the Dutch policy approach, the chapters 5, 6 & 7 represent the Dutch researcher approach in three case studies, respectively SPIN-Indonesia, JSTP-China and WOTRO-Africa. These are all presented in the same structure that follows the spheres and dimensions of the conceptual model. The introduction to each case consists out of a background of the partner country or region and the relation with the Netherlands. The spheres of the conceptual model will be discussed in the case specific context, moving from approach to outcomes and finally this is discussed in with regard to the local context, or the broader setting. For each sphere the dimensions will be discussed individually. Although the policy level of the approach is already discussed in chapter 4, each case study includes a Dutch policy section as well, which elaborates further on the case specific policy approach. Although some references across cases are made, the actual comparison of the cases is saved for chapter 8. This chapter is the case study on the STI cooperation between Indonesia and the Netherlands.

5.1 Introduction and historical background

The historical ties between the Netherlands and Indonesia have also made an impact on the STI cooperation between the two countries. Therefore the cooperation between Indonesia and the Netherlands first has to be placed against the right background. Because of the special connection this section will be somewhat more elaborate than in the other cases. The following section will give an epitome of a long and vibrant history between the Netherlands and Indonesia.

The Netherlands and Indonesia have a special relationship because Indonesia was a Dutch colony for a century and a half from 1789 onwards (except for the British occupation in the years 1811-1816). The Netherlands recognised the independence of Indonesia in 1949. The scientific links go back to these colonial times. For instance the Bandung Technical College (ITB), the Eijkman Institute in Jakarta, the Indonesian College of Law, and the Universitas Indonesia all date from that period. (KNAW, 2012a). Nico Schulte Nordholt¹², stated in an interview for this study that until 1958 the level of research and teaching at ITB was at the same level as in the Dutch top technical university. The number of students was relatively small and predominantly of Dutch descent.

In 1958 president Soekarno broke the union with the Netherlands and 35.000 Dutch repatriated, including Dutch students and professors. Most of the staff that had to leave their jobs in Indonesia could continue their jobs as researchers and professors at the technical universities in the Netherlands without any major problems since they were just as capable as the staff here. In 1967 the Dutch were allowed back into Indonesia. Schulte Nordholt stated that in those nine years the quality of teaching and research decreased drastically. *“The laboratories that were fully functioning in 1958 were used as normal classrooms in 1969. The practical’s were done on paper only.”*

Main reasons for the decreasing quality level was that a large share of the human resources in research and technology moved out along with the Dutch. In addition, the vastly increasing number of Indonesian students put considerable pressure on the capacity of the research system. In 1950, Soekarno decreed that the school was free for all children to the age of 12. The first large group of these children went to high school in 1958 and started as university students by ’62-’63. *“Suddenly millions of*

¹² Nico Schulte Nordholt is emeritus professor of the Technical University Twente (Twente Centre for Studies in Technology and Sustainable Development) and Indonesia expert. This background section on Indonesia is predominantly based on the interview with Nico Schulte Nordholt.

Indonesians went to university and logically universities would pop up like mushrooms. As a result there was a great shortage of staff to teach all these people. It is therefore no wonder that the level dropped.”

Because of political reasons, in March 1992 all development aid related activities with the Netherlands were banned once more. Until the fall of Soeharto in 1998 Indonesia would not accept any public financial support from the Netherlands, only strictly commercial relations were possible. This again, made it impossible for Dutch researchers to work there or even participate in joint research. Also an entire generation of Dutch students was not able to study in Indonesia and Indonesians studying in the Netherlands had to move to neighbour country universities such as in Aachen. Indonesia altered its focus to countries, such as Australia, China and the US. Also Dutch researchers had to focus on other research partners than Indonesia. Especially for technical sciences the focus shifted towards more stable countries such as China, India and also Vietnam and South Africa. The Asian financial crisis in 1997 finally led to the fall of Soeharto. When Dutch researchers were able to renew their activities in Indonesia in 1998, there was an overrepresentation of social scientists. For the social scientists it was very interesting to do research there, but the Indonesian technical research had gotten to far behind and the Dutch preferred their other partners.

Since '98 the relation between Indonesia and the Netherlands is relatively stable. However the multiple gaps in the relation left their marks on the cooperation in the following years. The following years (2000-2012) will be further elaborated upon in the following sections. The Scientific Programme Indonesia-Netherlands (SPIN) programme is the research-funding programme that is central in this case study. The SPIN budgets, themes and goals will be elaborated upon further in this chapter. Thereby a selection of the researchers active in SPIN funded research projects and the SPIN programme leader are interviewed. Box 1 will provide an insight into a Indonesian-Dutch research project that was funded by SPIN.

Box 1 Bio-fuel research by Prof. dr. ir. Erik Heeres

Prof. dr. ir. Erik Heeres is professor applied chemistry at Groningen University (RUG). His predecessor in Groningen had good connections with the Institute of Technology Bandung (ITB) since an Indonesian staff member of ITB promoted with him in Groningen early in the 1990s. Later the departments in Indonesia and the Netherlands started a joint-degree master programme, which included one year in Bandung and one year in Groningen. This master programme has not longer active since there are no new applicants anymore. This is mainly due to the fact that in 2008 the tuition fee for foreign students increased from € 1,600 to over € 9,400. That makes Groningen (and the Netherlands in general) relatively expensive. Groningen has to compete for students with cities that provide funds to foreign students such as Taiwan and Singapore.

Of this joint master programme, three Indonesian students started a PhD in Groningen in 2003. The faculty and RUG funded these PhD's. Although at a relatively moderate scale, this was the beginning of joint research between the Netherlands and Indonesia. In 2004 the joint research project “*exploring the potential of the jatropha plant*” commenced. This was the first of two SPIN-funded joint research projects for Heeres and his group. With a runtime of eight years and a total funding of around €800k, this was a fairly large project. Dutch scientist from Wageningen University (WUR) and RUG (including Heeres), and Indonesian scientist from ITB guided the research. Eight PhD candidates and two senior fellows from Indonesia participated in the research.

The second project, running from 2010-2014, is named “*Breakthroughs in Biofuels – Mobile Technology for Indonesian Biofuels, using the Biorefinery concept*” and is funded by the SPIN/WOTRO sub-programme Agriculture Beyond Food (AbF). The research is carried out at six universities, three in Indonesian and three in the Netherlands. At the Dutch side these are RUG, WUR and Twente University. From

Indonesia these are ITB, Gadjah Mada University (UGM) and the University of Palangka Raya. Together, and supported by AbF, the research is carried out by four Indonesian sandwich PhD students and two postdoctoral fellows, one from Indonesia, one Dutch.

Another 2 PhD projects are supported by SPIN-DIKTI scholarships, provided by the Indonesian government. According to Heeres, the downsides that were always mentioned concerning research cooperation with Indonesia was that there was little to no funding available from the Indonesian counterparts. For example, in the *Jatropha* project there was no funding available in Indonesia. Investments of both sides are not yet equal, however this is seen as a positive development.

Heeres is the promoter of the Indonesian sandwich PhD's in Groningen. When the PhD is in Groningen the research is carried out under Heeres' supervision. In Indonesia the research is supervised by the Indonesian co-promoter. Heeres describes this as two positive developments for the Indonesian department. Not only the PhD and thus a staff member of UGM is trained, but also the Indonesian supervisor learns from the experience. This form of capacity building is seen as a derivative of cooperation.

The training and promoting of PhD's is mentioned as an important output of the cooperation. Not only from a capacity building prospective, but also for a network that facilitates future cooperation. Heeres now cooperates with Indonesian researchers he promoted in Groningen. For both projects holds that most of the partners knew each other already and SPIN provided the possibility to expand the research cooperation.

To apply for funding, the partners had to respond to the SPIN call for proposals by means of a joint research proposal. In practice, Heeres explained, the writing of the research proposal was primarily a Dutch effort. However the design of the proposal, including the research theme and deliverables was done in consultation with the Indonesian partners. That most of the writing of the proposal was done in the Netherlands is, according to Heeres, a direct result of the origin of the funding, i.e. because the funding is Dutch, the research proposal is Dutch. To strengthen this statement he explains he is now involved in a research proposal in response to a DIKTI call for proposals that is open for international partnerships. His Indonesian partners clearly have the lead in this proposal and Heeres provided some input.

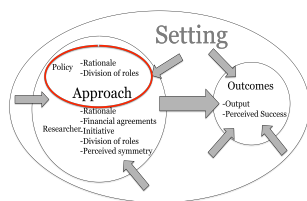
Heeres remarks the different kind of knowledge he and his Indonesian partners have. In experimental knowledge the Indonesian partners can learn from the Dutch. Because the research infrastructure in Indonesia is less developed, their expertise in experimental research is also less. However in theoretical knowledge and creativity the Indonesian partners are comparable. Hereby Heeres states that he only wants to cooperate with the Indonesian top institutes because other universities are of significant reduced quality and focus primarily on their educational tasks.

The high level of the partners is mentioned as a reason to cooperate. However Heeres states that for high quality scientific output the USA would be the preferred partner. The research group is accounted for its publications and impact, however this is personally less important for Heeres. The cooperation with Indonesia is above all very interesting, fun and very inspiring for biomass research. Heeres indicates that he has email and Skype contact on a regular basis and he travels to Indonesia 3-4 times per year. The real life meetings are said to be essential for a successful cooperation.

In chemical research the research infrastructure in terms of equipment and the availability of chemicals, is very important. This is clearly less developed in Indonesia and that is also the reason the cooperation is not perceived as entirely symmetric. Asymmetry in funding is the other important reason for the perceived asymmetry of the cooperation. Based on the current investments in research infrastructure in research cooperation Heeres thinks that the cooperation is and will be increasingly symmetric, however there is still a long way to go.

Source: This box is based on the interview with prof. dr. ir. Erik Heeres and the chapter on this project in the 10 years SPIN booklet.

5.2 Dutch policy approach



The Dutch policy approach to cooperation with Indonesia is, after a general section further discussed by the dimensions of the policy approach from the conceptual model, the Rationale (5.2.1) and the Division of roles (5.2.2).

An inventory of the policy instruments used by the Dutch government to stimulate STI cooperation with third countries shows that 7 out of the 35 instruments aimed at STI cooperation are designed specifically for cooperation with Indonesia. That is the most after China (which has 11 instruments). Largest of which in terms of funding budgets is SPIN (Scientific Programme Indonesia-Netherlands) led by the KNAW. SPIN had a total 8,235 million euro available for cooperation between Indonesia and the Netherlands in the period 2007-2011. Other instruments are for example the Academy Professorship Indonesia (API), also coordinated by the KNAW and mainly aimed at capacity building and the Bilateral Energy Cooperation Indonesia-Netherlands (BECIN), which focuses on joint R&D and capacity building.

Two MoU's are signed between the Dutch and Indonesian ministers. The first was signed in October 1992 between the Dutch minister of Education, Culture and Science (OCW) and the Indonesian minister of Research and Technology (MoRT or Ristek) and National Education. The second MoU was signed in 2002 and was also between the ministers of OCW and Ristek. At a lower level the Indonesian Academy of Sciences (AIPI), the Indonesian Institute of sciences (LIPI), NWO and KNAW together signed a new MoU for scientific cooperation in 2004, encompassing existing MoU's between the individual organisations or their sub divisions. Under this MoU, the parties aim:

- To increase and strengthen scientific research cooperation between scientific institutions from Indonesia and the Netherlands in an efficient, collaborative and focused manner, making use of each others' existing (international) scientific networks and infrastructure; and
- To promote long term scientific capacity building, sustainable scientific networks and partnership, knowledge transfer and dissemination of science. (KNAW, 2012b)

The signing of a 'Comprehensive Partnership' in 2010 with president Susilo Bambang Yudhoyono could not take place because the Indonesian president cancelled his state visit to the Netherlands after the Republic of the South Moluccas demanded his arrest. (De Volkskrant, 2010)

For this case study, the focus will be on the SPIN programme because it is the oldest and largest Dutch research-funding programme aimed at the scientific cooperation with Indonesia. SPIN is a KNAW programme specifically aimed at promoting and facilitating research cooperation between the Indonesia and the Netherlands. Most important thereby is the funding of joint research projects. Researchers can apply for SPIN funding by submitting a research proposal to a SPIN call for proposals that are announced every couple of years. A committee assesses the entered proposals of all the researchers on the quality and other criteria described in the call for proposals. The researchers with the best proposals are granted with a research funding of about €100k - €800k depending on the available budget and the number of granted proposals. The budget covers the travel costs, sometimes the cost of equipment, but most importantly the salary of the research team. The Dutch-Indonesian research team generally consists of one or two professors or senior researchers that are the main applicants and have a supervising role, a research coordinator, and a number of post-docs and PhDs that perform the actual research.

SPIN had three rounds of funding, which started in 2002, 2005 and 2011. The first round of 25 SPIN research projects covered the following five 'priority programmes': Indonesia in Transition, Islam in Indonesia, Infectious Diseases, Biotechnology Research and Applied Mathematics. Later two more themes were added, namely: Legal Research and Coastal Zone Research. The latter is the precursor of the East Kalimantan Programme in cooperation with NWO. This first round was mainly

dedicated to PhD's from Indonesia and the Netherlands and post-docs from the Netherlands. This first phase was later reinforced with a Mobility Programme for short-term training and exchange activities.

In 2005, a second round commenced with six 'integrated priority programmes' of which two in cooperation with NWO. The fields of science were: Social Sciences and Anthropology, Chemical Technology (Bio-refinery), Agriculture and Biotechnology, and Medical Sciences. The two programmes in cooperation with NWO are the earlier mentioned East Kalimantan Programme on coastal zone research and Agriculture Beyond Food, which takes a multidisciplinary research approach on Bio-based resources (start: 2009). Next to the six 'Integrated Priority Programmes' the second round comprised of a Post-doc Programme (31 post-doc's in 2005-2011) and a Mobility Programme for network building activities and short-term training and exchange activities.

The third round is from 2011 to 2016 and has a focus in three themes: Food, Non-Food and Water Research; Social and Economic Development and: Infectious Diseases and Health. A total of nine joint research projects received funding, three in each theme. In each project two 4-year PhD positions and one 2-year Post-doc position will be funded through SPIN. In most cases these are supplemented by DIKTI PhD Scholarships. The latter will be discussed in the Indonesian setting in section 5.5 of this case study.

In the themes of the latter funding round the influence of the top sectors is clearly visible. The themes are obviously related to the Top Sectors: Agro-food, Horticulture, Water and Life Sciences. At the 10 years SPIN symposium on June 19 2012, the Joint Working Committee (JWC) announced that they had been working on the draft of a new MoU. Thereby, chairman of the Indonesia Committee, Jos van der Meer, announced that (renewable) energy, also one of the Top Sectors, would again be one of the priority themes. Thus, for a possible round after 2016 we may expect more focus on (renewable) energy than in the previous round.

There seems to be another trend that is similar to the general policy trend, which is an increasing focus on multilateral projects. Interviewed policy makers indicated that for the cooperation with Indonesia, European initiatives such as the ASEAN-EU (Association of Southeast Asian Nations-European Union) and SEA(Southeast Asian)-EU-NET are becoming increasingly important. These are European funds that deepen the STI cooperation with Europe and Southeast Asia.

Following the conceptual model, the Dutch policy approach is further divided in the policy rationale and the division of roles, which will be discussed in more detail in the following two sections.

5.2.1 Policy Rationale

Indonesia is not one of the priority countries of the Dutch ministry of Economic Affairs, Agriculture and Innovation (**EL&I**). From the interview at EL&I it became clear that the priority countries are the ones where there are economic opportunities, political priorities and intervention is desirable, notably the BRIC countries¹³. From the interview at EL&I it became clear that countries like South Africa, and presumably Indonesia, might become of interest in a few years. The ministry uses the criteria of a reciprocal flow of knowledge in the selection of their partner countries. For now, the ministry perceives the cooperation with Indonesia as a net-knowledge flow from the Netherlands towards Indonesia, i.e. there is more knowledge flowing from the Netherlands to Indonesia than there is knowledge flowing back. When the cooperation meets their criteria of a reciprocal knowledge flow the cooperation would become

¹³ EL&I's focus countries are: Brazil, China, Germany, France, India, Israel, Japan, Russia, Singapore, US, Canada and South Korea. These are the countries in which an Innovation Attaché is placed.

economically interesting and viable. The interviewee at the ministry also mentioned that if they had more staff they probably would focus on these countries as well because it would be a smart investment for the future. However they have to focus because of the limited resources they have.

The Dutch ministry of Education, Culture and Science (**OCW**) did not sign a new MoU with the Indonesian ministry of Research & Technology (Ristek) because, as stated in the interview with the ministry: *“To continue a MoU requires the fiat of all the parties involved, it is then easier to just continue the budgets.”* So that is what the parties did in 2010. It remains unclear whether this has to do with the cancelled state visit in 2010. From the same interview it became clear that the rationale of OCW to cooperate with Indonesia used to contain an element of capacity building. However, the rationale has changed to scientific advancement and the Dutch self-interest has become more important. The cooperation has to be beneficial for both parties. This relates to the increase in scientific quality of Indonesian institutes as observed by the interviewees at OCW. The perceived benefits for the ministry are scientific advancement of Dutch research and the access to (human) resources. In return *“We have a lot to offer in the field of knowledge and innovation in themes such as water and agriculture.”* (Francien Heijs, OCW).

For the Ministry of Foreign Affairs (**BuZa**), Indonesia remains one of the fifteen partner countries in development cooperation for the period 2011-2015 (Min. BuZa, 2011). Of those fifteen countries Indonesia is earmarked as one of the four countries with a healthy economical growth, together with Bangladesh, Ghana and Kenya. Indonesia is also seen as a strategic partner, which means that cooperation does not only have to be in the form of development aid, but can have benefits for the Netherlands as well. The reason for BuZa to cooperate with Indonesia are: Connection to the themes Water, Food Security, Sexual and Reproductive Health and Rights, and Safety (all four focus themes of BuZa); special relationship with the Netherlands and a good positioning for Dutch businesses; corruption is a cause of concern; reasonably good contribution to their own development (taxation) and broad interest in the Netherlands. (Min. BuZa, 2011)

KNAW is an independent organisation with its own strategy. They are however dependent on the budgets of OCW for the cooperation with Indonesia. The rationales for the cooperation with Indonesia that are stated in the **SPIN** mission statement are: *“It allows Indonesia and the Netherlands to take advantage of the scientific, human, natural and other resources available in both countries and to maintain and set up new research networks.”* (KNAW, 2012a). The aims formulated are:

- to promote long-term cooperation between Indonesian and Dutch research groups;
- to prevent fragmentation in scientific pursuit;
- to work efficiently, collaboratively and with focus on building critical scientific mass;
- to help foster scientific curiosity and academic scholarship in Indonesia;
- to create public awareness and recognition of the importance of basic and strategic science in Indonesian and Dutch society;
- to help develop and consolidate multidisciplinary knowledge networks in the Netherlands focusing on Indonesia.

Rudi Trienes, team leader International Relations Department KNAW, stated in an interview for this study that the main criterion for cooperation of the KNAW is scientific excellence. *“With Indonesia this would not be feasible in the field of material sciences, since Indonesia is not that scientifically advanced. However for the social context this is no problem. The added value in Indonesia is in the amount of material there is available.”*

First phase was mainly dedicated to PhD students and post-docs from the Netherlands and Indonesian PhD students. SPIN (2005-2011) has been designed with a view to

strengthening the S&T capacity building component of the programme (KNAW, 2012b) and according to the KNAW itself *“The Scientific Programme Indonesia-Netherlands has led to scientific capacity-building in Indonesia.”* (KNAW, 2010). In the current policy, capacity building has a less prominent role. From the interview at KNAW it became clear that the altruistic auxiliary objective that is applicable for African countries used to be part of the cooperation with Indonesia as well. Although this has changed in KNAW’s policy on Indonesia, there is still an element of capacity building. Trienes: *“We still give a bit more than we get back.”*

Summary of the policy rationales for Indonesia:

- Help Indonesia with capacity building, decreasing in importance;
- Scientific advancement of Dutch research;
- Access to human resources;
- Access to unique sites
- Historic ties, decreasing in importance
- Access to new markets

5.2.2 Policy - Division of roles

Top sectors play an increasingly important role in the Dutch cooperation policy with Indonesia. However since EL&I states that Indonesia is not (yet) a focus country, the cooperation cannot be regarded as purely under the influence of Top Sectors. Mutual benefits did however become more important during the 2000’s. According to the SPIN mission statement *“The programme is based on the principles of reciprocity and mutual benefits”* (KNAW, 2012a). From the interview with the SPIN programme leader at KNAW it became clear that although this is indeed their mission, in practice capacity building still plays a role in the cooperation. Under the guidance of the Joint working Committee (JWC), research themes are chosen that are in the interest of both countries. This is thus demand driven cooperation from both countries.

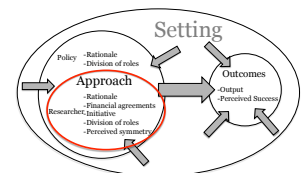
5.3 Dutch researcher approach

The second part of the Dutch approach is the researcher level of the approach. This section is divided in five sub sections, each covering one of the dimensions of the Dutch researcher approach. Since this case study elaborates on the KNAW SPIN programme, the researcher approach is predominantly based on interviews with researchers that are active in a joint research projects funded by SPIN, including the programmes in cooperation with NWO, East Kalimantan and Agriculture Beyond Food.

