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Sida Decentralised Evaluation

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Evaluation of the Sida supported programme “International Science Programme 2014–2018”

Final Report

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June 2018**

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The views and interpretations expressed in this report are the authors' and do not necessarily reflect those of the Swedish International Development Cooperation Agency, Sida.

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Abbreviations and Acronyms

ACE	African Centres of Excellence
ARUA	African Research Universities Alliance
AAU	Addis Ababa University
DAC	Development Assistance Committee
EQ	Evaluation Question
IPICS	International Programme in the Chemical Sciences
IPMS	International Programme in the Mathematical Sciences
IPPS	International Programme in the Physical Sciences
ISP	International Science Programme
RBM	Results Based Management
RG	Research Group
RUPP	Royal University of Phnom Penh
SN	Scientific Network
SEK	Swedish Kroner
Sida	Swedish International Development Cooperation Agency
SO	Specific Objective
ToC	Theory of Change
ToR	Terms of Reference

Executive Summary

The International Science Programme (ISP) at Uppsala University provides long-term funding to the development of research capacities in low income countries in Chemistry, Mathematics and Physics. It focuses on supporting research groups (RGs) and scientific networks (SNs) the majority of which are working in defined applied science problem areas within the basic sciences. These groups and networks in turn collaborate with better resourced scientific teams and individuals either within or outside their own region. A focus on capacity development, long-term support, improved research environments, collaborative links, exchange activities and a sandwich model of PhD training have characterised the programme. In 2017 ISP supported 40 RGs and 19 SNs in 12 countries, nine of which are Sida focus countries. Sida has been the main funder of ISP's core programme since 1965, providing about 162 MSEK (80% of its overall budget) for the 2014-2018 programme period.

The stated aims of the 2014-2018 ISP, which is the subject of this evaluation, align with Sida's interests in promoting the role of scientific knowledge for addressing development challenges and contributing to social and economic development. Three specific objectives (SOs) structure the ISP and are concerned with (a) improved organisation, conditions for and planning of research and training, (b) greater production of high quality research outputs and (c) increased relevance and use of trained graduates and research results for society. The ISP fulfils a direct, facilitating and promotive role in supporting scientific activities in its partner research groups and university departments.

Based on a review of the programme and its activities, this evaluation takes stock of the results achieved and aims to provide new thinking on the future development of the ISP. This will contribute to Sida's assessment of its support to a possible new phase of the programme and also provide input into the ISP learning on how the programme implementation may be developed in a new phase. Although focused on the 2014-2018 period, the evaluation has taken into account the historical development of the ISP. The primary users of the evaluation are the Unit for Research Cooperation within Sida and the management team of the ISP.

The evaluation took place between February and June 2017. The evaluation methods followed the approach developed in the inception report. It was participatory and implemented according to a Theory-Based Evaluation model. It was guided by using a reconstructed Theory of Change for the 2014-2018 programme period. Data was collected from documentary analysis, analysis of ISP monitoring information, interviews with the ISP management team, field visits to two country programmes in

Ethiopia and Cambodia. Data was also collected in three secondary case study countries (Bangladesh, Burkina Faso and Uganda) through telephone and skype interviews with RG and SN leaders and document review.

ISPs capacity development activities have primarily focused on the capabilities of RGs and SNs to generate results and it has not generally addressed other necessary capabilities to support the development and sustainability of good research environments in the partner universities. The changing landscape in higher education, particularly in Africa with new partnerships and networks in support of science and technology development, will place demands on the ISP model to more clearly position itself in the future. Moreover while ISP's strategy emphasises both the principled and instrumental reasons to support the basic sciences, the limited reach of its capacity development interventions are justified more by the public good argument to support such research than its broader societal relevance in terms of development and poverty reduction.

The ISP programme has considerable strengths and all those who have benefited from its support speak to how responsive it has been to their needs and priorities, its supportive and participatory approach and its long-term flexible funding. Its support through funding for skill development, equipment provision, consumables, as well as ability to facilitate international research collaboration and exposure has done much to bring its grantees¹ into a wider community of research. Its pragmatic approach to problems and issues has been effective. Much of the research that has been supported has clear relevance to country-specific development needs and where the application is less clear, the research has been of intrinsic merit. In this sense ISP has contributed significantly to the public good in its domain of activities.

ISP management has done much to bring in routines and systems in order to bring coherence to the programme, and this started before the 2014-2018 period. However it has been working to a results framework that is not coherent and not helpful to formal programme learning and reporting. Data is collected for compliance purposes and limited analysis of it has been undertaken. Formal learning from monitoring of change processes has not been systematic. At the heart of the challenge is a disconnect between what ISP actually does in relation to capacity development and its monitoring framework, which gives insufficient attention to the chronology of the development of those capacities it is engaged with and to what its activities can and cannot deliver with respect to the development of capabilities. We also sense this, combined with ISP's long term funding and commitment to RGs and SNs, may have trapped these groups into forms of financial dependency on ISP. ISP has no mandate or means to build the capacities of the institutions where the RGs and SNs are located

¹ The term grantee is applied to both individuals and RGs and SNs.

and since many of these institutions suffer severe capacity constraints and the RGs and SNs are financially dependent on ISP, they do not progress to independence.