5.3.1 Rationale

Often-mentioned reasons by researchers active in SPIN-funded research projects to cooperate with Indonesian scientists are:

- Access to complementary skills and knowledge. This is usually the local knowledge on problems, regulations and the public debate. Skills in local languages are an important asset of Indonesian researchers that makes the cooperation very valuable for the Dutch.
- Access to data and make use of the network that the local researchers have.
- Access to unique sites. One could argue that in order to do research in unique sites, international cooperation is not necessary. In the past, local partners were less often involved in this kind of research. However, the Indonesian government realised that Indonesia could benefit better from the research performed in their country and made its immigration rights more rigid. Researchers now have to go



through extensive procedures and are only allowed to do research when this is in cooperation with local partners. To most Dutch researchers this is not seen as a difficult restriction. In addition to the benefits that cooperation with local partners brings, they also really prefer to do the research in cooperation because since it otherwise would give them a “*neo-colonial feeling*” as Researcher L phrased it.

- Access to complementary knowledge. In Indonesia this is usually the access to the local knowledge.

Access to unique sites (and populations) has always been an important reason for Dutch scientists to do research in, and in cooperation with, Indonesia. Capacity building was more important for researchers in the 90's- early 2000's. Capacity building, for instance in the form of setting up a faculty in an Indonesian university, has become less important. Capacity building is not the main reason to cooperate anymore, but in many cases still a ‘by-product’ of the cooperation.

5.3.2 Financial agreements

Most joint research projects between Indonesia and the Netherlands are funded with Dutch resources only. SPIN is a Dutch programme and the Dutch government funds the joint research projects. In that sense there is a sponsor recipient relation between the Netherlands and Indonesia.

However, the Directorate General of Higher Education (DIKTI) of the Indonesian Ministry of Education (MoEd) started investing in the cooperation as well. In 2011, 50 DIKTI PhD scholarships are officially linked to the SPIN programme. This ‘matching’ of Dutch funds by the Indonesian counterpart implies that PhD's from Indonesia are no longer dependent on Dutch funding for their mobility. More Indonesian PhD's are now able to obtain their degree in the Netherlands. In most joint research projects that run from 2012 to 2016, the two PhD's and one post-doc position will be supplemented by a number of DIKTI PhD scholarships. (KNAW, 2012a)

In addition to the funding of Indonesian PhD's, the Indonesian government started to fund research projects as well. This instrument is not specifically aimed at cooperation with Dutch researchers, but it is open for joint research with a foreign partner. In this case funding arrangements are reversed, i.e. Indonesia becomes the sponsor and the Netherlands the recipient. Even though there are not many cases known of this construction, the Indonesian investments are a sign of increased reciprocal flows of funding.

With a joint research fund such as SPIN, funding is made available for researchers in the Netherlands as well as in Indonesia, which makes it relatively easy to find research partners. Also with additional research funding one can hire another researcher to do part of the research, this is the so-called ‘contract research’. For Dutch researchers who do not have extra research budgets at their disposal, for instance PhD students who are only granted a salary and expenses, it is sometimes harder to find research partners. In the latter case both researchers have to benefit from the scientific output of research cooperation, for instance when researchers have to do research in the same field and forces can be united. In Indonesia it can be problematic to find partners that are willing to cooperate in such modality because of the dependence on external funding to do research.

Researcher G mentioned the difference in the dependence on Dutch funding between publically funded research institutions and private research institutes. The experience of a number of Dutch researchers is that those Indonesian universities that rely on public funding often do not have the funds available to carry out extra research and publish their work. For this, they rely on additional funding from other sources or they are too occupied with their teaching tasks. This is particularly true for universities further away from Jakarta, the political and economical heart of Indonesia. Internationally operating institutions like the WWF also receive external funding for

their research and are therefore less dependent on Dutch research funding in the cooperation. Researcher G noted that a compensation of the expenses is usually sufficient in this case, as opposed to universities that sometimes tend to look for additional funding rather than shared research benefits.

5.3.3 Initiative

Researchers indicate that the initiative to cooperate usually lies with the Dutch researchers. Dutch researchers are driven by their interest in the research subject and the global or local problems and search for a partner to do research with. From the sample in this study the majority of the Dutch researchers knew their partner before the cooperation or had connections with their partners through their seniors.

It appears that the initiative usually lies with the party in which country the research is funded, this party takes the lead in the cooperation. This has always been the Netherlands. However since RISTEK started funding research projects as well the initiative for those research projects lies with the Indonesian partner as can be read in the example in Box 1. The Dutch scientist is then invited to join the project. The role of the Dutch researchers in these collaborations also changes with the initiative. More about the division of roles is described in the next section.

5.3.4 Division of roles

Based on the interviews it became clear that the division of roles between Dutch and Indonesian researchers usually lies in fieldwork for the Indonesian party and the integrated multidisciplinary research for Dutch researchers. Dutch researchers usually manage the research since funding comes from this side. That entails that the translation of the fieldwork data to meaningful input for the socio-economic debate also is the responsibility of the Dutch researchers. Indonesians have more local knowledge and are therefore the logical party to do the fieldwork. Dutch researchers tend to have more general knowledge of similar cases in other regions. It is therefore that the Dutch researchers integrate the local data into the bigger picture and compare Indonesia with other regions.

As mentioned before, the role of the Dutch researcher changes when the one who takes the initiative changes. Whenever the Indonesian government funds a joint research project, the initiative in the cooperation moves from the Dutch, to the Indonesian partner. The division of roles thereby changes. The Dutch partner no longer has a leading role in the research design and coordination but takes an advisory role and provides the Indonesian partners with feedback.

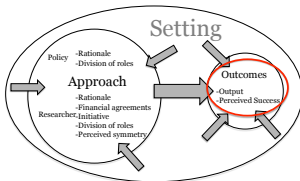
5.3.5 Perceived Symmetry of the cooperation

Not all researchers in the sample for this study perceive the cooperation as symmetric. Some state that if it remains a sponsor-recipient division –i.e. Indonesia remains dependent on Dutch research funding- it will never be an equal cooperation. Others state that since the Dutch learn so much and use the Indonesians local knowledge, this can be called reciprocal learning and cooperation on equal footing.

Researcher F expressed dissatisfaction about the inequalities in the Dutch funding structure. The Dutch PhD receives a full contract while the Indonesian PhD only receives a grant, which comes down to a fraction of the funding of the Dutch PhD. Researcher A stated that cooperation became more equal now DIKTI is funding the Indonesian PhD's.

Based on the rationales to help the Indonesian partner capacity building, the unequal investments in research cooperation, the predominantly Dutch initiative to cooperate

and the role of the Dutch as managers, Indonesia and the Netherlands are not considered equal research partners in this study. However in some dimensions there are signs that this is changing. For instance capacity building is has moved to the background as a researcher rationale and Indonesia has started to increase their investments in STI and STI cooperation. Thereby the Dutch also learn from their Indonesian partners, the relation can therefore not be described as merely a knowledge flow from north to south.



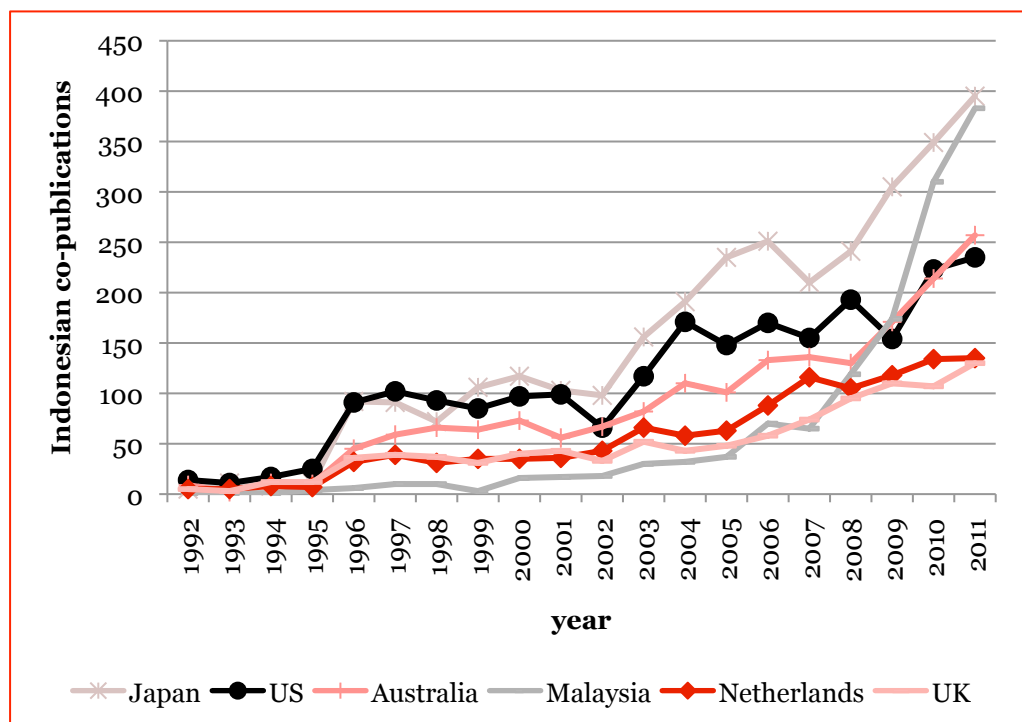
5.4 Outcomes

This section discusses the outcomes of Indonesian-Dutch STI cooperation. Following the conceptual model, the two dimensions are Output (5.4.1) and Perceived success (5.4.2).

5.4.1 Output

Of the Dutch co-publication partner countries of all time, Indonesia ranks 36th, while the Netherlands ranks fifth as co-publication partner of Indonesia - after Japan, United States, Australia and Malaysia. The number of Dutch-Indonesian co-publications almost tripled between 2000 and 2011. This is still a smaller increase than other countries in the selection, but larger than for instance the US. (Scopus).

Figure 6 Indonesian co-publications with top-6 partners



Source: Scopus, 2012

Figure 6 displays the trend in the number of Indonesian-Dutch co-publications. Remarkable is that between 1992 and 1998 there are still co-publications reported. Despite the earlier mentioned 'frozen' relationships, it must have been possible for researchers to do write joint publications despite of the political measures. Indonesia's other top-6 co-publications partners are also displayed in the graph. Malaysia has clearly overtaken the Netherlands in importance. Japan is still Indonesia's number one partner. From the figure it seems that Indonesia has an increasing regional focus.

In the sample for this study there were no patents or co-patents as a result of the research projects in which the researchers were involved. There were however co-publications. In an international co-publication, as in every co-publication, the place of the author as first, second, third, etc. author is decided on the scientific input that was given for the specific paper. When a partner only supplies data, they are more likely to be mentioned in the acknowledgements and not as an author. Interview data suggests that there are more co-publications now than before, however, not all the publications that follow from a project are co-publications. Bibliometric data confirms that there is an increase in Dutch-Indonesian co-publications. The co-publications between Dutch and Indonesian authors in all fields of science went from 35 in 2000 to 135 in the year 2011. As mentioned before, this is a relatively slow growth.

Another output that was mentioned in almost all the interviews for this case, is the organisation of a workshop, congress or other dissemination event. Capacity building and knowledge sharing are important goals in these events.

5.4.2 *Perceived success*

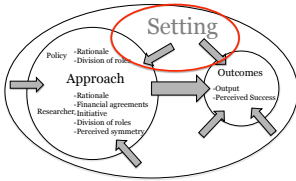
The Dutch researchers that were interviewed for this case study perceive the cooperation with Indonesia as successful to very successful. The reasons for their enthusiasm differ, but generally they state that without their partner the research could not have been carried out. Working with their Indonesian counterparts allowed them to get the data they were looking for, in an efficient manner. Successful co-publications were written and congresses are held. But also the promotion of an Indonesian PhD at a Dutch university is regarded as a success. Also when the promoted returns to an Indonesian university (which almost all do) this has been a success in terms of knowledge- and network building.

There are also barriers that make cooperation harder and less efficient. In general, the barriers make the cooperation more time consuming, but are almost never insurmountable. Obviously the geographical distance between the research partners is perceived as a barrier that cannot be solved by e-mail and Skype alone. To carry out research in cooperation, the Dutch researchers feel a strong need to be present in Indonesia because it is found very difficult to make agreements from abroad. However, travelling there is time consuming and expensive, especially to the rural regions.

The interviewees also mention cultural barriers that influence the process of the research. According to multiple interviewees the hierarchy is much stronger in Indonesia, which makes the Professor less approachable for the PhD's and common discussions are rare. Related to this is the different style of education. In the Netherlands, professors and students are used to a learning culture, where in Indonesia it is typified as teaching. Compared to Dutch PhD's, the Indonesian PhD's adopted a less independent way of operating and own vision is less present in their research design.

In the case that a research project is perceived as less successful, the reason is usually the perceived inequality of the cooperation. In these specific research projects the Dutch researchers mention the dependence on Dutch funding and limited scientific input from Indonesian counterparts as factors that have a negative influence on the perceived equality. The latter could be explained by the approach of the Dutch researcher, says Researcher F. He noticed that some colleague researchers write almost the entire research proposal without a decent discussion with their Indonesian partners on the direction and the goals of the research. Since the Dutch researchers have not included the partners sufficiently in the design of the research, it is not surprising to him that the Dutch researchers are dissatisfied with the inputs of their Indonesian counterparts during the project. More researchers referred to themselves

5.5 The Indonesian setting



The Dutch policy and researcher approach to cooperation with Indonesia and the outcomes of the cooperation have to be placed in a case specific context to fully understand how they are connected to each other and influenced by external factors. The external factors that have an influence on the cooperation are considered changes in the broader setting of the cooperation. In this section the developments in the broader setting and the Indonesian perspective of the cooperation are discussed. A subdivision is made in the Indonesian economy, the Indonesian STI system and the perspective of the Indonesian researcher.

5.5.1 The Indonesian Economy

Indonesia suffered from the Asian financial crisis in 1997 of which it had to recover in the years after. The World Bank (2012) rates Indonesia as a lower middle-income country. The economy is growing steady with 6,5% in 2011 and is the largest economy of Southeast Asia and one of the six largest developing country economies. This has elevated Indonesia to G20 status. Indonesia is recognised as one of the BRIICS¹⁴ by the OECD. Still, estimates are that around half of the population has to live in poverty. Indonesia started their transformation to democracy in 1999 and is now one of the most democratic countries in the region. (Ministerie van Buitenlandse Zaken, 2012).

5.5.2 The Indonesian STI system

The total government budget allocated for R&D doubled between 2005 and 2010 to 1.9 trillion Rupiah, which is however still less than one percent of the total government expenditure. Indonesian President Yudhoyono announced that the government will continue to increase the budget to reach an adequate figure. (SEA-EU-NET, 2012). This is in line with the vision of Ristek: “*To establish Science and Technology as the main force for sustainable prosperity and the nation's civilizations*” (Ristek, 2012a).

Ristek's vision is translated in the following six mission statements:

- To place Science and Technology as the basis for the policy of national development in achieving sustainable prosperity;
- To build ethical foundation for the development and implementation of science and Technology;
- To create solid national system of innovation for increasing the global competitive ability;
- To increase Science and Technology diffusion through the consolidation of the network of its actors and institutions, including the development of its mechanism and institutionalization of its intermediary;
- To build quality and competitive human resources, infrastructures, and institutions for Science and Technology;
- To create smart, creative, and competitive Indonesians in a Knowledge Based Society.

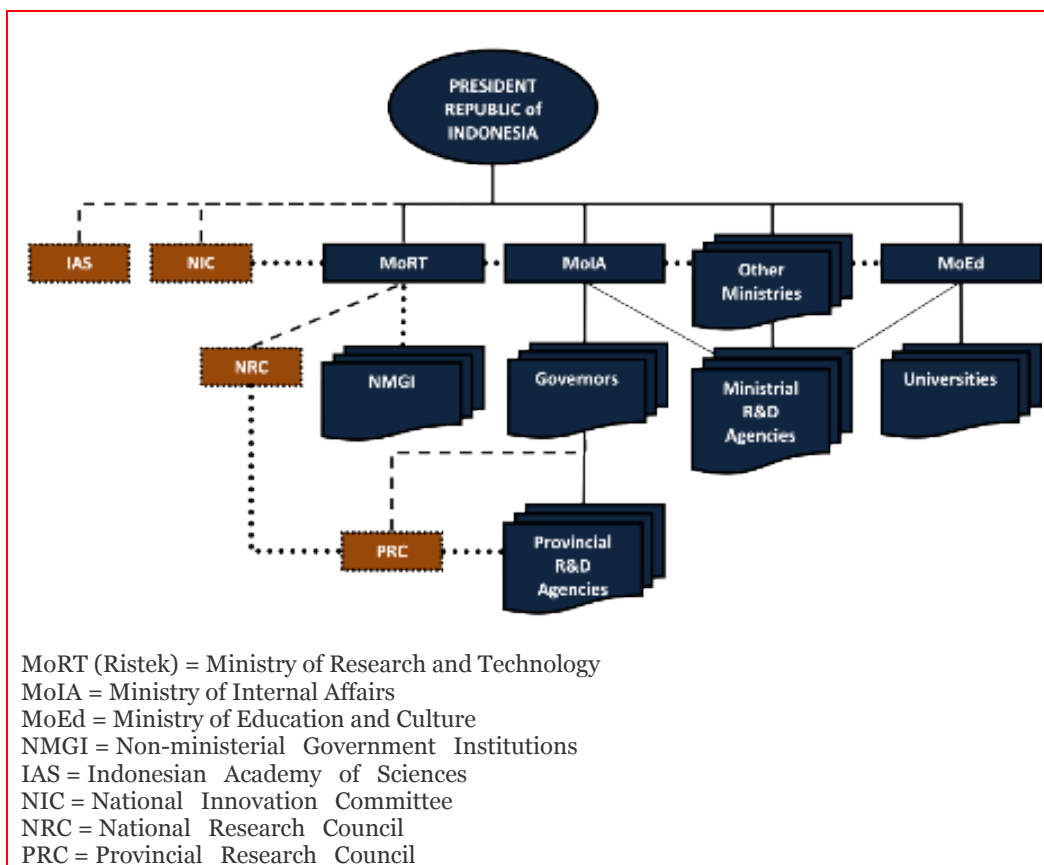
The efforts are focussed in what Ristek calls the ‘Six Focus Programs’. These are: 1) development of food security, 2) generation and utilization of new and renewable energy resources, 3) development of transportation technology and management, 4) development of information and communication technology (ICT), 5) development of

¹⁴ BRIICS refers to Brazil, Russia, India, Indonesia, China and South Africa. BRIICS is the addition by the OECD to BRIC, the new high-growth emerging economies.

health and medicine technology, and 6) Development of defence technology. (Ristek, 2012b)

These six focus programmes partly match the three themes of recent calls in the SPIN programme. 1) And 2) are reflected in 'Food, Non-Food and Water Research. 5) Matches with the 'Infectious Diseases and Health' theme. The other SPIN theme, 'Social and Economic Development' does not have a direct link, but inherently is in Indonesia's interest. Transportation, ICT and defence technology are not included in the SPIN themes. About this the Indonesian State Minister of Research and Technology (Ristek), Gusti Muhammad Hatta commented: *"Over the past decades, Indonesia has defined scientific themes and challenges that should receive priority in scholarly attention and funding. RISTEK is pleased to note that many of the themes pursued within the SPIN collaboration meet the national scientific agenda to strengthen the National and Regional Innovation System in Indonesia. The concerted effort of Indonesian and Dutch scientists within SPIN is helping Indonesia to create knowledge-based solutions to scientific as well as societal challenges."* (KNAW, 2012a)

Figure 7 National linkages among R&D-related institutions



Source: Lakitan, 2011

International STI cooperation is not explicitly in the mission, nor the focus programs. However one of the S&T support programmes of Ristek that concentrate on the development of new technologies does have this international focus. This is the Indonesian International Joint Research Program (RUTi), which task it is to fund research by Indonesian scientists in bilateral projects with foreign partners. (SEA-EU-NET, 2012)

Figure 7 shows the Indonesian ministries and other institutions concerned with STI and how they relate to one another. The Ministry of Research and Technology (Ristek

or MoRT) is the party that signed the MoU in 2002 with the Dutch Ministry of OCW. Ristek is the main, but not the only ministry concerned with STI policy. These are the ministry of Internal Affairs, the Ministry of Education and other ministries as well. There are a large number of Ministerial research institutes, which are placed under some of the other ministries and seven Non-ministerial Government Institutes that are coordinated by Ristek, including the Indonesian Institute of sciences (LIPI). The Indonesian Ministry of Education (MoEd) houses the Directorate General of Higher Education (DIKTI) that among other things provides the PhD-scholarships and is concerned with the universities. (Lakitan, 2011).

Indonesian PhD's that are granted a DIKTI PhD scholarship usually return after their PhD to teach or start a research group at an Indonesian university. *"This is not a rule per se, but more of an urgent request from the DIKTI"*, as Researcher A, professor and promoter of Indonesian PhD's, stated in an interview. MoEd has a clear focus and agenda with these scholarships. *"Training the next generation of Indonesian scientists is one of the cornerstones of the further advancement of Indonesia. Towards this end, the Republic is making available a substantial budget for PhD training abroad."* (KNAW, 2012a). The goal is thus the capacity building of Indonesia. This way DIKTI works on the capacity building of the Indonesian STI system. This has advantages as well as disadvantages for the Dutch research institutions. Disadvantages are that an institution loses a staff member in whom they invested a lot of time. However when the Indonesian researchers go back to work in Indonesia, they are often regarded as valuable and close contacts for future cooperation. Thereby they benefit financially from each PhD that promotes at their university.

Indonesia's scientific output in terms of papers rose with 466% between 2000 (605) and 2011 (2820). That is more than the Netherlands, which doubled its yearly publications in this period¹⁵. Interviews with Dutch policy makers and researchers suggest that the quality of research has increased in the period under study. Despite this growth, the Indonesian publication output is still relatively low. The absolute number of Indonesian publications stays behind the other countries in the selection. Researcher F relates this phenomenon to the lack of scientific research- and publishing culture in Indonesia. The need to publish in high impact journals is smaller because, unlike in western countries, a scientist is not judged on his publication output. Since the recent introduction of a valuation system, publishing has become more important. ITB receives money for each international publication now there is a scoring system introduced. They now receive money for each international publication. However, a cultural transformation, such as this one, will take time. Lakitan (2011), deputy minister for S&T institutional affairs, sees the very low scientific publication from Indonesian R&D institutions as one of the indicators of a limited horizontal substantial communication. Indonesia has a very vertical, hierarchical and formal reporting system. *Changing this working culture is obviously a serious challenge.*" (Lakitan, 2011).

There are about 150 Indonesian Universities with –according to the interviews- a large range in quality. The most prominent universities and institutions according to the interviews and international university rankings (Quacquarelli Symonds, 2012) are the University of Indonesia, University Gadjah Mada (UGM), Institute of Technology Bandung (ITB) and the Eijkman Institute of Molecular Biology. These are also the universities that are often mentioned as research partners by Dutch researchers in the sample for this study.

As briefly mentioned in the Dutch Researcher Rationale section, one needs a research permit from the Indonesian immigration to do research in Indonesia as a foreigner. This is only granted when the research is done in cooperation with a local partner. This is a policy measure that was issued because foreign researchers used to perform

¹⁵ Based on a Scopus search on country for those years.

their research in Indonesia without sharing the benefits of this research with Indonesia. Through this measure Indonesia attempts to learn and benefit from the research performed there. In their own wording: *“These provisions are not intended to hamper research and development by foreign university, research and development institute, entity or person in the territory of the Republic of Indonesia, but to protect the people, nation and state from any potential harms that may ensue from such research and development activities.”* (Ristek, 2012c)

5.5.3 The Indonesian researcher

Since the research themes usually include local problems, there have to be other reasons to cooperate with Dutch partners. The input for the Indonesian perspective comes from three main sources: 1) The interviews with Dutch researchers and what they think the reason for their partner is to cooperate with a Dutch partner, 2) the informal chats with Indonesian researchers, mainly during the ‘10 years SPIN’ event on June 19 2012 and 3) from quotes from interviews performed by others (see KNAW, 2012a).

The rationales for Indonesian researchers to cooperate are:

- Access to funds from Dutch institutions / programs.
- Solve lack of resources.
- Preferential attachment / career advancement.
- Western point of view on local problems.
- Additional expertise

These reasons to cooperate are not characteristic or exclusive for cooperation with Dutch researchers, but can hold for researchers from other (western) countries as well. As could be seen in Figure 6, the Netherlands was and is still an important research partner in terms of co-publications. The focus however seems to be shifting towards Malaysia, which made a jump in co-publications from a shared sixth place with Germany in 2007 to a second place just behind Japan in 2011. (Scopus, 2012). Indonesia is looking further than the Netherlands for cooperation in STI. Multiple interviewees declared the shared history is losing importance and thereby the strength of the ties between Indonesia and the Netherlands is decreasing. Moreover, interviewees hear from their Indonesian partners that the current political climate in the Netherlands and its growing anti-Islamic image prevents Indonesians from going to the Netherlands.

Researcher L stated that more Indonesians speak English and that the average level of English has improved over the last ten years. This means that communication and cooperation is now easier than it used to be. Researcher L thinks the improved level of English is due to the upcoming and increased availability of Internet and thereby the access to English content. Other interviewees do not mention this trend and say the level of English has always been good or sufficient.

5.6 Case conclusion

This case study aims to answer the question: *How has the Dutch approach to STI cooperation with Indonesia and in particular within the SPIN programme changed from 2000-2012?*

To answer the question, this section discussed the Dutch approach from a policy and a researcher perspective. As Indonesia develops and the shared history is becoming less important, capacity building is becoming less important for Dutch policy makers. Thereby the focus has become less on development aid and more on the mutual benefits of the cooperation between Indonesia and the Netherlands.

For Dutch researchers the access to unique sites has always been an important reason to cooperate with Indonesian researchers. Thereby the value of the local knowledge seems to be better appreciated now than before, when capacity building used to be one of the main reasons to cooperate. Indonesia has a fast growing economy and has more funding available for research and research cooperation. Although joint research projects are still predominantly funded by the Dutch government, a shift can be seen towards increased funding from the Indonesian partner by providing research grants within the projects. With the increased availability of funding also comes an increased initiative from the Indonesian researcher. However also the initiative to cooperate is predominantly Dutch. Apart from a leading role, the integrated and multidisciplinary research is still mainly done on the Dutch side. However, Dutch researchers are learning more from their partners than they used to do. More papers are co-published, although the real research and publishing culture in Indonesia is still in its infancy. None of the researchers in the sample perceive the cooperation with Indonesia as entirely symmetric, mostly because of the asymmetry of the issues above. The input of local knowledge of the partner and the changing dimensions however has a positive effect on the perceived symmetry.

Based on this study the policy approach and the researcher approach are both steadily changing in the same direction. That is looking for opportunities for research cooperation with more equal flows of funding and knowledge and thereby being realistic that Indonesia cannot meet those requirements to complete symmetry yet.

All in all, together with Indonesia itself, the Dutch approach to cooperation with Indonesia is in transition. The scientific developments are expected to follow the economic developments, however until then the scientific and experimental knowledge flow is predominantly from the Netherlands to Indonesia. The knowledge that flows from Indonesia to the Netherlands is predominantly local knowledge. Especially in fields like bio-fuels the cooperation with Indonesia is very interesting for Dutch researchers since Indonesia has a rich biodiversity. From a top sector perspective Indonesia is interesting to cooperate with, since research in a number of themes including bio-fuels is relevant in Indonesia. However it is not yet developed enough for EL&I to participate from an economic perspective.

On the basis of Indonesian-Dutch co-publications one could conclude that Indonesia is not developing very quickly, since the number of co-publications is not increasing fast. Dutch researchers indicated that this must have to do with the lack of a 'research culture' in Indonesia. However the co-publications with other countries, notably Malaysia, does show a significant growth. A more probable explanation is then that the historic ties between the Netherlands and Indonesia are decreasing in importance and Indonesian researchers have a more regional focus. Thereby the Netherlands has not made significant additional investments in the cooperation, something Malaysia probably has. The latter would be an interesting relation to study in further research.

Dutch policy makers seem to hold on to what they always have done, investing in research cooperation with Indonesia. However the historic ties and the urge to 'help' Indonesia is decreasing. Therefore they search for research relationships with more equal flows of funding and knowledge. Indonesia on the other hand, just started to make investments in their STI system, but still predominantly leans on foreign investments for their international STI cooperation and cooperates where they can get that. The research is almost in all cases on a local Indonesian problem or plant, which is also in the Dutch interest. Indonesia on the other hand has no interest in working especially with Dutch researchers for the Dutch context.

6. Case study JSTP - China

6.1 Introduction

China is without doubt the most developed country of the three case studies, however it is still a country in development and classified as an upper middle income country (The World Bank 2012b). China is, among other things, notable for being the most populous country in the world (over 1.3 billion people) and for its exceptional economic growth (avg. 11%/y in 2003-2007).

China and the Netherlands have a long history of scientific cooperation and a comprehensive set of instruments to foster current and future STI cooperation. From the overview of the Dutch STI instruments aimed at third countries (Appendix A) 11 out of 35 instruments are aimed at the cooperation with China. This is more than for any other country. The instruments include a number of MoU's with different Chinese ministries, networking and brokerage instruments, exchange and other mobility programmes, and joint research programmes (see Appendix A for an overview).

In this case study there will be specific focus on the Joint Scientific Thematic research Programme (JSTP). JSTP is one of the programmes with the largest funding and unique in the sense that there are seven Ministries and Science Academy stakeholders involved, three in the Netherlands, and four in China. The programme under study is JSTP. The programme runs from 2009-2014 and launches a new call for research proposals and for dialogue seminars each year. Researcher from China and the Netherlands can apply for JSTP research funding by joint proposals. JSTP Dialogue Seminars focus on networking and discussion on themes for future cooperation.

The Sino-Dutch STI cooperation and how this has changed over the years 2000-2012 will be further discussed in the following sections on the policy and researcher approach and the outcomes of the cooperation. Again, following the spheres in the conceptual model, including their dimensions. Thereafter the findings will be discussed with respect to the broader setting, i.e. for instance the influence of the economic growth in China on the Dutch approach to cooperation. Box 2 provides an example of a research cooperation that is funded through JSTP.

Box 2 Biochemistry research by dr. ir. Ronald de Vries

Dr. ir. Ronald de Vries is Group Leader Fungal Physiology at the CBS Fungal Biodiversity Centre in Utrecht. In 2010, the research proposal that he wrote with his Chinese partners was granted with JSTP research funding. The title of the research is: *Reducing the stringency of chemical and thermal treatments of plant biomass for bio-fuel production by developing more efficient enzyme mixtures*. The central research theme is to try to understand how fungi deal with plant-based substrates. The central question is how it is possible that fungi are so efficient in breaking down plant biomass, while researchers keep struggling with enzyme mixtures. De Vries has been working on plant cell degradation for his whole scientific career, "Bio-fuels are very important at the moment, so that is a nice label to relate the research to."

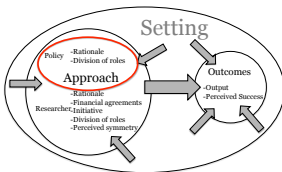
Besides the cooperation with China, de Vries is also cooperating with partners from the USA, Europe and Brazil. De Vries states that international cooperation is increasingly important because a large part of the developments in the field are in those countries. Thereby the competition for Dutch funds is increasing. For a new research proposal he is looking for cooperation with Chinese partners and a multinational industrial chemical party for a Public Private Partnership.

In 2010, JSTP offered a good opportunity to get research funding, however therefore de Vries needed a Chinese partner. At the time there was a Chinese PhD who had just left the research group of de Vries. "When the PhD had to leave after three months, he wanted to come back to do more research in Utrecht. This was when the JSTP just had a call for proposals, so I proposed the PhD to find us a Chinese partner and

promised him that if we would succeed, he could join the research team. That is how I found my Chinese partners. It really helps to have good connections, such as this PhD, to find the right partner in China”

Although it was a joint research proposal, de Vries states that still 80% of the work on the proposal was done in Utrecht. De Vries wanted to cooperate with this Chinese research group because they already had experience with a particular fungus. Both research group perform more or less the same research, however both with a different fungus. The research project is planned for four years. After every year the research groups come together to see if the combination of the enzyme mixtures they have each been working on is even more efficient than the individual mixtures. De Vries states it helps that the Chinese research group already had experience with the fungus they worked on, however the expertise in this field is hardly ever so specific that cooperation is essential. The same research would therefore also have been possible without the partner. However to do it alone would have given a delay and the research would possibly not have been executed at all.

De Vries mentioned that his Chinese partners have more money available for the equipment and instruments in their laboratory. *“Here in the Netherlands it is relatively difficult to raise funds for equipment. I have seen researcher there [in China] who, after their appointment, receive a couple of million [Euro] for the equipment of their laboratory. In the Netherlands that would be unimaginable”*



6.2 Dutch policy approach

This section discusses the Dutch policy approach to cooperation with China following the two dimensions, policy rationale and the division of roles. First the policy agreements will be briefly elaborated upon.

At the basis of the JSTP programme laid four memoranda of understanding between the Dutch ministry of OCW and the two Chinese Ministries and Academies. These are the Ministry of Science and Technology of the People's Republic of China (MoST), the Ministry of Education of the People's Republic of China (MoE), the Chinese Academy of Sciences (CAS) and, the Chinese Academy of Social Sciences (CASS) (also see the section 6.5.2 on the Chinese STI system). Besides JSTP the memoranda contain other agreements on joint research programmes, including the China Exchange Programme (CEP) on the exchange of researchers and execution of joint research projects and the Programme Strategic Scientific Alliances (PSA) that runs for 15 years and specifically aims on material science, biotechnology/medicine research and environmental research. OCW asked NWO and/or KNAW to execute these programmes (Rijksoverheid, 2012). These and other programmes aimed at STI cooperation with China can be found in the instruments overview in Appendix A.

As mentioned before, JSTP launches a new call for proposals with a new theme each year. The themes in the years 2009-2012 are respectively: *Integrated Water Management*; *Hybrid Conversion of Biomass*; *Medical devices for an Ageing Society* and: *Agriculture & Food: How to Feed the World?* The themes are also presented in Table 6 in the output section of this case. The influence of the Top Sectors themes is clearly visible in the research themes. From 2009 to 2012 the influencing Top Sectors are respectively Water, Energy, Life Sciences & Health and Agro-food. The themes are chosen by the Programme Committee, which is represented by NWO and KNAW (also on behalf of OCW) and the Chinese counterparts MoST, MoE, CAS and CASS. When determining the themes the representatives look for strong aspects of both countries and mutual benefits. Also in the coming years NWO will focus on the Top Sectors when choosing the themes (AWT, 2012b). The Dutch stakeholders and their policy rationales in cooperating with China will be further discussed in the following section.

6.2.1 Policy – Rationale

As mentioned earlier, China is one of two non-EU countries with which OCW has a bilateral agreement (the other is Indonesia). It can therefore be said that China is relatively important to OCW. From the interview with OCW stems that China is one of the countries where policy intervention has an added value in the STI cooperation. The goal of **OCW** is to promote sustainable research cooperation between Dutch and Chinese researchers. *“The country [China] is going through a rapid development when it comes to scientific research. The strengthening of the research relationships with China is therefore of great importance”* (Min. OCW, 2011).

In the interview for this study with OCW it was stated that there is a clear difference between China and Indonesia. The barriers in terms of language and culture in China are relatively high compared to Indonesia. OCW aims to decrease barriers where they can by setting up agreements and programmes. In this, OCW builds on a 30 yearlong relationship with China. Heijs, policy maker at OCW, also states in the interview for this study that the research cooperation with Indonesia used to include an element of capacity building, this is not the case in China.

In 2010 OCW introduced the first ‘Science Attaché’ to the network of Innovation Attachés of Agency NL. The Science Attaché is stationed at the Dutch embassy in Beijing to signal new developments in the Chinese science, build on the network with Chinese research organisations and institutions and represent OCW, NWO and KNAW in China. (Rijksoverheid, 2010)

EL&I predominantly has –as they have in all their collaborations- an economic and innovative interest in the cooperation with China. EL&I has no share in the funding of public research programmes such as JSTP, however it does have an important role in the STI relationship with China. From the interview at EL&I, as well as the policy agenda of EL&I (Min EL&I, 2012) it became clear that the international focus of EL&I lays with promising international markets where the added value of a policy intervention is the highest. Of the country cases in this study, China is the only one that is a focus country of EL&I. The fast growing and open economy of China also entails a large and growing market for Dutch business.

The economic opportunities and access to their market is the main rationale for EL&I to invest in cooperation with China. Other rationales to cooperate with strong countries mentioned in the interview are to transfer high quality knowledge to the Dutch parties in order to strengthen the knowledge position of the Netherlands and realise high quality innovation. Also the access to human resources is an important rationale. In all cooperation the connection to the Top Sectors is increasingly important.

BuZa ended the development cooperation with China 2003. The cooperation was completely phased out in 2008 with the finalisation of the last project (Min. BuZa, 2012). The only programmes that are performed with development cooperation recourses are on the one hand aimed at the strengthening of the rule of law in China and on the other on the preservation of the Tibetan culture in China (together 1,5 M€/y). Moreover, 2,1 M€ from the BuZa budget for Official Development Aid is used to finance the so-called Asia-facility for China. This subsidy programme was launched in 1999 with the goal to promote the knowledge cooperation between China and the Netherlands in human resource development. This programme is executed by Agency NL (Min. BuZa, 2012).

NWO and **KNAW** share the vision of OCW in the cooperation with China in **JSTP**, that is to promote sustainable research cooperation between Dutch and Chinese researchers. In the Dutch side of the cooperation NWO has the ‘back office’ function e.g. granting of proposals, and KNAW is the ‘front office’ with mainly networking activities.

In their strategic agenda, KNAW states that the cooperation with China will grow increasingly important since China aims not only to be the ‘world’s factory’, but also

one of the world's most innovative countries by 2020 (KNAW, 2010). Both from this strategic agenda as from the interview at KNAW it became clear that the cooperation between Europe and China is increasingly important. Since 2005, KNAW coordinates the multilateral network between Europe and China (FP6 CO-REACH project).

In the interview with Rudie Trienes of KNAW it was also mentioned that besides the focus on scientific quality, which is always the main criterion for KNAW, there is now a stronger focus than before on how the Dutch research can benefit from the cooperation with Chinese (and Indonesian) research groups. Another development that Trienes mentioned is that short-term programmes, such as 1-year mobility programmes, are no longer funded. The focus is increasingly on the long-term projects and integrated projects including for example mobility, joint research and seminars. This is fuelled by the demand from China, Trienes: *"We have to come with something big, because otherwise it is not interesting enough for China and they will move on to the USA"*.

The research proposals submitted to the JSTP calls are assessed on a number of criteria, including the following (NWO, 2011b):

- Challenging content;
- Innovative elements;
- Potential to make an important contribution to the advancement of science or technology;
- Quality of the research groups
- Added value of Sino-Dutch co-operation to the research project, including the complementary of the Dutch and Chinese research teams;
- The degree of inter-institutional co-operation between the project partners, and the prospects for long-term scientific collaboration beyond the duration of the research project.

The quality of the research is obviously of importance, as well as the added value of the partnership and the sustainability of the cooperation.

Summing up, the following policy rationales can be identified for STI cooperation:

- Scientific advancement (OCW, NWO, KNAW)
- Market Access (EL&I)
- Access to knowledge, increasing in importance (OCW, EL&I)
- Human resources (EL&I, BuZa, NWO)
- Networking / sustainable cooperation (EL&I, OCW, KNAW)
- Capacity building, decreasing in importance (BuZa, OCW, KNAW)

6.2.2 Policy - division of roles

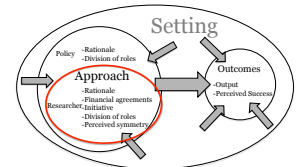
Although the political relation with Indonesia goes longer back in time than China, the cooperation with China is more often referred to as a long term and stable science relationship. Trienes, as opposed to Heijs, states that the cooperation with China used to have, and still has, an element of capacity building, although less eminent than with Indonesia. However both conclude that the current cooperation with China is based on reciprocity and mutual benefits. Jan Karel Koppen of NWO comments on the relation that on the one hand for China there is a lot of knowledge to gain in the Netherlands. On the other hand, China has many students and researchers of high quality, which is a giant pool of knowledge workers for the Netherlands.

In the relation between China and the Netherlands there is no sponsor-recipient division since the Chinese counterparts match all the Dutch investments in JSTP as well as in most other programmes. Also with the phasing out of BuZa's development cooperation, the Netherlands no longer has a role as sponsor. In the next section the funding arrangements will be further discussed.

From the perspective of the Netherlands, the research themes are increasingly influenced by the Top Sectors, which indicates the strategic financial interest the Dutch policy makers have in this cooperation. The Chinese have their strategic themes. The programme committee decides on research themes that are in the interest and benefit of both countries, there is thus no clear ownership or push from either side.

6.3 Dutch researcher approach

This section discusses the (changing) researcher approach to cooperation with China and on the five dimensions from the conceptual model, Rationale, Financial Agreements, Initiative, Division of roles and the perceived symmetry of the cooperation.