Relevance

There is no question that ISP's support to the development of research capacity has been broadly relevant and aligned with Swedish policies for research in development cooperation. However while all the recipients interviewed see the ISP support as being highly relevant to the development of their scientific research capacity, ISP does not have specific objectives or an over-arching strategy for developing scientific research capacity. In many cases it is evident that much of the research is very relevant to local development challenges. But the picture is uneven as the ISP's concern to see RGs engaging in outreach is not reflected consistently in the assessments and there does not always appear to be consistent follow-up where doubts are raised about the relevance of research to national development challenges.

Effectiveness

The 2011 evaluation of ISP recommended changes in the governance of the ISP programme. Although the Board membership has been diversified during the current programme period, the ISP Board would benefit from broadening its skills sets even further. The recommendation on the membership and selection of members of Reference Groups which guide the RGs and SNs has been addressed but performance management of the Reference Groups remains underdeveloped. Further the Reference Groups are not playing a sufficient and systematic role in evaluating progress reports and outcomes and evaluating new research proposals. While there have been changes in the invitation and selection of RGs, the weaning of RGs or SNs off ISP funding has not happened in a systematic way.

The logical framework developed by ISP has not provided a coherent approach to relate activities and outputs to higher level outcomes. Monitoring has focussed primarily at a lower level of the results chain. While a considerable volume of data has been collected it has not provided a basis of learning or a tool for management of the programme. The aggregation of data across all RGs and SNs and the presentation of averages in annual reports has limited use for learning about the chronology of development of specific RGs and SNs over time. While the contribution of ISP to the improvement of scientific research facilities and technical resources has been a core strength of the ISP the absence of relevant data means that it is not possible to assess whether capacities to formulate research problems or improve research proposals have changed. Nor is there systematic evidence of changing capacities to attract external research funding. ISP's monitoring has not addressed developments in research leadership.

In sum there is no coherence between how ISP carries out capacity development in practice and what is contained in its strategy and results framework for capacity development. This leads to a lack of clarity about capacity development objectives and the processes that ISP uses to achieve them. ISP does not specify what the

capacity gaps are for each RG or SN, or establish baselines of capacity at the time that funding starts to a RG or SN, or set out specific strategies that will be used to address these. Its monitoring data, both because the indicators poorly address the development of capacities and because ISP averages its metrics across the total population of its grantees offer no systematic understanding of ISP's contribution to enhanced research capacity.

Impact

The ISP's strategic objective 3 (Increased use by society of research results and of graduates in development) is set at too high a level to be achievable, since ISP has little or no influence over whether and how research results are disseminated or taken up by the public or private sectors. The related logframe indicators – which list examples of uptake – are an inadequate measure of any contribution that the ISP may have made to the achievement of this objective. Simply enumerating examples of results in this way does not provide evidence that they can be attributed to the ISP. A degree of attribution to ISP can be assumed where there has been uptake of outputs from research that ISP funding made possible and there are some persuasive cases where ISP support has clearly contributed to such outcomes. But the effects of the ISP support on the policy level are too far removed from ISP's actual operations and sphere of influence to be meaningfully measured.

Gender

Annual ISP reporting includes some basic gender-disaggregated data i.e. on the number of men and women in PhD and MSc student cohorts. In line with most global trends, these show low rates of participation by women, and they generally indicate no significant changes in the gender balance in RGs and SNs since 2014. On the whole, chemistry RGs and SNs have higher proportions of women than either physics or mathematics. Findings from the evaluation did not clarify the reasons for this. The very different contexts in which RGs and SNs are located mean that cultural norms alone cannot explain the small number of female postgraduates in science. Other country- and institution-specific factors need to be considered. In its 2013-2017 strategic plan, ISP committed to initiating a focused approach to promoting gender equality in its PhD and MSc intakes and a Gender Equality Working Group was accordingly set up. A number of initiatives have resulted including a grants programme to promote gender equity that started in 2017. Initial results from this look promising but it is still too early to reach a full assessment of its impact.

Environment

The ISP collects information in its activity reports on whether RGs and SN have implemented any of the 9 measures listed to reduce or avoid negative natural environmental impact. However the data is not complete and its current organisation did not allow time for group and network based analyses. Moreover the scoring approach on predefined issues might speak to some of the environmental issues faced by individual RGs but not necessarily all of them. They tell us little about the environmental impacts of activities of ISP-supported research.

Sustainability

With respect to the sustainability of RGs and SNs, the analysis of financial data made available to the evaluation for the period 2014-2016 shows that most RGs and SNs remain highly dependent on ISP. The sixteen RGs/SNs that have received ISP support for 20 years or more had funding levels that varied between 32 percent and 100 percent with a median of 79 percent. Similarly, funding levels to groups and networks in the case study countries ranged between 13 percent and 100 percent, with most lying between 60 percent and 80 percent. The prospects for financial sustainability of most ISP-supported groups and networks therefore appear poor.