6.3.1 Rationale

Rationales for cooperation mentioned in the interviews are:

- Access to funding. This is a common rationale for researchers to work with Chinese partners. As explained earlier, the Dutch public research funding is getting increasingly scarce and there is more policy attention on international cooperation. Funds like JSTP demand a foreign partner. Not only is cooperating with Chinese partners a way to get access to Dutch funding, it is also a way to get access to Chinese funding outside the Sino-Dutch programmes like JSTP. (Also see the following section 'Financial agreements').
- Network building. Although from the evaluation of JSTP it appears that the majority of the cooperating researcher knew each other prior to the research, from the interviews for this study it became clear that networking is still an important reason for Dutch researchers to cooperate with Chinese partners. The rationale behind this has also to do with the expectation that China will become one of the leading science nations in which it is beneficial to have established a network.
- Access to complementary knowledge is also mentioned in the interviews. This is local knowledge about China's policy and regulations on for instance bio-fuels, but also the knowledge and expertise on local organisms important in the production of bio-fuels.
- Access to complementary expertise was mentioned by Researcher B, who focussed on the technical aspects of bio-fuels. His partners were more concerned with the policy recommendations regarding bio-fuels. In theory this would be perceived as the access to complementary expertise, however in practice the Dutch based researcher made little use of the Chinese expertise because their focus was not on the Dutch policy recommendations and not on publishing scientific papers.
- Capacity building, if relevant at all, is becoming less important. The policy makers, as well as the researchers, see capacity building in the cooperation with China rather as a by-product than as a main rationale.

Although researchers were also active in biomass / bio-fuel research, solving transnational problems was not mentioned as a main reason to do the research. It does however make the research cooperation easier because it is a relevant problem for both countries.

6.3.2 Financial agreements

For the years 2012-2014 OCW and NWO both invest € 750k. per year. KNAW invests another € 100k to bring the yearly contribution to JSTP from the Dutch side to € 1.6m or € 4.8m over the three years (Min. OCW, 2011). Over the first years of JSTP (2009-2011) the planned budget was the same as for 2012-2014, the actual expenses were

however somewhat higher, € 5.67m in total. This was mainly due to the higher expenses in joint research project in the 2009 and 2010. The difference of € 1.5m was compensated by NWO.

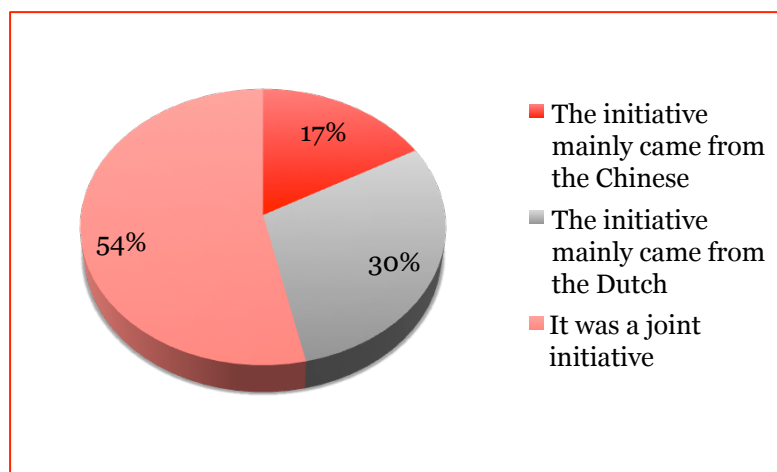
There are no exact figures available on the actual contribution from China (Smeets, Veldkamp, Remøe, & Hertog, 2011), however the agreement is that the Dutch contribution is matched by the Chinese partners MoST, MoE, CAS and CASS. Moreover, from the interview data as well as other studies (see: AWT, 2012; International Top Talent, 2011) it appears that the Chinese counterparts have more funding available and want to invest more in the Chinese science and science cooperation. The ITT-study (International Top Talent, 2011) even concludes that the Chinese research partners experience the cooperation with the Dutch as low-profile and short-term oriented, with little involvement of the Dutch government and limited financial contribution from the Dutch side.

Researcher D, who cooperates with China on a regular basis, confirms that in his perception China has more research funding available than the Netherlands. The Researcher D states that when he is looking for funding for new research cooperation with China it is much easier to get funding from China than it is to get funding in the Netherlands. This concerns Chinese research funding programmes that are open to foreign researchers as well and thus outside JSTP or other Sino-Dutch research funding schemes. Also see Box 2 on the research project of dr. ir. de Vries who stated that his Chinese partners receive more funding than would be imaginable in the Netherlands.

6.3.3 Initiative

In the mid-term evaluation of the JSTP programme one of the survey questions was on the initiative to the cooperation. As presented in Figure 8, the majority of the research proposals were written as a joint initiative. In almost one-third of the collaborations the initiative mainly came from the Dutch side and another 17% was mainly on the initiative of the Chinese partners.

Figure 8 Initiative to the cooperation



Source: (Smeets et al., 2011) *Whose initiative was it to jointly draw up a JSTP research proposal? (data from survey, n=54, based on answers from all survey participants)*

Logically, for a joint initiative research partners have to know each other prior to the decision to jointly draw up a JSTP research proposal. As already mentioned in the 'Output' section of this case study, researchers mainly knew each other because they conducted research together, exchanged information, had a joint publication or exchanged staff and less often because they exchanged facilities or had contact at conferences (Smeets et al., 2011). However, this does not imply that when the

researchers knew each other beforehand it was always a joint initiative. Researcher C met his partners at a conference and still indicated that the initiative had to come mainly from his side.

When researchers did not know each other prior to writing the proposal it follows more logically that one side had the initiative to the cooperation. In the interviews performed for this study the researchers that had to find a partner for the research they wanted to perform found them either on organised match making events, through a search on related publications and their authors or through their network. A telling example of finding a partner through the network is that of dr. ir. de Vries, described in Box 2, who found his partners through a Chinese PhD that was assigned to him by the faculty.

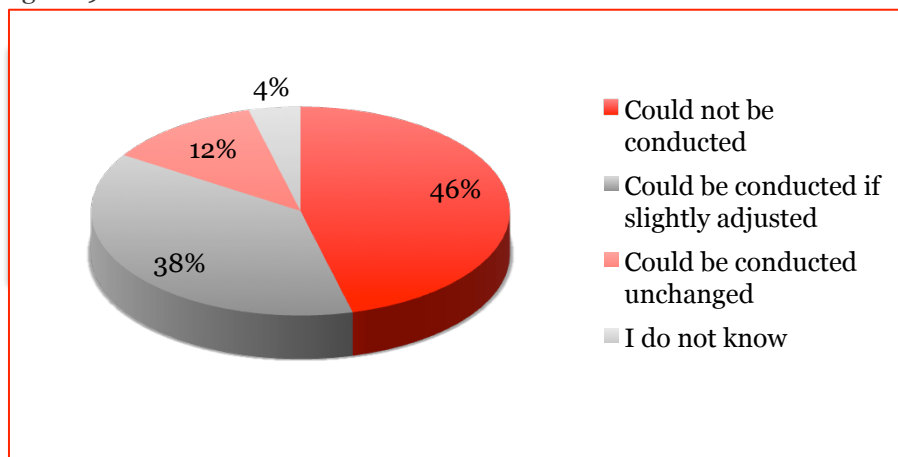
Clear trends in time are hard to identify, although based on three reasons it can be said that China has become more attractive to Dutch researchers. First is the increase of Chinese research quality. Second the increased availability of Chinese research funds together with the shrinking Dutch funds. The third reason is the expectation that the first two will increase even further in the years ahead, which makes network building now more attractive. On the other hand China is increasingly promoting international cooperation, which gives the Chinese researcher more incentive to cooperate with, for instance, the Netherlands.

For the legitimacy of the JSTP research funding it is interesting to see whether the research that was rejected JSTP funding could still take place otherwise. Of the researchers that were rejected funding after submitting a joint proposal, 63% indicated that the research could not take place at all. 21% could still take place with the same partners, either unchanged (6%), with a delay (6%) or with a lower budget (9%). 16% of the research could take place without the partners (Smeets et al., 2011).

6.3.4 Division of roles

In addition to the dependence in funding discussed in the previous section, it is also interesting to see how dependent the research groups are on their partner. Smeets et al. (2011) conclude that half of researchers were able to conduct the research in their own country without collaboration, although 38% of those needed 'slight adjustments'. 46% could not be conducted without the Chinese partners.

Figure 9 The extend to which the research could be conducted without the partner



Source: (Smeets et al., 2011)

The interviews for this study give insight in the reason why the cooperation with Chinese partners was essential for the execution of the research and why not. This is related to the field of research. Dr. ir. de Vries stated that that their partners have a certain expertise that made it attractive to cooperate with them. However the expertise in his field is hardly ever so specific that cooperation is essential. The same research

would have been possible; to do it alone would have given a delay at most (also see Box 2).

For Researcher B the role of the Chinese partners is to give a deep social discussion in the Chinese context. This would be very difficult for the Dutch based researcher because of the lack of local knowledge and, because of the fact that the relevant policy documents are only available in Chinese. In the example of Box 2 the researchers from both countries are biologists and each group performs more or less the same research on another organic matter. In the example of Researcher B the backgrounds are very different –social vs. technical- and the two parties complement each other in their own expertise. Within JSTP both forms are possible.

For the example of Researcher B it has to be noted that it is not yet a smooth cooperation, because of the different disciplinary linguistics, and the different goals in research. The Chinese partners are mainly interested in making policy recommendations where Researcher B feels the need to publish. Researcher B stated that the communication and integration needs to improve in order to not end up with two different researches and outcomes.

From the interviews it became clear that although China has researchers with a very high level of expertise, the integration and multidisciplinary aspects of the research are still mainly performed in the Netherlands.

Table 5 is based on a survey performed for the mid-term evaluation of JSTP and displays the division of roles in number of researchers and PhD's in China and the Netherlands. The data confirms what was found in the interviews for this study, namely that there are often more Chinese than Dutch researchers involved in a research cooperation. Striking is the difference between China and the Netherlands in the number of PhD students involved in the research. The average is approximately 3,5 Chinese PhD's to 0,5 Dutch PhD per research project. The relatively good availability of funding and relatively low costs of PhD's in China are probable influences for this difference.

Table 5 Average numbers of involved researchers and percentage of PhD's per country

	Total number involved		Percentage of which PhD	
	Avg.	Std.	Avg.	Std.
Number of persons in China	8.1	3.75	44%	30%
Total FTE in China	5.94	3.61	39%	35%
Number of persons in the Netherlands	4.31	1.91	11%	16%
Total FTE in the Netherlands	3.21	2.56	27%	40%

Source: Smeets et al., 2011

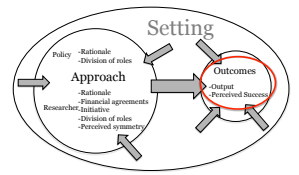
6.3.5 Perceived symmetry of the cooperation

From the interviews follows that Dutch researchers do not perceive the cooperation with their Chinese partners as entirely symmetric. Reasons mentioned are that the initiative in the run-up to the cooperation as well as during the cooperation has to come mainly from the Dutch side, that they received little input and feedback from their partners and that the cooperation still includes aspects of capacity building. On the other hand, reasons that were mentioned why the cooperation was perceived as symmetric are the high scientific quality of their partners and their financial and material resources.

Researcher C commented on the difference of the quality of researchers within China. *“In the Netherlands we have good, medium and relatively bad researchers. In China it is either good or bad, there is no ‘in between’. It is thus important to find the right partner and build on a relationship mutual trust and respect.”* In the interviews it was often mentioned that it takes effort to reach a level where the Chinese partners feel comfortable enough to take part in discussions and give their personal opinion.

6.4 Outcomes

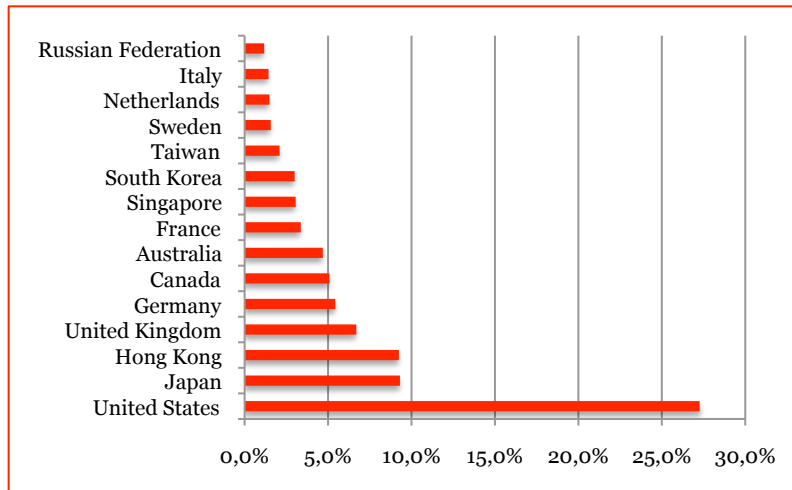
The outcomes of the STI cooperation with China are discussed on the basis of the Output and the Perceived success of the cooperation in the following two sections.



6.4.1 Output

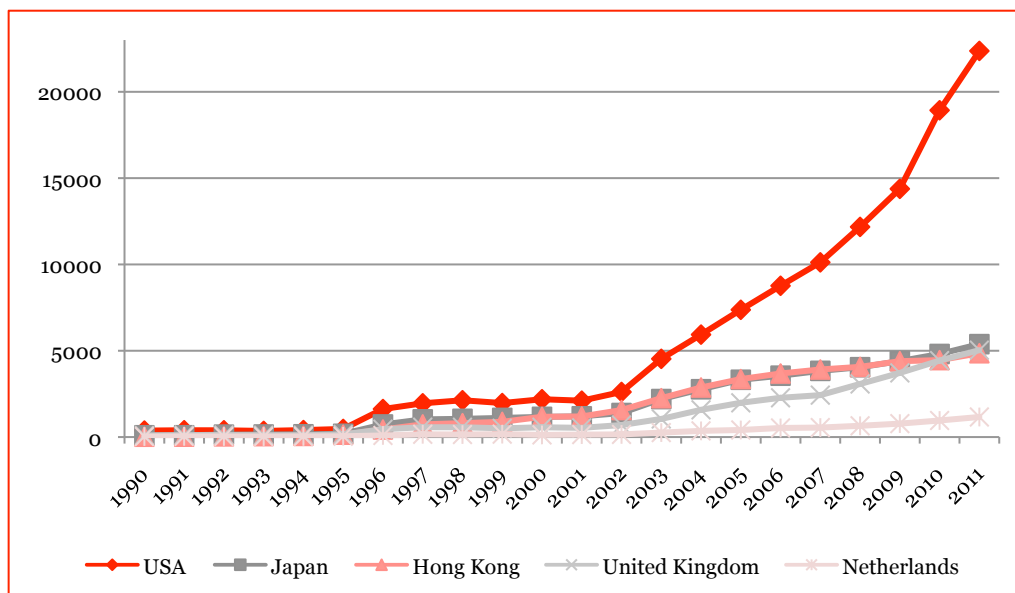
The first co-publication between Chinese and Dutch researchers found in the Scopus database stems from 1979, one year after the start of the Chinese Reform (see section 6.5). Since then Chinese and Dutch researchers have published over 8000 papers together. That is 1,5% of China's international co-publications (also see Figure 10).

Figure 10 Percentage of Chinese international co-publications (2000-2011)



Source: Scopus, 2012

Figure 11 Chinese co-publications with top-4 partners and the Netherlands (1990-2011)



Source: Scopus, 2012

Remarkable is that this does not differ too much with the Netherlands. Despite of the difference in size of the countries, Dutch co-publications with China amount for 1.6% of all Dutch international co-publications (Scopus, 2012). The Netherlands is the 13th

most frequent partner in Chinese co-publications, as displayed in Figure 10. The other way around, China is number 14 for the Netherlands. The USA -as for the Netherlands- is the clear number one for China, its position only got more explicit over the years 2000-2011, as shown in Figure 11. Compared to China's top four partner countries in co-publications, the Netherlands experienced a moderate growth in co-publications with China (see Figure 11). In 2011, Chinese- and Dutch based researchers published 1081 papers together.

Since 2009, fourteen joint research projects have started and 6 dialogue seminars have been granted funding by JSTP alone. From the interviews follows that joint research projects usually result in joint publications as well. However, the share of joint publications stemming from JSTP funded research on the total number of joint publications will be limited because of the modest number of granted research projects and the time lag between the start of the research and the publishing of the paper.

Table 6 Number of submitted and granted proposals per year¹⁶

Year – Theme	Research Proposal / Dialogue Seminar	Submitted	Granted	Conversion ratio
2009 – Integrated Water Management	Research proposal	34	10	29%
	Dialogue Seminar	2	1	50%
2010 – Hybrid Conversion of Biomass	Research proposal	13 ¹⁷	4	31%
	Dialogue Seminar	3	2	67%
2011 – Medical devices for an Ageing Society	Research proposal	No data	No data	No data
	Dialogue Seminar	No data	2	No data
2012 – Agriculture & Food: How to Feed the World	Research proposal	No Data	No data	No data
	Dialogue Seminar	No data	1	No data
Total	Research Proposal	47+	14+	30%
	Dialogue Seminar	8+	6	75-%

Source: (Min. OCW, 2011; NWO, 2012b, 2012c; Smeets et al., 2011)

Apart from the exchange of staff, researchers mention workshops and writing papers together as important activities that promote knowledge transfer between the partners (Smeets et al., 2011). From the interviews for this study it became clear that not all papers that follow from the research funded by JSTP are co-published with the Chinese partners. The main reasons mentioned for this are that the cooperation consists out of two different researches, one in each country, that are integrated at a later stadium. The separate research can result in publications; the partner does not become a co-author if the contribution to the paper is insufficient.

¹⁶ The data for this table had to be conducted from three different sources; the JSTP evaluation, the NWO website and the news item on the web page of the ministry of OCW. There is limited information for 2011 and 2012, this might have to do with the assessment is quite a lengthy process and the submitted projects are not granted/rejected yet (Smeets, Veldkamp, Remøe, & Hertog, 2011). From the interview with NWO it became clear that China can suddenly decide to not fund a research project without consulting the Dutch partners. This makes the assessment even less transparent. The transparency of the assessment of research proposals was mentioned as a weaker point in the mid-term evaluation (Smeets, Veldkamp, Remøe, & Hertog, 2011).

¹⁷ in 2010 there was less budget available, thus the theme of research was narrowed in order to limit the number of proposals that would be submitted.

In the interviews for this study, researchers also mentioned their growing network in China as an output of the cooperation. However this is not the most important output of the JSTP programme. From the evaluation in 2011 follows that most of the researchers knew each other prior the research. 60% conducted research together at an earlier stage and 45% already had a joint publication. NWO expects that more 'new' collaborations will start with the new themes in which there is traditionally less cooperation between the Netherlands and China (Smeets et al., 2011).

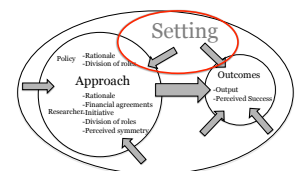
6.4.2 Perceived success

In 2011 JSTP had a positive mid-term evaluation and the programme was continued to 2014. In his speech at the signing of the agreement in 2011, the Dutch Minister of OCW mentioned the mid-term evaluation and its positive statement that JSTP is on the right track to intensify the relations between Dutch and Chinese researchers. The minister also mentioned that the seven stakeholders were very enthusiastic and wanted to continue the programme.

The researchers interviewed for this study that were involved in joint research projects with China mention different success factors and also reasons why they perceive the cooperation as less successful. Success factors that were mentioned include: good quality of the partner in research as well as in English, refreshing perspective to the research problem and the complementary knowledge of the partner. Trends that made recent cooperation more successful than previous cooperation were modest, but mostly in terms of better communication through better understanding of English and the improvement of the knowledge institutes in China. This is said to be subject to the opening up of China; an increasing number of (PhD-)students studied abroad to improve their research and language skills and came back to work in China.

6.5 The Chinese setting

The Dutch policy and researcher approach to cooperation with China and the outcomes of the cooperation have to be placed in a case specific context to fully understand how they are influenced by external factors. This is what in this study is called the setting. In this section the Chinese developments and the Chinese perspective are discussed in the Chinese economy, the Chinese STI system and the perspective of the Chinese researcher.



6.5.1 The Chinese economy

In 1978 the Chinese economic reform started and China started the transition from a centrally planned- to a market based economy. In the following three centuries China has experienced a remarkable period of rapid growth with an average rate of 9,7% per year. In the period under study the growth was exceptionally strong in the years 2003-2007 where growth rates averaged about 11% per year. Even during the recent global financial crisis the growth rates remained strong. In 2010 China exceeded Japan and became the world's second largest economy. It is playing an increasingly important and influential role in the global economy. (The World Bank, 2012b).

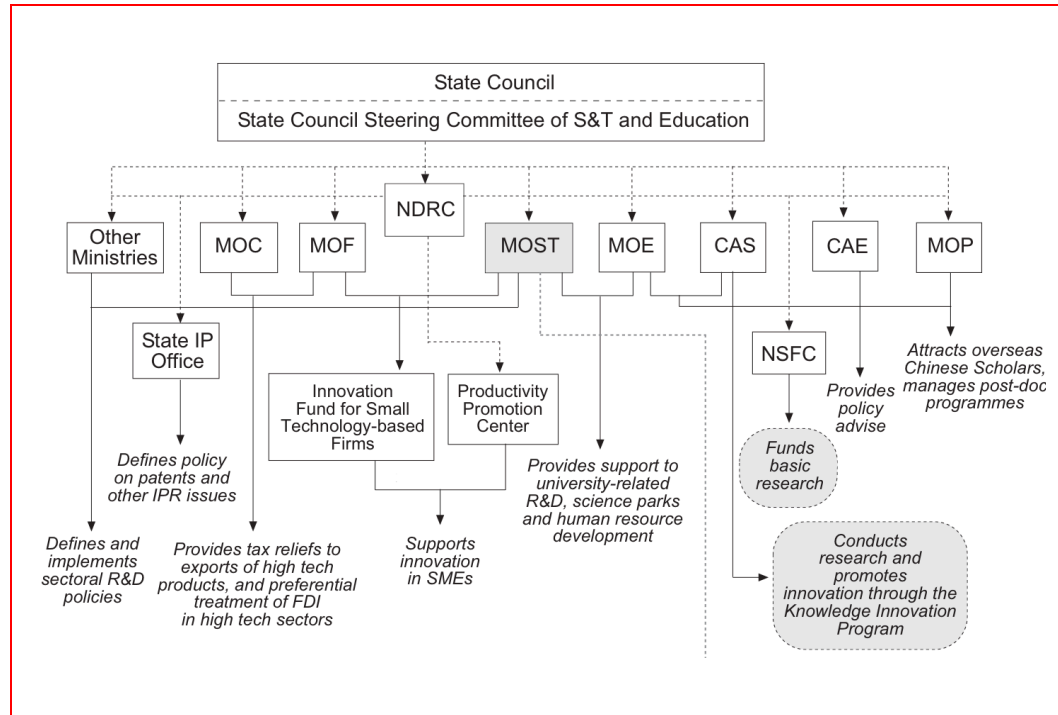
However, China is not (yet) considered as one of the developed countries. Since July 2011 The World Bank (2012b) classifies China as an upper middle income country, where the year before it was still classified as a lower middle income country. The International Monetary Fund classifies China as a developing economy (IMF, 2012).

The Chinese economic reform went hand in hand with opening up to the rest of the world, including scientific partnerships. The cooperation between The Netherlands and China dates back to the late 1970s - 1980s (KNAW, 2012c). The relation between China and the Netherlands is not as tumultuous as between Indonesia and the Netherlands. In the interviews Dutch policy makers referred to the relation with China

as a 'stable relationship'. The economic developments make China an interesting partner for the Dutch.

6.5.2 The Chinese STI system

Figure 12 Governance of the Chinese STI policy



Source: OECD, 2008

Figure 12 displays the governance structure of the Chinese STI system. The Ministry of Science and Technology (MoST) -also one of the partners in JSTP- is leading in formulating S&T policies, coordinating activities and it promotes international S&T cooperation and exchanges. The other ministries formulate and implement S&T policies relevant to them (Li, 2012; OECD, 2008). The other stakeholders in JSTP are the Ministry of Education (MoE), which is responsible for the education system and two academies; the Chinese Academy of Sciences (CAS) is an academic institution and research and development centre in natural science, technological science and high-tech innovation in China, it comprises over 100 institutes, one university and one graduate school and; the Chinese Academy of Social Sciences (CASS) focuses on philosophy and social sciences and is responsible for 35 research institutes, over 90 research centres, and one graduate school (Smeets et al., 2011).

Along with the vast economic growth of China described in the background in this case study, the R&D expenditures have increased rapidly since the 1990s. In absolute terms China overtook Japan in 2005 to become the second largest R&D investor in the world behind the USA with €24.5bn in 2005 and €70.6bn in 2010. The relative R&D intensity is still relatively low. The GERD (GDP on R&D expenditure) increased from 0,74% in 1991 to 1,75% in 2010. By the year 2020 China's R&D expenditure is expected to reach 2,5% of GDP, which comes down to €91bn (Li, 2012). This is in line with the earlier mentioned Chinese mission to become the most innovative country in the world by 2020.

The Chinese government has become actively engaged in international research cooperation. The 12th 'Five Year Plan' for S&T development stressed the importance of international research activity and that China will actively participate in international science programmes and international S&T organisations (Li, 2012). Comparable with

the Dutch Top Sectors, China promotes seven emerging industries to ensure long-term prosperity. These are: energy-reservation and environmental technology, next-generation communication technology, biotech and biotech-based agriculture technology, advanced manufacturing, alternative energy (nuclear, wind, solar, and bio-fuel), new materials, and new energy vehicles (Li, 2012). These sectors show several matches with the Dutch Top Sectors and should be provide enough common ground to find possibilities to cooperate.

Since the 1990s, China has an active policy to stimulate outgoing mobility. The process of applying for a Chinese passport has simplified and there are multiple granting programmes initiated. The current country focus however seems to be on South-East-Asian countries (Nuffic, 2012). Nuffic (2012) notes that a remarkable aspect of the Chinese mobility policy is that there is strong emphasis on international institutional cooperation in higher education. In 2010, 160 of over 2.000 Chinese Higher education institutions had a partnership with a foreign institution. The goal of these international partnerships is to increase the quality and the reputation of the Chinese institutions (Nuffic, 2012).

As briefly mentioned before in the section on financial agreements, China has the desire to scale up the cooperation with Dutch knowledge institutions. From the Chinese perspective the multiple budgets available for Dutch cooperation with China are “*highly limited*”. Budgets for cooperation are divided over different universities, faculties and research groups. Also NWO and KNAW have different budgets for different purposes. The impact of each budget can therefore be perceived as limited. (AWT, 2012b; International Top Talent, 2011)

6.5.3 The Chinese researcher

In 2011 International Top Talent (ITT) did a research on the experience and vision of Chinese researchers on the Sino-Dutch cooperation. 90% of the respondents of Chinese researchers perceived the Netherlands as attractive for their career path, of which 10% even indicated the Netherlands as very attractive. Only 10% perceive the Netherlands as average. Reasons for the attractiveness of the Netherlands that were mentioned in the ITT-study are that the work life balance is considered to be more relaxed than for example in the UK; the language barrier in the Netherlands is considered to be lower than in other European countries and; the open culture and international attitude is acclaimed (International Top Talent, 2011).

Most of these points correspond with the interview data for this case study. From the interviews with Dutch researchers it became clear that their research groups are very internationally oriented. English is not only the scientific language, but often also the language spoken in informal settings such as the common lunch.

6.6 Case conclusion

This case study aims to answer the question: *How has the Dutch approach to STI cooperation with China and in particular within the WOTRO programme changed from 2000-2012?*

China has become a more attractive partner to work with in the period under study, 2000-2012. Since the 1990s China has had an active policy stimulating outgoing mobility and students started their master or PhD abroad. This has had a positive influence on the knowledge level as well as the skills in English language. Chinese investments in STI have exceeded Dutch investments and the Chinese STI system has gone through an incredible development. Dutch researchers are therefore increasingly interested in working with China. The availability of Chinese funds for the matching of Dutch funds in joint research programmes also contributes to the attractiveness of the bilateral cooperation. By matching Dutch funding, more money is available for joint

research. The funding relations have shifted to the point where China is willing to invest more in the bilateral cooperation and the Dutch government is the party that has limited resources and cannot go into the same level of investments. Chinese policy makers as well as researchers consider the Netherlands attractive because of the knowledge level and for the working atmosphere.

That bio-fuel research is also an important theme in China facilitates the research cooperation. China is investing in seven upcoming industries to ensure long-term prosperity, renewable energy, including bio-fuels is one of them. Thus also in this research theme the initiative to cooperate internationally has increased and will increase even further, however for now, the initiative in JSTP research projects is still mainly Dutch.

In cooperation with China, capacity building is no longer an issue for policy makers. The termination of the development aid is typical for the research relationship. The Dutch interest has become the priority in the cooperation. For researchers capacity building has also become less of an issue, although some researchers in the sample indicate that the 'net knowledge flow' is still towards China, but that the developments are going so fast that they expect that this will not be the case for long. Cooperation with China almost sounds like a self-fulfilling prophecy, in that so much research cooperation is initiated because expectations that China is going to be such an important partner, that it automatically becomes an important partner. However, a large part of the research done in cooperation with China could also have been performed alone or with other partners.

7. Case Study WOTRO – Africa

7.1 Introduction

The third and last case study of this study is somewhat different from the other two, in the sense that the programme under study does not have a specific country focus, but rather a thematic focus in international cooperation. WOTRO was founded in 1964 as the Netherlands Foundation for the Advancement of Tropical Research (Wetenschappelijk Onderzoek van de Tropen en Ontwikkelingslanden) to replace the smaller foundations WOSUNA (Scientific research for Surinam and the Netherlands Antilles) and WONG (Scientific research in Netherlands New Guinea). Over the years WOTRO has increasingly focused on programming and funding development-oriented research in cooperation with developing countries (WOTRO, 2010a). Henk Molenaar¹⁸ states that the partners thereby still include BRIC countries, but the focus has shifted more towards the countries ‘poorer’ than the BRICs, notably African countries.

‘WOTRO science for development’ is a research-granting organisation focusing on programming, funding and monitoring research. It is in that sense comparable to SPIN and JSTP, however WOTRO is not only a programme, but also a foundation with its own executive board. WOTRO is part of the Netherlands Organisation for Scientific Research (NWO). This chapter will follow the same structure of the previous two, which is the policy approach (7.2), the researcher approach (7.3), the outcomes (7.4), the broader setting (7.5) and the case conclusions (7.6).

Box 3 IPR research by dr. Bram de Jonge

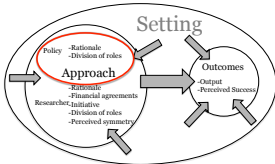
A particularly interesting project at the interface of self-interest and development cooperation is the research of Bram de Jonge on Intellectual Property Rights (IPR). From 2009-2011 he was active in a WOTRO funded research cooperation with, among others, ACODE in Uganda. Currently (2012), part of his research is also funded through EL&I and the Top Sector Horticulture and Propagation Materials. De Jonge stated that the goal of the ministry is agriculture development in Africa. Dutch companies are already relatively active in Asia and South America. In Africa the Dutch flower growers are mentioned to be quite active, the growing of vegetables is on the other hand just emerging and stakeholders see large potentials. It is however difficult for individual companies to start their business in Africa. EL&I and NL Agency try to facilitate here.

De Jonge: *“This is a direct link between the well-understood self-interest and developing countries. [...] The Top Sector policy states that everything concerning IPR should be well regulated and exporting and selling genetic material should not be too much of a hassle. And this is the ministries responsibility”*. To achieve this objective, de Jonge received research funding for his research on the balance between the needs of the commercial sector and the needs of the of food security and the stakes of the developing countries. De Jonge stresses the need to speak to all the different stakeholders, including the commercial sector. Private parties do not determine the research agenda, but to come to a fitting solution they have to be heard and they have to be able to make profits somehow. De Jonge: *“For BuZa, making a profit on cooperation with African countries was almost a filthy thought”*.

De Jonge stated that it is not uncommon that the partners from the developing

¹⁸ Important input for this case study came from WOTRO’s executive director Henk Molenaar. Apart from his know-how on WOTRO’s policy, he also gave important insights in BuZa’s policy, his former employer, and the research practice through his regular contact with researchers in the field. Four researchers gave insight in research cooperation then and now with African researchers, predominantly from Mozambique and Uganda.

country have to sign an agreement that they distance themselves from any possible intellectual property that results from the joint research. When they do not sign the agreement the Dutch, or western, partner is likely to find another partner who will. De Jonge: *“If you are really looking for equal cooperation, you have to start thinking about sharing IPR.”*



7.2 Dutch policy approach

The policy approach is discussed following the two dimensions from the conceptual model, the Rationale and the Division of roles.

7.2.1 Policy – Rationale

BuZa's policy towards developing countries is elaborated upon in section 4 on the general Dutch policy approach. In the newfangled development cooperation the well-understood self-interest has become more important. In this respect the cohesion with the top sectors is increasingly important, specifically with the sectors Water, Agro-food and Horticulture. These two Top Sectors overlap with DGIS priority themes Water and Food Security. Consequently, these are the sectors NWO-WOTRO focuses on since this is financed 50-50 between OCW and BuZa. Capacity building in the partner country and making an impact on development issues are the main rationales for BuZa to finance NWO-WOTRO.

Molenaar states that WOTRO and BuZa have always cooperated, however the cooperation is particularly close since 2006. Since that year WOTRO specified its focus on development-oriented research. According to Molenaar the cooperation has also become more diverse. From just one of BuZa's departments, the cooperation has broadened to multiple directorates and different departments of those directorates.

OCW has policy on the internationalisation of science, however not specifically on STI cooperation with developing countries, other than their agreements with China and Indonesia and the investments in WOTRO.

OCW is BuZa's partner in the financing of WOTRO. Molenaar states that despite the intensification of the cooperation between BuZa and WOTRO, OCW policy remains the most important input for WOTRO's strategy. That is because of the NWO identity of WOTRO and NWO is an independent administrative body of OCW.

As a reaction on the Top Sector policy, OCW published a policy statement that is consistent with the Top Sector approach. Which implies that NWO, and thus WOTRO, have to deploy a fair share of their resources for the Top Sectors, in cooperation with private partners (see WOTRO's rationale later this section on the public private partnerships).

EL&I has no specific focus on any of the African countries, including South Africa. Their influence on WOTRO is primarily through the Top Sector policy. Again, the Top Sectors are sectors in which the Netherlands excels and the rationale is to invest even more in these sectors to strengthen the Dutch competitive position. Translated to development cooperation that implies that the Netherlands has to deploy their strengths for the purpose of the developing countries. EL&I and NL Agency try to involve the private sector. The speaking example of the kind of research EL&I and NL Agency finance to this purpose is that of dr. Bram de Jonge, which is discussed in Box 3.

Molenaar confirms that for BuZa, involving the private sector is not an end in itself. However, private parties and knowledge institutions are seen as an instrument that can be used for development purposes.

WOTRO is aiming for those projects where the developmental needs, as well as the scientific and the economic interests, are served. Molenaar: *“The research is often*

interdisciplinary and in increasingly transdisciplinary, in other words, in cooperation with private partners or NGO's."

The strategy plan 2011-2014 (WOTRO, 2010a) points out three 'overall-objectives' and one 'cross-cutting objective'. The objectives are to: 1) Achieve increased generation and use of high- quality knowledge for development (Most important); 2) Achieve increased generation of groundbreaking ideas through the funding of challenging ideas fostering breakthrough; 3) Reach enhanced synergy in knowledge for development through facilitating platforms for learning and knowledge sharing. And Crosscutting: Contribute to strengthened research capacity at the individual, the institutional and the systemic level.

Three clear trends stand out in WOTRO's policy through the years 2000-2012. First is the earlier mentioned increased focus on development issues in 2006. And second is the shift towards more strategic partnerships as opposed to subsidy schemes that are fully WOTRO funded. This is mentioned in the strategy plan 2011-2014 as compared to the strategy plan 2007-2010. The third trend relates to the crosscutting objective of capacity building. Capacity building at the individual and institutional level has always been part of WOTRO's approach, at least for the studied period. Capacity building at the systemic level is first mentioned in WOTRO's strategy plan 2011-2014 (WOTRO, 2010a). System level capacity building is for example possible through the organisation of centres of excellence or close cooperation with African research councils.

Summing up, the following policy rationales can be identified for STI cooperation:

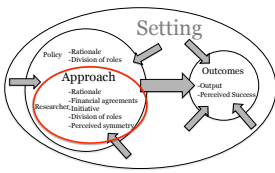
- Capacity building
- International and local development goals
- Scientific advancement
- Market access, upcoming
- Access to unique sites

7.2.2 Policy - division of roles

The WOTRO strategy document is very explicit on this matter with respect to development aid. In the section on trends in global development, the strategy document states: *"Aid is likely to shift from philanthropy to collaboration based on enlightened self-interest, with donor-recipient relationships turning into interdependent partnerships."* (WOTRO, 2010a).

Generating 'Knowledge for development' is WOTRO's mandate. Thereby capacity building is a 'cross-cutting objective'. This implies 'helping' the developing countries. With regard to their own perspective on the division of roles, the strategy document states that WOTRO puts emphasis on stakeholder consultation in the funding of demand led research that is integrated into society. This implies a 'demand driven' approach, however on the other hand Top Sector policy is increasingly influential, which implies a certain 'push'. It seems that WOTRO is looking for mutual benefits both between the different ministries, as well as between the different nations.

The personal opinion of Molenaar is that within NWO there is a very strong interest in the advancement of science and especially the Dutch science. On the other hand there is BuZa with a strong interest in development cooperation, however this is too much based on the notion that the developing country is in an earlier stage of the western development. Although in theory development cooperation has shifted towards 'local ownership', 'partnership' and 'shared responsibilities', in practice this is still very much the transfer of knowledge from north to south. Molenaar feels that within WOTRO there is a good balance of interests.



7.3 Dutch researcher approach

Also in this case, the Dutch researcher approach to STI cooperation with African partners is discussed using the dimensions from the conceptual model, Rationale, Financial agreements, Initiative, Division of roles and the perceived symmetry to the cooperation.

7.3.1 Rationale

Rationales mentioned by researchers interviewed for this case study are:

- Access to data
- Access to unique sites and populations and problems
- Addressing global challenges
- Access to complementary knowledge
- Access to cheap research labour
- Help the partner with capacity building

The access to data was mentioned either with regard to partners that are involved in the fieldwork or the use of the partners' network. Complementary knowledge is again the knowledge about the local context. African researchers are in general less expensive as their Dutch counterparts. With the same budget more African researchers can make a contribution to the research. This is the access to cheap research labour. To help the partner with capacity building was never the main reason to cooperate, however it was often mentioned as a positive side effect.

Career advancement is obviously less important for researchers in this case. Researchers are always judged on their publications, this is no different in cooperation with African countries, however the applicable result and contribution to development issues is in general found more important. Researcher H stated that the most important reason to do the research was to contribute to international development and global equality and the fair distribution and use of resources globally. Researcher H: *"Publications are important for a researcher and I invest a lot of time to that. For a career in science you need to publish. However in University systems, publishing has become an ending itself and that is a shame. It's easy to forget sometimes why you are doing the research."*

Molenaar commented that, in order to start a research cooperation with a partner from a developing country, the researchers have to have a certain intrinsic motivation to contribute to development processes. They have to fight against prejudices that research in cooperation with developing countries is of inferior quality. Thereby interdisciplinary research is hard to publish in high impact journals. To make this choice has its effect on the scientific career of a researcher.

No clear trends in rationales could be identified for the researcher approach. A possible reason for this is the relatively slow development of the STI system in African countries. Researchers did not indicate that the STI capacities anno 2012 are much different from 2000. Therefore the access to complementary expertise and skills has not become more important.

7.3.2 Financial agreements

Barring for some possible exceptions, WOTRO research is funded entirely by the Dutch side. From the interviews it seemed that not only WOTRO research but also other research cooperation with African countries was mainly funded through Dutch channels. This has a direct effect on the relation between the research partners. Two results that were mentioned in the interviews are 1) that the Dutch researcher is the 'owner' of the research. Most research is contract research in which the partner is hired to do a part of the work. Contract research is not uncommon in research collaboration in general, the relation is however different than in joint research with

joint funding and shared goals. And 2) since the Dutch party is funding the researchers they are usually also entitled to all the IPR rights as IPR expert dr. de Jonge explained (see Box 3).

As mentioned earlier in this case, WOTRO is increasingly looking for strategic partnerships, as opposed to subsidy schemes that are fully WOTRO funded. This includes increasingly involving private parties in the research cooperation and in the funding of research. The Top Sector policy is about integrated system approaches, which is considered a Dutch specialty by policy makers. This is however quite a supplier driven approach, similar to the old-fashioned way of development aid, as is also stated by Molenaar. Still, WOTRO is increasingly involving private parties to the research cooperation, although only the terms and conditions of WOTRO.

Although outside the studied period 2000-2012, an interesting development is WOTRO's idea to set up partnerships for development cooperation with research councils in Brazil or China. Especially China is mentioned to be increasingly active in development cooperation, however they are still looking for own methods and legitimacy since China receives a lot of criticism. WOTRO wants the Chinese to support WOTRO's social embedded approach in development cooperation by jointly setting up a call for proposals.

7.3.3 Initiative

In the calls for proposals for integrated programmes, WOTRO started to require research partners from one or more developing countries. It has to be a collaborative initiative whereby developing country researchers and relevant non-scientific stakeholders are expected to be engaged in all phases of the programme, i.e. from the inception phase to the sharing of emerging results (WOTRO, 2011).

However in practice, also in the cooperation with African countries, the initiative is with the party that is funding the research. Since the research is funded primarily by the Dutch side, the initiative also lays with the Dutch researchers. With regard to the research partner, Researcher I stated: *"The initiative is always ours. They live of donors and these kinds of projects. They always do pilot projects. To start up a sustainable cooperation is very rare."* A reason for the latter statement is the dependence on Dutch funding. When in a new research project there is no funding available to hire the partners' services, they are unable to participate in the research.

On the other hand researchers expressed their willingness to cooperate again with the same partners. Finding adequate partners proved very difficult to some. An open call for partners or PhD's is almost impossible because of the multitude of reactions and the uncertainty of the proposed partners quality. According to the experiences of Dutch researchers, the latter can differ quite a lot. This is thus the willingness to cooperate again as well as the reticence to cooperate with new partners.

7.3.4 Division of roles

Because of the financial agreements, the roles are automatically divided in contractor and contracted. That implies that the Dutch researcher 'owns' the research and the partner is hired to do part of that research. The interviewees indicated that the developing country researcher is often commissioned with fieldwork and parts of the research where local contextualised knowledge is required. Dutch researchers direct the research, integrate the field data into the wider context and do the analysis.

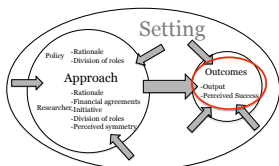
7.3.5 Perceived symmetry of the cooperation

The division of roles is also where the researchers learn from each other. Although the research skills of the partner are often perceived as less, the Dutch researcher can still learn from the local knowledge the partners have. Dutch researchers indicate that on the other hand the African researchers can learn from the systematic approach and research methods from the Dutch.

The level of the partners is however not always perceived as less than the own. Researchers indicate that there are really smart professors and other researchers, who in most of the cases have studied in the USA or EU. Those researchers are naturally the preferred partners, that is why they are also noted to be very busy people, which makes cooperation more complicated.

WOTRO aims for another approach. Molenaar: *“It used to be standard that the Dutch researcher was the dominant party. Not only because the money came from the Netherlands, but we also stipulated the agenda and researcher from developing countries were often weaker. We now set preconditions which have to prevent this from happening, however it differs per project whether the cooperation is based on equal footing.”* Whenever one party is clearly superior in experience, background and analytical skills they will always have the tendency to dominate the collaboration. Molenaar admits this, according to him these are the projects where capacity building in the form of transfer of knowledge and skills will be more eminent.

However, in general the research cooperation with African research partners is not perceived as symmetric. Even the researcher who indicated he had a strong relationship with his partners who delivered very valuable input for the research did not perceive the cooperation as symmetric, because of the funding. *“We have the money and they do not. When you would receive a call from Uganda and they invite you to cooperate in a research they are doing, that would be really cool. That is just not going to happen. Only then it is true equal cooperation, because then you would know whether they would call you. They will always cooperate if you would call them, because it is just work for them. A situation has been created where they want money for everything they do, it is because the cooperation is not equal.”*



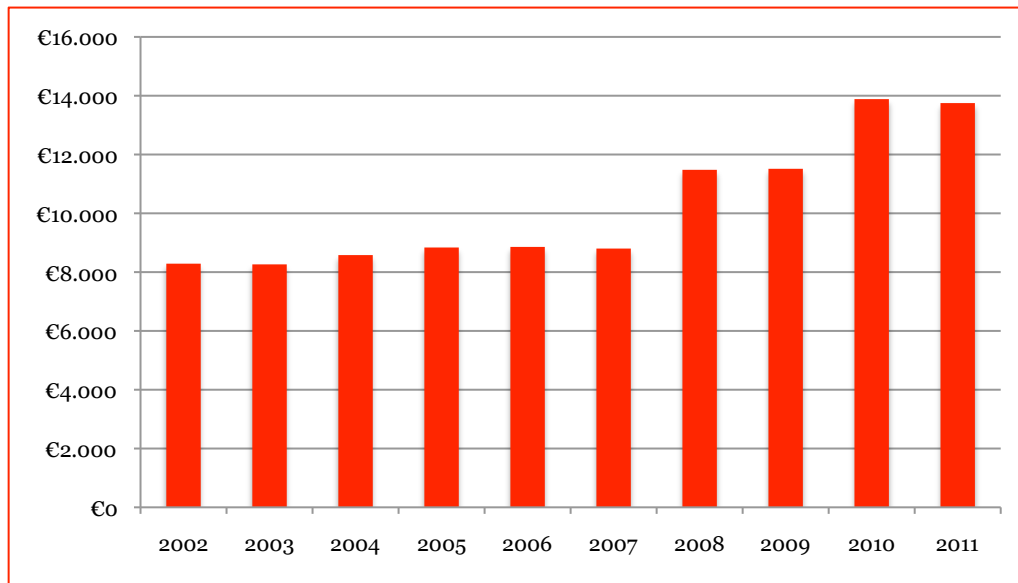
7.4 Outcomes

7.4.1 Output

WOTRO has been initiating and participating in large thematic research programmes where funding from different partners is pooled to encourage research of common interest. Partners for WOTRO in this process are the NWO science divisions, Dutch ministries or international scientific or developmental organisations.

The expenses of WOTRO are predominantly research funding, i.e. the funding of staff. Therefore the expenses are also a measure for the output of WOTRO. Over the years 2002-2011 a steady growth is displayed with a jump between 2008 and 2010 possibly because of the initiation of certain sub-programmes to WOTRO, or intensification of ongoing programmes (see Figure 13).

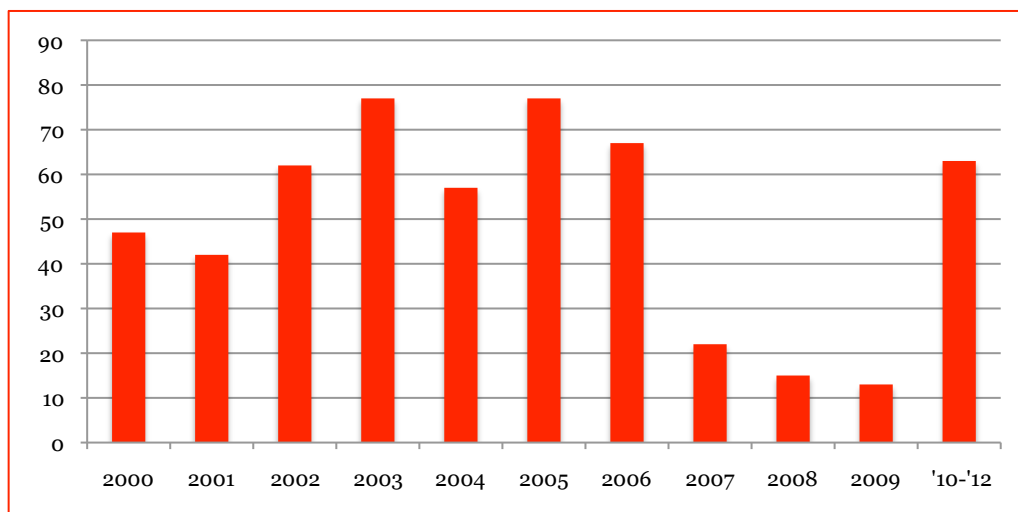
Figure 13 WOTRO expenses (2002-2012)



Source: (NWO, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011c, 2012d)¹⁹

Figure 14 shows the number of WOTRO granted projects that started each year. These include the projects in cooperation with SPIN, East Kalimantan and Agriculture Beyond Food, the so-called 'integrated programmes', travel grants and many more. Despite the increase in WOTRO's expenses, it seems that there are less projects granted from 2007 on. The data does not further explain this mismatch. Either projects are labelled differently from 2007 on or the average expenses per project have drastically increased.

Figure 14 Number of WOTRO projects started per year (2000-2012)



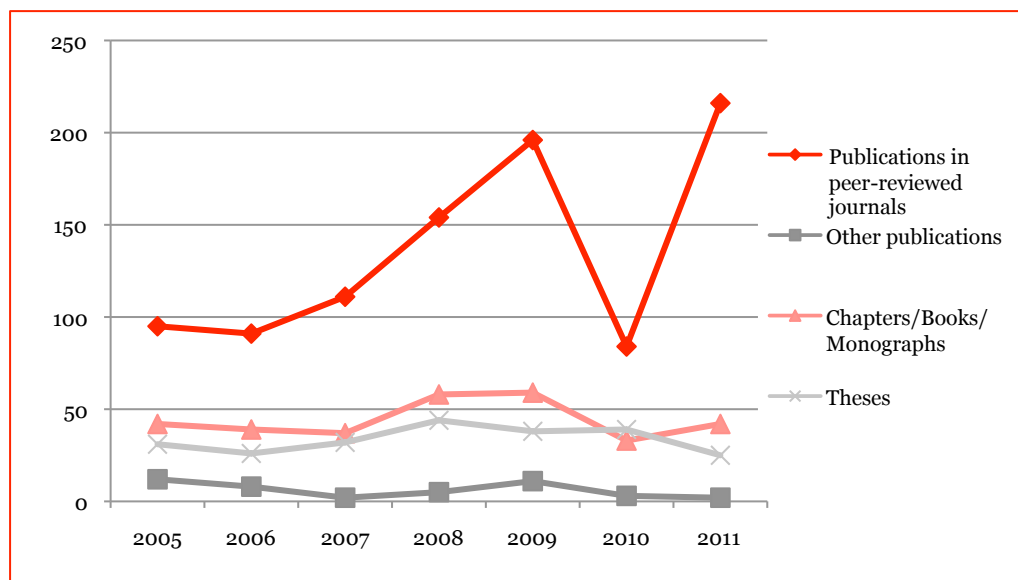
Source: (NWO, 2012e)

Figure 15 displays the actual measurable output of WOTRO financed research projects. Apart from the number of publications in peer-reviewed journals the output has not changed drastically between 2005 and 2011. The data does not tell what share is co-authored between Dutch and African researchers. As mentioned before, performing

¹⁹ Expenses of the years 2000-2001 are not specified for WOTRO in the NWO year report.

research together does not always result in co-publications. This was confirmed in the interviews for this case study. Co-publications were published, however researchers also mentioned that due to limited input from their partners, none, or not all of the papers following from the research are co-authored. Figure 16 gives insight in the total numbers of co-publications of African countries with the Netherlands.

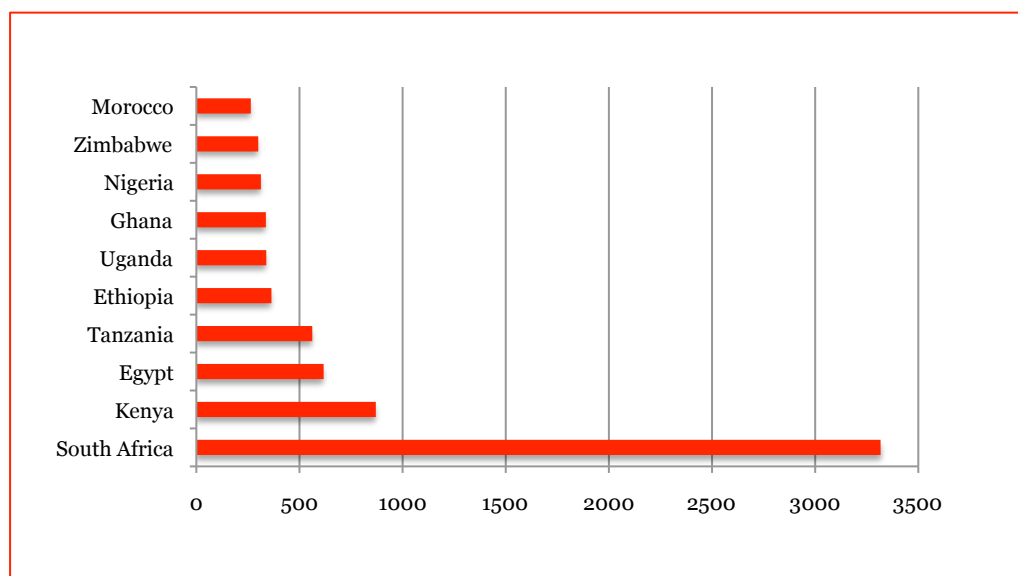
Figure 15 Number of WOTRO academic publications



Source: (NWO, 2006, 2007, 2008, 2009, 2010, 2011c, 2012d)

Figure 16 shows the top-10 African co-publication partners of the Netherlands. These are all the publications between the Netherlands and the respective country and not necessarily publications coming forth out of WOTRO funded research. South Africa is, not surprisingly, the clear number one African partner. Kenya, Egypt and Tanzania follow at reasonable distance from South Africa. These countries were also mentioned in the interviews as frontrunners in Africa. This confirms that the Dutch researcher is not oblivious to the scientific expertise of the partner.

Figure 16 Number of co-publication with the Netherlands (all years)



Source: Scopus, 2012

The share of the top-4 African partner countries of the total number of Dutch publications is relatively modest, however increasing. The share has increased from 0,5% in 2000, to 1,5% in 2011 (Scopus, 2012). The relative increase of the share of co-publications in the same period was higher for the top-4 African countries than for the USA, Netherlands number one co-publication partner (see Table 7 Dutch co-publication partners compared)

Table 7 Dutch co-publication partners compared

Year	NL total	SA	Kenya	Tanzania	Egypt	Total top-4	Share	USA	Share
2000	23179	71	18	18	14	121	0,52%	2530	10,9%
2011	46296	444	101	64	64	673	1,45%	6985	15,09%
Relative increase							278,47%		138%

Source: Scopus, 2012

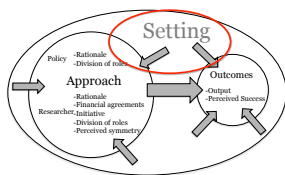
WOTRO does not solely focus on the bibliometric output, important other output that has gained increased attention over the years is capacity building (CB) and knowledge valorisation. This is mentioned in the strategy document (WOTRO, 2010a) as well by WOTRO's executive director and the researchers cooperating with African researchers. The research has to make a developmental impact. Within WOTRO projects different stakeholder are actively involved. From an evaluation of performed by WOTRO on their projects on 1998 it appears that *"For most of the projects, the research results were eventually used by non-scientific actors"* (WOTRO, 2010b). The organising of dissemination events, such as workshops and congresses, was also mentioned as outcomes of the research.

7.4.2 Perceived success

As an indicator for the perceived success, the researchers were asked whether they would cooperate with the same partners again. Most indicated 'yes', either because they had a very fruitful cooperation, or because prior to the research they did an inventory of the possible partners in the respective area and their partners seemed most adequate. In the latter case the cooperation was not perceived as a success because of the quality of the research of their partners, rather because doing the research in cooperation adds to the validity of the research and it opens doors.

Important note is that the bond with the partner is important for the perceived success of the cooperation. On the question whether the Dutch based researcher perceived the cooperation as successful, on researcher answered: *"Yes to an extend. It could be far better if there would be a lot more investment in the relationships."* The distance was often mentioned as a barrier that made close cooperation with the partner difficult. In addition this particular researcher mentioned that the cooperation suffered from the lack of involvement of the senior research partners. The involved PhD's, on the other hand, were very engaged and motivated.

Language was not necessarily perceived as a barrier. Their partners level in English was always sufficient and with a multiplicity of local African languages the partner often proved to be very beneficial. However, for fieldwork in other regions the researchers still need translators. Cultural barriers with the researchers were not often mentioned as a reason for making the research less relevant. However for doing the interviews the researchers sometimes had to get used to the cultural differences. For example in the field research on environmental problems the open questions to which problems the locals suffered from gave little response and the given examples were all confirmed. This is probably a politeness why researchers cannot take the first answer as true.



7.5 The African setting

The Dutch policy and researcher approach to cooperation with African researchers and the outcomes of the cooperation have to be placed in a case specific context to fully understand how they are connected to each other and influenced by external factors. The external factors that have an influence on the cooperation are considered changes in the broader setting of the cooperation. In this section the developments in the broader setting and the African perspective of the cooperation are discussed. A subdivision is made in the African economy, the African STI system and the perspective of the African researcher. Since WOTRO and this case study do not cover just one country, this section will stay at a more general level.

7.5.1 The African economy

Over the years 2001-2010, six of the ten fastest-growing economies were African countries. For the period 2011-2015 expectations are that 7 African nations will be in the top ten²⁰ (The Economist, 2011). In the years 2001-2010 the African countries were Angola (with 11.1% even exceeding China), Nigeria, Ethiopia, Chad, Mozambique and Rwanda. For the period 2011-2015 (and currently anno 2012) the African countries are Ethiopia (third behind China and India), Mozambique, Tanzania, Congo, Ghana, Zambia and Nigeria. South Africa, Africa's biggest economy by far, is lagging with an average growth of 3,5% over the years 2001-2010. North African economies suffer from the political disturbances during the 'Arab Spring' (The Economist, 2011).

However it has to be noted that these are all relatively 'poor' economies and thus have more potential for 'catch-up growth'. Africa's economy accounts for only 2% of the world's output. Much of the growth has been driven by the demand for raw materials, notably China's demand, and higher commodity prices. Uganda and Kenya have also shown a fast growth even though they are not dependent on the export of minerals (The Economist, 2011).

7.5.2 The African STI system

For the years 2000-2012 there is little indication that the science system has made significant improvements. Africa remains the world's poorest continent and the least scientifically proficient region. In 2009 Africa produced just 1,4% of the articles published in peer-reviewed international journals (NASAC, 2009).

Africa suffers from brain drain. One-third of all African scientists live and work in developed countries and this has crippled research development in Africa (NASAC, 2009). Molenaar, as well as some researchers, think that with the economic development of Africa, the research community will also develop and this will give opportunities for the future.

The Science and Development Network (SciDev.Net, 2012), as well as Molenaar (2008) state that there is a growing recognition that STI is essential to promoting economic growth. In 2008 Molenaar states that investments lag behind, while in 2012 the Science and Development Network states that African governments begin to increase their spending on R&D. The differing statements can indicate different conceptions as well as a trend.

²⁰ Based on the annual average GDP growth and the expected annual average GDP growth by the IMF. Excluding countries with less than 10m population and Iraq and Afghanistan.

7.5.3 The African researcher

According to the Dutch researchers as well as WOTRO's executive director, the African researchers' rationales to cooperate with Dutch partners are different from the Dutch rationales. The rationales that the Dutch interviewees mention for their African partners are:

- Solve lack of opportunities
- Access to funds from foreign research programmes
- Career advancement
- Solve local problems

As said, one-third of African researchers live and work in developed countries. NASAC even states that "*Most will never return*" (NASAC, 2009). In an evaluation of the WOTRO funded research cohort of 1998, the outcomes are that the majority of researchers indeed took a position outside their home country, notably northern countries. However, the majority of researchers from developing countries eventually returned to their country of origin. Note that this includes developing countries outside Africa and that this can explain the ambiguity.

7.6 Case conclusion

This case study aims to answer the question: *How has the Dutch approach in STI cooperation with Africa and in particular within the WOTRO programme changed from 2000-2012?*

At the policy level there has been change in the way Africa is approached. BuZa and also WOTRO still have a strong aim on capacity building, however also in cooperation with Africa the Top Sector policy is increasingly important. Through OCW and NWO that is also influencing WOTRO, which results in more focus in the research themes and increased private party participation.

Based on the interviews performed for this case study, it does not seem that there is significant change in the approach of the Dutch researcher. Researchers have a strong intrinsic motivation to work in Africa together with African researchers. The rationales for African researchers to work together with Dutch partners differ from the Dutch rationales. They are not symmetric in the sense that African researchers see cooperation also as a solution for the lack of resources and opportunities. There is synergy in the research goals of contribution to a solution to global and local (African) problems.

The funding flows predominantly from north to south, this has not changed over time. It cannot be concluded that the knowledge flows from north to south as well, since Dutch researchers indicate that they learn much from the local knowledge of their African partners. The level of expertise, analytical skills etc. are in general higher in the Netherlands, with the exceptions of researchers who worked in the north and have returned to Africa. STI in Africa is still in its infancy but has a promising future. That the level of STI has not made significant changes over the years 2000-2012, is also a reason that the Dutch researchers have not changed the way how they approach Africa.

8. Analysis

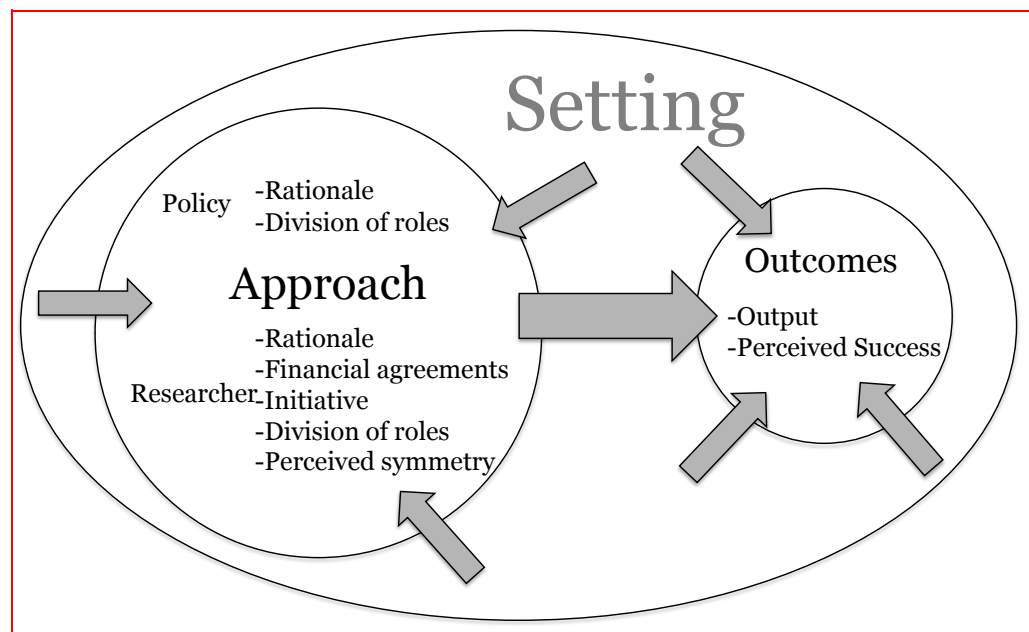
In Chapter 4 the Dutch policy approach to STI cooperation is set out, chapters 5-7 provide a detailed description of the case studies. In this analysis chapter, the findings from the previous chapters (4-7) come together in search of an answer to the question how the Dutch approach to STI cooperation with developing countries has changed.

The analysis will consist of three sections. The three cases will be compared with each other in section 8.1, in order to identify general trends over all cases and difference between the cases. The link and comparison with the Dutch policy context (Chapter 4) will be made in section 8.2 to see how these relate and to identify possible misalignments. Finally the relation between this study and the literature will be deepened in section 8.3, where the framework from the literature review is discussed and complemented with findings from the study.

8.1 Comparison of the cases

The change in dimensions show similarities, but also differences between cases. By comparing the cases it is possible to identify general trends in the changing approach as well as differences between the cases. This section will follow the same structure as the cases, which is the conceptual model from policy and researcher approach to outcomes and the relation to the broader setting. Figure 17 displays the conceptual model including the dimensions as it was introduced in Chapter 2. In addition the miniature conceptual model is also displayed next to each of the following sub-sections, indicating the relevant part of the model.

Figure 17 Conceptual model



In order to compare the approach over all seven dimensions and over all three cases, each dimension of both policy and researcher approach is indicated with a degree of change. Each dimension is indicated on whether it shows 'no significant change' (o), 'some change' (●), or 'much change' (●●). The relative terms 'some' and 'much' also partly indicate the change relative to the other cases. The explanation is given in each section and the results are summarised in Table 10 later this section.

8.1.1 Dutch policy approach

Policy Rationale

One of the main rationales for Dutch policymakers to support international cooperation in every case and every period in time is the scientific advancement. For Africa and Indonesia holds that this is the scientific advancement of both the Netherlands and their partner countries, however in the cooperation with China the emphasis is stronger on the Dutch scientific advancement. Related to this is that capacity building in China, at least for policy makers, has become less important over the years. In Indonesia capacity building still seems more important, however also decreasing. While in Africa capacity building is one of the main rationales for cooperation, it has even become a more explicit goal in WOTRO's strategy document in the second half of the 2000's.

Another clear overall trend is that the well-understood self-interest has become increasingly important in international STI cooperation. This relates to the access to human resources, access to knowledge and above all the Top Sector policy and the access to new markets. Table 8 summarises the policy rationales per case. SPIN-Indonesia shows change (becoming more- or less important) in the three rationales and is thus shows much change. JSTP-China only shows a slight decrease in the importance of capacity building but over all rationales no significant change. In WOTRO-Africa the access to markets is a new rationale for cooperation, other rationales show no significant change, thus overall WOTRO-Africa shows some change.

Table 8 Summary of policy rationales

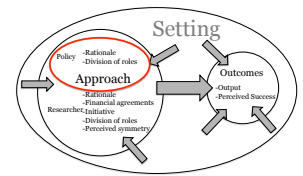
SPIN-Indonesia	● ●	JSTP-China	o	WOTRO-Africa	●
<ul style="list-style-type: none"> Scientific advancement Capacity building (-) Access to new markets (+) Access to unique sites Access to human resources Historic ties (-) 		<ul style="list-style-type: none"> Scientific advancement Capacity building (-) Access to new markets Access to knowledge Access to human resources Networking / sustainable cooperation 		<ul style="list-style-type: none"> Scientific advancement Capacity building Access to new markets (+) Access to unique sites International and local development goals 	

(-) decreased in importance, (+) increased in importance. Overall change Scale: o to ● ●. 'o' is no significant change, '●' some change, '● ●' much change)

Policy - Division of roles

As mentioned above, the well-understood self-interest and Top Sector policy are increasingly influential on STI cooperation. Thereby the focus in research themes has almost completely adjusted to find connection with one of the Top Sectors. This would imply a stronger supply-push type of cooperation, however research themes in SPIN and JSTP are chosen by joint-committees, i.e. by stakeholders from both countries. The committees look for mutual benefits in cooperation. In WOTRO this is slightly different because the focus is not on one specific country. However WOTRO also puts emphasis on stakeholder consultations to ensure demand led research. In combination with the Top Sector influence this has also shifted to mutual benefits.

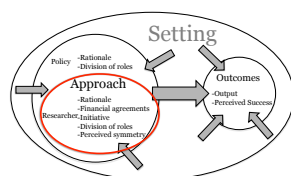
The ministries interest in the cases is illustrative for how the Netherlands perceives the partner countries state of development and how they are approached. EL&I is only active in China, the influence on cooperation in the other cases is merely through the Top Sectors. Simultaneously BuZa withdrew from China since development cooperation was no longer perceived necessary. This indicates that Dutch policy makers find China to be the most developed and economically interesting country.



The increased focus on the scientific and commercial benefits for the Netherlands in STI cooperation with developing countries results in that the Dutch policy makers show much change in the division of roles in general and thus in all three cases.

SPIN-Indonesia: ● ● | *JSTP-China*: ● ● | *WOTRO-Africa*: ● ●

(Change Scale: 0 to ● ●. '0' is no significant change, '●' some change, '● ●' much change)



8.1.2 Dutch researcher approach

Researcher rationale

The rationales for Dutch researchers to cooperate with partners from developing countries are summarised in Table 9. In general the rationales are not very different per case and have not changed much over time. Capacity building was mentioned as decreasing in importance and not more than a by-product in the cooperation with Indonesia and to a lesser extend also with China. For WOTRO this is still more relevant. Both in Africa and Indonesia researchers mentioned the access to unique sites as an important reason to cooperate. In cooperation with China the interviewed researchers never mentioned this, there is less intrinsic interest in working with China. The available funding for research cooperation with China seemed more important.

Researcher 'D', who is active in multiple research projects in all three cases, noted that research in China is focussed on other disciplines than the other cases. Where Indonesia and Africa are both very interesting because of their rich biodiversity and the possibilities to do fieldwork, research in cooperation with China is primarily based on lab work, or in case the Chinese Academy of Social Sciences (CASS) is the counterpart, the social context. This corresponds with the research disciplines of the other researchers interviewed for this study.

Table 9 Summary of Dutch researcher rationales

SPIN-Indonesia	●	JSTP-China	●	WOTRO-Africa	0
<ul style="list-style-type: none"> Capacity building (-) Access to data Access to unique sites Access to complementary knowledge Addressing global challenges 		<ul style="list-style-type: none"> Capacity building (-) Access to funding (+) Network building Access to complementary knowledge Access to complementary expertise 		<ul style="list-style-type: none"> Capacity building Access to data Access to unique sites Access to complementary knowledge Addressing global challenge Access to cheap research labour 	

(-) decreased in importance, (+) increased in importance. Overall change Scale: 0 to ● ●. '0' is no significant change, '●' some change, '● ●' much change)

Financial agreements

Within JSTP the funds are matched, which means that both Chinese and Dutch government fund the research in their country. As said, no exact figures are available, but there are signs that the Chinese partners often receive more funding than the Dutch researchers. Over the years 2000-2012 this has shown much change. This is different from SPIN and WOTRO, which is primarily funded by the Dutch government and within WOTRO increasingly by private parties as well. In the SPIN-Indonesia case, the Indonesian government is matching more Dutch funds, notably mobility funds. SPIN-Indonesia thus shows some change in financial agreements. WOTRO-Africa shows no significant change in financial agreements.

Researcher 'I', who is an expert in intellectual property rights (IPR) noted that in cooperation with African partners the IPR as result from the research usually belongs

to the Dutch partner, because they are funding the research. This is different in China where funding is matched. As other researchers confirmed, the IPR is then shared on the basis of scientific input.

SPIN-Indonesia: ● | JSTP-China: ●● | WOTRO-Africa: 0 (Change Scale: 0 to ●●)

Note: Based on the increase in input from the partner country, not Dutch arrangements concerning PPP.

Initiative

Both in Africa and Indonesia the initiative predominantly comes from the Dutch researcher. In China, where the funding arrangements are very different; the cooperation is more often based on a joint initiative or even on Chinese initiative. Thereby, the reason why also in China there is a strong Dutch initiative is not because the Netherlands is the paying party, but on the contrary it is more often to get access to research funding from China.

PhD students from Indonesia and China have increased access to mobility funds and more often take the initiative to do research in a Dutch research group. African researchers do not always have the same possibilities.

SPIN-Indonesia: ● | JSTP-China: ● | WOTRO-Africa: 0 (Change Scale: 0 to ●●)

Division of roles

In WOTRO and SPIN research projects, the local partners are usually more involved in the fieldwork and bring local knowledge to the cooperation. The research in cooperation with Chinese partners was less focussed on the local context. In general, the Dutch researcher is usually more involved with the multidisciplinary and analytical part of the research. This is also where Dutch policy makers and Dutch researchers indicate that they bring added value to the cooperation. Jointly writing the research proposals has become a requirement in all three case programmes, in most cases the same division of roles is observed, i.e. research design and direction in the Netherlands, addition on local aspects in the partner country. In cooperation with Africa and Indonesia it however seems that the Dutch researchers are increasingly interested in the vision and interests of their foreign partners.

Some change in the division of roles is observed in all three cases, based on the joint writing of the research proposal and the somewhat increased input of the partners.

SPIN-Indonesia: ● | JSTP-China: ● | WOTRO-Africa: ● (Change Scale: 0 to ●●)

Perceived Symmetry

In general, the STI cooperation with partners from developing partners was not perceived as symmetric. Of the three cases, the cooperation with China is perceived as the most symmetric. Of the three cases, researchers perceive the level of expertise the highest and the need to help the partner with capacity building the least in China. Cooperation with African countries is in general perceived as the least symmetric of the three cases. The aspect of capacity building is more important and the dependency on Dutch funding makes that the cooperation is perceived as the least symmetric. Indonesia is also mostly depending on Dutch funding for research cooperation. This has however changed now Indonesia is matching some of the Dutch funds. In terms of trends in the perceived symmetry of cooperation in the years 2000-2012, this is the most clear for Indonesia.

SPIN-Indonesia: ●● | JSTP-China: ● | WOTRO-Africa: 0 (Change Scale: 0 to ●●)

Table 10 Summary of change per dimension and case

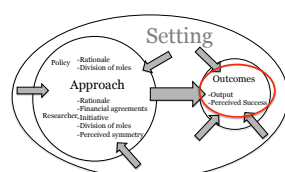
Level	Dimension	SPIN-Indonesia	JSTP-China	WOTRO-Africa
Policy approach	Rationale	● ●	0	●
	Division of roles	● ●	● ●	● ●
Researcher approach	Rationale	●	●	0
	Financial agreement	●	● ●	0
	Initiative	●	●	0
	Division of roles	●	●	●
	Perceived symmetry	● ●	●	0

Overall change Scale: 0 to ● ●. '0' is no significant change, '●' some change, '● ●' much change

In Table 10, a summary of the change is presented for each dimension per case. On the policy level, the division of roles shows significant change in all three cases. This is predominantly due to increased importance of the Top Sector policy. Developing partner countries are increasingly approached as opportunities, even though they can still receive aid. This is a change in approach that is largely independent of the state of development of the partner country.

China is generally considered the most developed country of the three cases, however the approach towards Indonesia shows more change over all dimensions, closely followed by China. It is very probable that in the period 1990-2000, China would have shown the biggest change and Indonesia would have shown a similar pattern as WOTRO. That would mean that the Dutch approach is heavily dependent on the state of development of the partner country.

The approach towards African partners shows the least change. However there are indications that Africa is quickly developing in terms of economic development and, related, in STI development. For the period 2010-2020 they might show the same patterns as Indonesia does now. The difference between the policy and the researcher approach is most eminent in WOTRO-Africa. Although the policy approach is more focussed on Dutch benefits, in practice the researchers have not changed the way they approach their African partners since there is little they can do differently.



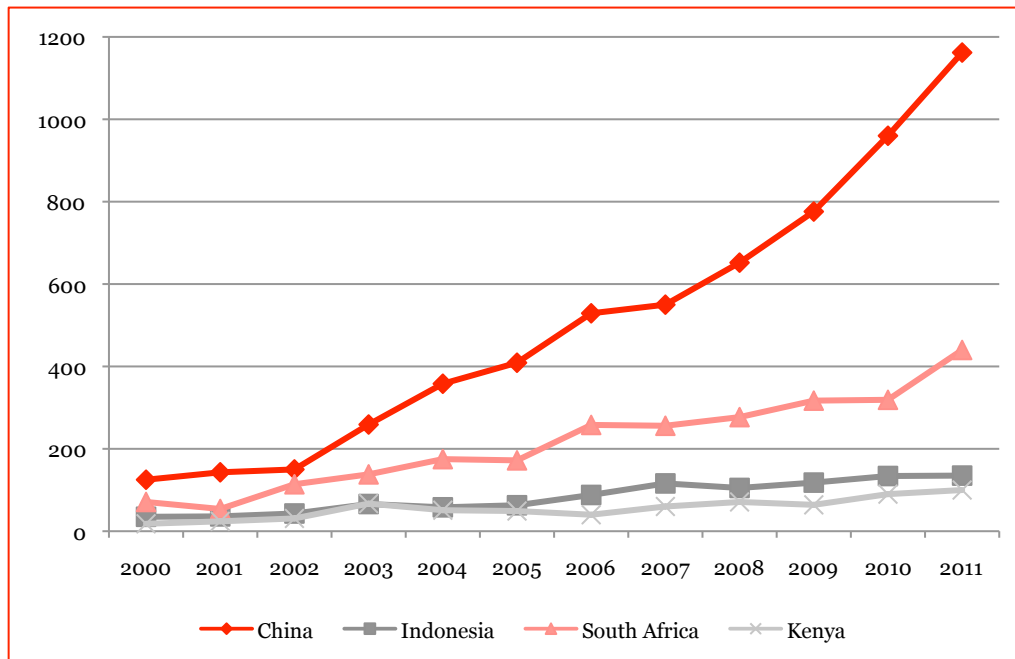
8.1.3 Outcomes

This section is the comparison of the outcomes of the three cases over the dimensions Output and Perceived success.

Output

Figure 18 shows the Dutch co-publications with China, Indonesia and the top-2 African countries for the years 2000-2012 (not restricted to the case programmes). All partner countries show an increase, however the co-publications with China show a significant higher increase.

Figure 18 Dutch co-publications with partners (2000-2011)



Source: Scopus (2012)

Scientific publications are important in most research cooperation, however these are not necessarily co-publications. There is no data available on the number of international co-publications vs. national publications per joint research project, however interview data does not suggest that the share of international co-publications is higher in China. The high number of Sino-Dutch co-publications thus has to come from a higher number of joint research projects, or from cooperation that did not involve joint research.

As stated in the programme objectives, as well as mentioned in the interviews, the type of output is different for the three cases. WOTRO projects in Africa, and to a lesser degree also SPIN (Indonesia) projects, have capacity building in the partner country as an important output. Capacity building is less relevant in cooperation with China; here the building of a network has become increasingly important. Workshops and other dissemination events are important outputs in all the cases, however the direct valorisation of research output to local problems is more important in WOTRO projects, less so in SPIN and even less in JSTP (China).

Perceived success

In general, based on all three case studies, the Dutch researchers perceive their research cooperation as successful and would like to cooperate with the same or similar partners again. There is no clear trend found in the perceived successfulness over time.

However not all the collaborations were perceived as very successful. In the projects where Dutch researchers perceived that the cooperation could have been more successful there was always a strong connection with the lack of communication and strength of the relation with the partner. There are examples of this in all three cases. Related to this are cultural barriers that make cooperation more difficult. In all three cases the Dutch researchers often described their partners as polite and difficult to involve in discussions and maybe a bit distant. This is a cultural difference with the Dutch direct manner of communication.

The perceived success of research cooperation is inherently related to the outcome of the expectations. When expectations are not met, this will have a negative effect on the perceived success and when expectations are met or even exceeded this has a positive effect on the outcome. The rationales to cooperate found in this study proved to be realistic, in the sense that these are not related to perceived (un)successfulness. I.e. the expectations of research projects in cooperation with African partners are lower than for research projects in cooperation with Chinese partners. Factors mentioned that have a negative influence on the perceived success are of a more process-oriented than output-oriented nature.

8.2 Policy - Researcher relationship

This section is on the following questions: How does the general Dutch policy relate to the researcher approach? How does one influence the other? Where do they share 'values', where do they misalign?

Answers to these questions are already touched upon in the previous section. In general, it can be said that the funding programmes facilitate in the needs of the user to fund joint research projects and to a lesser degree also help researchers to find partners. That is, researchers who want to do research in the theme that is decided upon by the programme committee. It was also mentioned in the interviews that researchers are quite path dependent. When one has a track in a particular field of research, one does not usually start a project in another field. Therefore, when a programme alters its thematic focus, the programmes do not necessarily guide the direction of the research, but merely serves another part of the research community.

There seems to be a difference between JSTP-China and the other cases. Researchers active in Indonesia and Africa indicated more often that they have an intrinsic driver to cooperate specifically with their partner country or developing countries in general. Researchers that cooperate with Chinese partners more often indicated to 'follow the money', so to speak. Dutch based research funding has become scarcer and research-projects could also, but not necessarily, be performed with Chinese partners where there is more funding available for cooperation. Therefore it seems that China is regarded more interesting from a policy level, than at a researcher level. This is probably because of China's recent- and potential development and maybe even because the ambition and push from China to further expand the STI cooperation. To relate this to the field of bio-fuels, both Indonesia and African countries, notably Mozambique, are interesting because of their rich biodiversity and biomass(-potential). Bio-fuel research in cooperation with China is more focussed on other elements, such as efficiencies. This is thus less context-dependent. And since China is perceived not to be excelling in this research either, the research is not dependent on the partner for success.

8.3 Reflection & Recommendations

Reflection on the case selection

The problem of selecting three cases out of numerous possible partnerships is that the study will not cover the entire development of Dutch STI cooperation with developing countries. The case selection of this study covers partners from least- to most developed-developing countries and with- and without historic ties. All in all this provides a good reflection of the possible research relationships with developing countries.

A possible addition to the cases used might be the cooperation with Brazil. A number of researchers interviewed for the case studies also cooperated with Brazilian partners. They indicated that their partners had a lot of experience in bio-fuel research since Brazil is using bio-fuels for some time. The cooperation would also be interesting for

further study because there are relatively few Dutch policy instruments aimed at cooperation with Brazil (see the overview in Appendix A) and relatively many Brazilian-Dutch co-publications (see Figure 4).

As already mentioned in the methods section, the external validity indicates to what extent the research conclusions can be generalised towards other populations (Yin, 2003). Since the case studies all cover Dutch international STI cooperation, the findings of this study relate to the Dutch approach for the selected cases. The findings cannot be translated one-to-one to other countries, however the characteristics and dynamics in the Netherlands will be indicative for other developed countries as well since these are placed in a similar broader setting. This is especially true for other EU member states with advanced STI capacities, since they benefit the same EU regulations.

Reflection on literature

In this section the results from this study are reflected upon in the light of the literature. Guiding questions are how the literature compares to the results, what results are in line with the literature, what contradicts and what does this study add to the literature?

Apart from the conclusions, an outcome of this study is a framework to study a possible change in approach to STI cooperation. Table 11 shows the framework of spheres and dimensions as proposed in the literature review. The findings from literature that guided to study of each dimension are supplemented with the findings from this study. The findings from literature that did not prove relevant in this study are displayed in red. Other findings from literature that are confirmed in the study are presented in the same column. The column to the right summarises the findings from the study that are added to the framework since they did not correspond with findings from literature.

Most findings from literature proved relevant to study a changing approach. However some findings were not mentioned. *Sharing costs and risks* was not mentioned as a reason to cooperate by the researchers in the sample for this study. Literature states that this is a common rationale with instrument intensive research. None of the research projects in the sample were very instrument intensive. In a research field where larger and more expensive instruments are required the *sharing of costs and risk* might be a relevant rationale. The *complementary skills* were only language skills in this study.

None of the Dutch researchers reported that they chose their partner to *increase their own impact and visibility*. Researchers mentioned this is more probable with very well known scientists in the field, who are more likely based in scientifically advanced countries. Cooperating with partners from developing countries is thus not business as usual in the sense that researchers strive for the best possible scientific output by choosing the best partners in the field. Reasons to perform the research in the specific country are more important. However within the country they cooperate, the Dutch researchers do look for the best partner.

Preferential attachment should not be confused with *network building*, which is reported as a reason by Dutch researchers, especially in cooperation with China. On the other side, preferential attachment, or career-oriented cooperation is mentioned as a reason for the foreign partners to cooperate with Dutch senior scientists.

Increasing the scientific quality was also not one of the rationales that was reported to cooperate with a developing country scientist. Similar to the preferential attachment, this would also be more appropriate in cooperating with a scientifically advanced country.

None of the research projects had a *co-patent* as output of the research project. This would be more probable in technology-based research.

Table 11 Framework added with study outcomes

Sphere	Dimension	Findings from literature	Findings from this study
Dutch Policy Approach	Rationale	<ul style="list-style-type: none"> Access to foreign markets Diplomacy Scientific advancement Addressing global problems Historic ties Capacity building 	<ul style="list-style-type: none"> Human resources (mobility)
	Division of roles	<ul style="list-style-type: none"> Sponsor push Demand driven Look for mutual benefits (including BoP ideology) 	<ul style="list-style-type: none"> Dutch benefits (Top Sectors)
Dutch Researcher Approach	Rationale	<ul style="list-style-type: none"> Sharing of the costs and risk Access to complementary knowledge Access to complementary expertise Access to complementary skills (Only language) Addressing global problems Increase own impact and visibility through research partner (preferential attachment) Network building Access to unique sites and populations Increase scientific quality Access to funding Help the partner with capacity building 	<ul style="list-style-type: none"> Access to cheap research labour
	Initiative	<ul style="list-style-type: none"> Initiative to cooperate comes from the most developed country Initiative to cooperate <u>not</u> only comes from most developed country The paying party has the initiative (Sponsor initiated) 	<ul style="list-style-type: none"> Initiative during the cooperation
	Financial agreements	<ul style="list-style-type: none"> Both parties contribute equally Sponsor-recipient division 	<ul style="list-style-type: none"> IPR rights belong to the paying party
	Division of roles	<ul style="list-style-type: none"> Complementary skills Sponsor push Demand driven 	<ul style="list-style-type: none"> Fieldwork and logistics – multidisciplinary and analytic research Design and direction with developed partner Contractee - contractor relation
	Perceived symmetry	<ul style="list-style-type: none"> Instrument intensity of the research Cooperation perceived as symmetric 	
Outcomes	Output	<ul style="list-style-type: none"> Co-authored scientific paper Co-patent 	<ul style="list-style-type: none"> Workshop / dissemination event Promoted PhD
	Perceived Success	<ul style="list-style-type: none"> Perceived benefits in line with expected benefits Willingness to cooperate again Strength of weak ties strengthens the research Cognitive distance makes cooperation difficult 	

The *Division of roles* as dimension of the researcher approach was primarily based on the notion in literature that research partners cooperate on the basis of *complementary skills*, each having added value in their own expertise. However during this study the division of roles developed into a broader conception, also including division of roles as ‘contractee’ (owner) - ‘contractor’ (executor), and a division of coordinating and supporting tasks.

This study confirms Cozzens' statements on a possible changing research relationship between developed and developing countries, but also elaborates more on how this change can be characterised, what influences the change and how this differs between developing countries. Study data confirms that the growing network cannot be solely explained by a self-organising phenomenon based on preferential attachment. This can still be true for developing partner country researchers, however for the Dutch researcher this does not hold. With the exception of the PhD researchers, the Dutch researchers that find their partners in Indonesia and especially in Africa do not cooperate because of career advancement. Thereby in these countries the initiative is still mainly Dutch where, following the line of reasoning of Wagner and Leydesdorff, one would expect the least developed party to take the initiative to cooperate with a prominent researcher from the north.

Following Cozzens, Career-oriented collaboration does fit in the self organising system, however most research projects in this study are also project-oriented and sponsor-initiated. An important finding is that commercial interests and opportunities are reported to be more important than career advancement in sponsor initiated research. It has to be noted that China does not fit this framework, in North-South divisions; China should not be regarded as at the same level as Indonesia en especially not as Africa. China has more funding available and is more interesting from a career-oriented perspective.

The dimensions used in the research can be perceived as the indicators for change in the approach. The dimensions that show a change over time are indicative for a changing approach. This should however not be mistaken with the drivers for change, which are the driving forces behind a changing approach. The drivers of change are different for policy makers and researchers, although in general the drivers seem to be primarily the development of the partner country. The difference between change in approach as a response to the developing partner and the change autonomous of the partner and what this entails for the conclusions is further discussed in the next chapter; Conclusion & Discussion.

Recommendations for further research

In addition to some suggestions earlier made in this study, here a few words are devoted to recommendations for further study. This study has led to important indications on how to measure a changing approach and how the change in the Dutch approach can be characterised. In further research an attempt could be made to further quantify the predominantly qualitative findings of this study. The framework that is build on the findings from literature and this study could be used as a starting point in a large scale survey to quantify the relative change of each finding and dimension of the change in approach.

9. Conclusions & Discussion

This study examined the possible change in the Dutch approach to STI cooperation with developing countries and how this change can be characterised. A framework was developed to study a changing approach at the policy level and the level of the researcher.

Bibliometric data shows that the global co-publication network has changed. More players are involved, the network is more decentralised and more links occur between players. Literature suggests that changing scale and scope of the network can have implications for the role of developing countries. For one it is suggested that researchers from developing countries could be involved in more equal research relationships and developed countries should learn more from developing country researchers. In this chapter the study comes to a conclusion to the main research question, which is:

- *How has the Dutch approach to STI cooperation with developing countries changed from 2000-2012?*

In chapter two the literature review led to a framework that enabled and directed the study to a changing approach in STI cooperation. Chapter four displays the study of the first level of the approach, the Dutch policy approach to international STI cooperation. Chapters five, six and seven cover the second part of the study, the researcher level of the approach. To study the researcher level, as well as the specific policy approach, three case studies were performed covering three different research-funding programmes with different geographical foci. Chapter eight is the analysis of what is found in the chapters four to seven.

The Dutch approach is partly related to the state of development of the partner country and for the other part autonomous of the partner country. This difference is essential to make further statements on a changing approach. The broad UN classification of developed and developing countries is used in this study, which entails that there are differences between the developing countries. The case studies range from 'most developed'-developing country, China, to 'least developed'-developing countries, Africa, and Indonesia somewhere in between. Without going into further detail, this difference has an influence on the Dutch approach and explains part of the differences found between the cases.

Thereby there is not only a difference between the countries, in differing degrees the countries themselves have also developed in the years 2000-2012. The change towards 'more-developed' with respect to a decennium ago partly explains the change in Dutch approach. There are also changes in the approach that are related to Dutch national developments and which are quite autonomous from partner countries.

Having made these two distinctions, the following section continues with answering the research question first for the policy and the researcher approach and thereafter for the specific approach towards the different policy countries. Subsequently the implications of these conclusions for researchers and policy makers are discussed.

So, eventually, this study supports the idea that the Dutch approach to STI cooperation with developing countries has changed over the years 2000-2012. In general the change in approach can be characterised by an increased focus on the Dutch self-interest. At the policy level the Top Sector policy has been introduced and has to a large extent become guiding in the international positioning of the Netherlands. The Top Sector policy proved to be both a thematic focus in the nine top sectors, as well as a different ideological approach where the competitive position of the Netherlands is the most important.

The Dutch policy approach has shown a clear change. Where previously development cooperation and *ownership* or even a *sponsor push* (*We decide what is good for the*

partner country) in international STI cooperation was normal, the Dutch *well-understood self interest* has increased in importance, especially over the second half of the 2000's. Resources have become increasingly scarce and therefore the invested research funding, in the long run, has to be beneficial for Dutch developments as well. Budgets are cut for cooperation with countries for which the extra stimulation has the least added value. The countries for which the budgets have decreased are European countries, since the European Commission has taken over this role, and other countries with which there already is extensive and 'easy' cooperation, such as the USA. The available resources are allocated to countries and regions where there are possibilities for the advancement of Dutch STI and possible markets for Dutch business and policy intervention has an added value, i.e. where access is difficult without the help of the government. From the three cases that were studied, China is such a country, although the Netherlands cannot meet the level to which the Chinese government wishes to increase the joint STI investments.

The Dutch researcher approach shows less clear changes. There are signs that this has become less altruistic, however the approach, logically, differs per researcher. Bluntly said, researchers always work in their own interest, because the science remuneration system demands publications and impact. However, for the researchers active in research cooperation in the field of bio-fuels and biomass, the impact they want to make is not always a publication impact but rather an impact on development, fair global distribution of resources and solving global challenges. This is thus not business as usual, although similar patterns can be expected in other fields of research, such as medicine research.

The researcher approach does not seem to change per researcher but between generations of researchers. The researchers in the sample have referred to themselves as belonging to a new generation of researchers who take a different approach towards partners from developing countries. Older generations are said to be mainly interested in the access to research grounds and helping the partner. The 'new generation' of researchers is thereby also interested in using the local knowledge of the partner and use those insights in the study. This is an approach more similar as they would have to researchers from other developed countries. This shift is thus not characteristic to the years 2000-2012 only; it changes with the change of a generation of researchers.

So, in general the answer is that both the policy and researcher approach are changing. In addition this study highlighted differences in the approach to different developing countries.

In cooperation with China, 'helping' China has ceased to be a reason to cooperate. Regarding the past economic and scientific advances and the current investments, cooperation is more a matter of keeping up to avoid Dutch obsolescence. Dutch researchers recognise these developments and see funding opportunities from China.

The Dutch approach towards Indonesia shows change in all dimensions. In cooperation with Indonesia the historic ties are increasingly less important. Still there is a lot of policy attention in terms of research funding programmes and other instruments. Although capacity building is in practice still important, the policy approach has an increasing focus on the Dutch scientific and commercial interest. Indonesian investments in STI cooperation make that the cooperation is perceived as more symmetric, however research funding is still predominantly Dutch.

The approach to STI cooperation with African partners has shown the least change of the three cases. This makes the correlation between the state of development of the partner country and the Dutch approach even more apparent. The African STI system is not as developed as the other case countries and this is recognised by policy makers and researchers. Although also in Africa there are exceptions of strong partners and fruitful cooperation. At the policy level the Top Sector 'ideology' is also operative, although development cooperation is the most prominent cooperation.

Implications for researchers

This study has led to a number of implications for researchers and policy makers with intentions to cooperate with developing countries on the basis of the changing relation, as well as in general for STI cooperation with developing countries.

In cooperation with developing countries the developed country researcher should make a distinction between different developing countries and the expectations in cooperating with partners from that country. However in all cases holds that researchers should not be after the quickest and best scientific output. The historic scientific powers are still the preferred partners to this end. Researchers should have an intrinsic driver to do research in the partner country and consider the factors, such as cultural and language barriers, that can make research more difficult and time consuming than would normally be the case. Also the level of expertise of the partner could be considered as lower than the Dutch. There is usually an element of capacity building in cooperation with partners from developing countries, whether it is the actual training of staff, or a slightly larger knowledge flow from North to South.

On the other hand, with the right approach cooperating with researchers from developing countries can also have large benefits. Not only the local context of especially Indonesia and Africa prove to be interesting research material, an open and non-patronising approach to the local partners proves to have very satisfying results. As opposed to research cooperation that is entered with a definite research plan that leaves little to the partner's perspective to the research.

Good communication with the partners sometimes proved difficult, however also essential for the perceived success of cooperation. Although, especially in developing countries, the possibilities to communicate remotely have made considerable improvements since 2000, face-to-face meetings and on site visits are of vital importance to fruitful cooperation.

The Dutch policy focus on Top Sectors provides opportunities for researchers interested in fields such as bio-fuels. However, researchers active in unrelated fields will experience more difficulties to acquire funds from Dutch research funding programmes. In that case a Chinese partner might offer the access to Chinese research funding which will enable the research. This would be very difficult to impossible in Indonesia or Africa.

Implications for policy makers

With an increasing stress on the development cooperation budgets, the cooperation with developing countries will increasingly be focussed on the Dutch benefits of cooperation. The policy implications of the increased focus on the Dutch Top Sectors for cooperation with developing countries will become more eminent in the future, however the first implications can already be seen. For one, new WOTRO funded research projects focus only on two of the four themes that BuZa focuses on in development cooperation, because these show overlap with the top sectors. In all research funding programmes, there will be decreasing interest in cooperating on other themes than the top sectors. This is (again) a sort of sponsor push from the Netherlands, in that the Dutch decide on the research theme.

However, developing countries also have stronger research agendas. For instance in cooperation with Indonesia, the Dutch are no longer in the position of designated research partner as the historical ties are becoming less important. Other countries recognise the development of Indonesia as an interesting research partner and Indonesia looks beyond the Netherlands for cooperation opportunities. A Dutch push of research projects will not be enough to attract the best Indonesian researchers unless it is also in their interest. Looking for mutual benefits and investing in long-

term cooperation rather than short-term are key if the Dutch want to keep cooperating with Indonesia in the future.

On top of that are the financial agreements. Dutch policy makers, as well as researchers, are increasingly looking for co-funding of research projects in order to increase the total available research funds, but also the perceived equality of the cooperation. Indonesia increased their investments, although in practice the Dutch researchers feel that their partners count and depend on Dutch funding. Thus at this point both parties want their partners to invest more in the cooperation. The cooperation thus has to be in both parties' interests.

The interest of the Netherlands in Indonesia has not changed significantly; it is still primarily the unique local context and not the scientific excellence. For Indonesia the interest in the Netherlands is not the unique Dutch context, but primarily the scientific excellence and access to resources. Both things in which the Dutch are not unique and the latter is even becoming less interesting. This pattern of decreasing importance translates in a lagging growth in Indonesian-Dutch co-publications.

In the search for co-funding in research programmes the Dutch should be aware of their competitive position as a research partner. That means that in research cooperation with Indonesia and Africa, which is almost always focussed on the unique local context, the Dutch should not depend too much on funding from their partners in the nearby future, especially when the Dutch interests are of high priority. Cooperation with China is very different since this seems to focus more on research projects that are not specific to a local context. Thereby the Chinese investments in STI exceed the Indonesian and African, and even Dutch investments by far.

The Dutch can have an influence on a more equal flow of benefits of the cooperation concerning intellectual property rights (IPR). Although the research funding mainly comes from the Netherlands, the Dutch research institutions could consider sharing the IPR if the foreign partner made a contribution to the research that led to the intellectual property.

In terms of bio-fuel research the conclusion is that the Dutch should invest in research on sustainable biomass and bio-fuel possibilities such as the *Jatropha* nut and make use of Chinese co-funding in research on biomass conversion efficiencies. This is the current reality. In STI cooperation with developing countries the Netherlands is dependent on the development of the partner country for change in the system of asymmetric interests and flows of funding.

The STI relationship between the Netherlands and developing countries has changed in many ways as was presented in this study. Although cooperation between the Netherlands and developing partners has become more symmetric, differences still exist. In Dutch policy, the symmetry of cooperation has become increasingly important, however the study showed that the equivalence of cooperation is also dependent on the economic and scientific development of the partner and the approach of the individual researcher. This is important to take into account when considering engaging in sustainable and successful STI cooperation with developing countries.

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Appendix A Dutch instruments for STI cooperation with third countries

Table 12 Total set of instruments for international collaboration with third countries

Instrument name (click name for web site)	Responsible Dutch actor(s)	Country	Memorandum of Understanding	Inward mobility	Outward mobility	Joint R&D funding	Attaché	Capacity building	Networking & brokerage	Duration	Budget [€/year]
BECIN (Bilateral Energy Cooperation Indonesia Netherlands)	AgentschapNL	Indonesia			X	X		X	X	Since 1995	N.A.
MoU India	EL&I	India	X								N.A.
MoU Brazil	EL&I & OCW	Brazil	X							Since 2011	N.A.
Innovation Attaché-Network	EL&I, AgentschapNL	BR, CA, CH, IN, JP, RU, SG, US, SK, IL					X				N.A.
API (Academy Professorship Indonesia)	KNAW	Indonesia						X	X	Since 2005	<50k
CEP - China Exchange Programme	KNAW	China		X	X	X					>50k - <1.0m
PSA (Programme Strategic Scientific Alliances)	KNAW	China							X	2003-2018	>1.0m (1.36m)
SPIN (Scientific Programme Indonesia-Netherlands)	KNAW	Indonesia		X	X	X		X	X	Since 2002	>1.0m
EKP (The East Kalimantan Programme)	KNAW, NWO	Indonesia				X			X	Since 2002	>50k - <1.0m
TT China (Talent & Training China-Netherlands)	KNAW, NWO	China		X						Since 2009	N.A.
Agriculture Beyond Food	KNAW, WOTRO	Indonesia				X				2009-2013	>50k - <1.0m
CAS-KNAW Joint PhD training programme	KNAW, OCW	China		X	X					2005-2013	>50k - <1.0m
JWC (The Joint Working Committee for Scientific Research Co-operation between the Netherlands and Indonesia)	KNAW(lead), OCW, EL&I, NWO, VSNU, Nuffic, INHEP	Indonesia							X	Since 2003	N.A.
Brasilia-Nederland	BuZa, Nuffic, NWO	Brazil		X						Since 2012	N.A.
ICC (international Collaboration in Chemistry)	NWO	USA				X				Since 2010	>50k - <1.0m
JRS (Joint Research Scheme Cooperation Hong Kong)	NWO	Hong Kong		X	X				X		>50k - <1.0m
Fulbright Award	NWO	USA		X							N.A.

JSPS (Japan Society for the Promotion of Science)	NWO	Japan		X	X				X		>50k - <1.0m
KOSEF (Korean Science and Engineering Foundation)	NWO	South Korea			X				X		>50k - <1.0m
NACCAP (EDCTP) (Netherlands-African partnership for Capacity development and Clinical interventions Against Poverty-related diseases)	NWO, WOTRO	Africa				X		X		Since 2004	>50k - <1.0m
NSC (National Science Council)	NWO	Taiwan			X				X		>50k - <1.0m
NSFC	NWO	China			X	X			X	2010-2014	> 1.0m (1.9m)
WOTRO	NWO	Developing countries, notably Africa				X		X	X	2000	>1.0m
JSTP (Joint Scientific Thematic Research Programme)	NWO, KNAW, OCW	China				X			X	2009-2014	>1.0m (1.6m)
CoCoon (Conflict and Cooperation over Natural Resources in Developing Countries)	NWO, WOTRO, BuZa	Developing countries				X		X		2009-2014	>50k - <1.0m
SSCIN (Social Science Cooperation India Netherlands)	NWO, WOTRO	India	X			X			X	Since 2006	N.A.
New Medical Devices for affordable Health	NWO, ZonMW	India				X				Since 2010	no data
Science Industry Cooperation (Hé Programme)	NWO	China				X				Since 2012	1.0m
MoU Chile	OCW	Chile	X								N.A.
MoU Indonesia	OCW	Indonesia	X							1992 and 2002	N.A.
MoUs China (4)	OCW	China	X								N.A.
Science Attaché	OCW, AgentschapNL	China					X				N.A.
ACO (Dutch Academic China Meeting)	VSNU	China							X	Since 2004	N.A.
BECAS Chile	VSNU	Chile		X							N.A.
MoU on Cooperation in Education and Research	VSNU	India	X	X	X	X				2008-2011	N.A.
Total			7	10	10	14	2	6	15		

BuZa Dutch Ministry for Foreign Affairs
 KNAW Royal Dutch Academy of Arts and Sciences
 MoU Memorandum of Understanding
 NWO Dutch Organisation for Scientific Research
 OCW Dutch Ministry for Education, Culture and Research

VSNU Association of Dutch Universities
 WOTRO Netherlands Foundation for the Advancement of Tropical Research
 EL&I Dutch Ministry for Economy, Agriculture and Innovation

Appendix B Interviewees

Table 13 Policy level interviewees

#	Interviewee	Organisation	Function
1	dr. Rudi Trienes	KNAW	Team Leader International Relations Department
2	dr. Francien Heijs & Janna Hensing	Ministry of OCW (Francien is ex BuZa and resides in Brussel)	Research and science policy
3	dr. Jan Karel Koppen	NWO	Director Policy development and Support
4	Jaap Broersen	Ministry of EL&I	Unit manager 2g@there
5	Jeroen van Oort	VSNU	International
6	Beer Schöder	Nuffic	Head of department expertise development
7	Henk Molenaar	WOTRO (ex BuZa)	Executive director

Table 14 Researcher level interviewees

#	Interviewee (institution)	Research title /theme	Remark
8	dr. Paul Burgers (UU)	i.a. Biomass, Poverty	
9	dr. John Alexander Posada Duque (UU)	<i>Biorefineries</i>	
10	prof. dr. Geert Duysters (UvT, TU/e)	i.a. strategic alliances, international business strategies, innovation strategies	Preliminary interview
11	prof. dr. André Faaij (UU)	Energy and resources	
12	dr. Madeleine Florin (WUR)	Biomass for fuel: Opportunity or threat to food and feed security?	
13	prof. dr. ir. H.J. Heeres (RUG)	<i>Exploring the potential of the Jathropa plant</i>	
14	dr. Floor van der Hilst (UU)	Biomass and Biomass potential	
15	dr. ir. Ton Hoitink (WUR, UU)	Hydrology, and quantitative water management	Informal conversation
16	dr. Bram de Jonge (WUR)	IPR in agricultural research in developing countries	
17	Carina van der laan MSc	Sustainable agriculture, Ecology, Natural Resources Management	PhD researcher
18	em. prof. dr. Nico Schulte Nordholt (UT)	Transfer and social construction of technology and sustainable development	
19	prof. dr. Johan Sanders (WUR)	i.a. Bio-fuels, Bio-energy, Agrotechnology	Brief e-mail contact
20	dr. ir. Ronald de Vries (KNAW)	<i>Reducing the stringency of chemical and thermal treatments of plant biomass for bio-fuel production by developing more efficient enzyme mixtures.</i>	

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