For the ISP as a whole few if any donors are prepared to focus on capacity development processes and give the time for it that Sida has been willing to do. The chances of getting significant complementary funding for ISP given its current mode of operation and weaknesses in the performance monitoring are also slight. ISP has not communicated well on what it has done and a more articulated and managed process that could speak more convincingly to external actors of the strengths of the ISP approach and achievements might be more likely to find co-funding. There are actions that ISP could take in the design and development of its programme that could make it more attractive to complementary funding.

Recommendations

ISP's strengths can be leveraged in new ways and there is a future role for ISP. It offers a modality of working in capacity development support that is all too rare in allowing its partner national scientists the opportunity and support to develop their capacities. ISP needs to develop a robust Theory of Change and articulate which specific capacities it is focusing on supporting and from this develop an appropriate monitoring framework. Such a framework should enable both accountability to Sida and learning within the programme.

The current model of operation provides the basis for continuation, albeit within a phased and time bound modality. A time horizon for support to RGs/SNs at should be defined at the outset, linked initially to five three-year cycles of funding. This would then be subject to external review if a case was to be made to extend funding for a further defined period. This would encourage more systematic monitoring of capacity changes and joint assessment by ISP and the concerned RG/SN of progress towards sustainability. This would take account of both baseline conditions in the institutional environment as well as any subsequent changes. In deciding how to position itself after 2018 and how to focus its support to groups and networks, ISP will need to consider whether it has the responsibility and the capacity to assist RGs and SNs to develop and implement fund-raising plans so that, by the end of an agreed period of ISP support, they have diversified their funding and significantly reduced their financial dependence on ISP.

The ISP could consider moving its support a little more upstream and provide selective support to a post-doctoral scheme. Linking such a scheme to building collaborations or working in new research environments with existing RGs and SNs would provide real opportunities for career development and wider research experience.

ISP could also consider moving towards a competitive research funding approach, particularly for more mature RGs/SNs specifically designed to bring them up to competitive standards. The principle of this would be for ISP to identify core areas in the basic sciences that it considers are in the public interest, in need of support and are not being addressed by others. The funding could support all the modalities that ISP currently deploys, including training, mentoring, collaboration, etc. However the funding should be fixed term and subject to progress which must be closely monitored.

The report concludes with ten specific recommendations.

1 Introduction

The International Science Programme (ISP) at Uppsala University was established in 1961. It provides long-term funding to the development of research capacities in the basic sciences of chemistry, mathematics and physics in low income countries, tied to support for postgraduate education in these disciplines. Originally based on a model of individual training it has evolved over time. It now focuses on supporting research groups (RG) and scientific networks (SN) the majority of which are working in defined applied science problem areas within the basic sciences. These groups and networks in turn collaborate with better resourced scientific teams and individuals either within or outside their own region. A focus on capacity development, long-term support, improved research environments, collaborative links, exchange activities and a sandwich model of training have characterised the programme.

Sida has been the main funder of ISP's core programme since 1965, providing currently about eighty percent of its overall budget. Other important funders of ISP are Uppsala University and Stockholm University. The scope and scale of the programme have reflected the ambitions and principles guiding Sida's international engagement. From 2008 there were a number of years of uncertainty over Sida funding, but from 2014 it committed support of 162 MSEK to ISP over a five year period. In addition to this core programme of ISP, the ISP provides coordination services for a number of Swedish bilateral programs in research cooperation in Ethiopia, Mozambique, Tanzania and Uganda. It also has four other partnerships funded by the collaborating partner and there was a Minor Field Studies programme that provided stipends to students to work with ISP supported research groups which was centralised in 2016 by Uppsala University, thus ending IPS's role in it.

The stated aims of the 2014-2018 ISP, which is the focus of this evaluation, align with Sida's interests in promoting the role of scientific knowledge for addressing development challenges and contributing to social and economic development as stated in the Swedish Government policy for research in Swedish development cooperation in force at the time of the ISP design and is consistent with the Government of Sweden's subsequent strategy for research cooperation.² Three specific objectives (SOs) structure the ISP and are concerned with (a) improved organisation, conditions for and planning of research and training, (b) greater

² Government Offices of Sweden, (2015), 'Strategy for research cooperation and research in development cooperation 2015-2021'. Government Offices of Sweden: 'Policy for research in Swedish development cooperation 2010-2014 and strategy for Sida's support for research cooperation 2010-2014' and 'Strategy for research cooperation and research in development cooperation 2015-2021'.

production of high quality research outputs, and (c) increased relevance and use of trained graduates and research results for society. The ISP aims to fulfil a direct, facilitating and promotive role in supporting scientific activities in its partner research groups and university departments.

The ISP has three constitutive programmes: the IPICS (the International Programme in the Chemical Sciences), the IPMS (the International Programme in the Mathematical Sciences) and the IPPS (the International Programme in the Physical Sciences). In 2017 these supported 40 research groups and 19 scientific networks³ in 12 countries, nine of which are Sida focus countries. The IPICS and the IPPS date back to the early days of the ISP and have the largest number of research groups and networks while the IPMS was established more recently (2002) and is the smallest programme. ISP is subject to the governance of Uppsala University, where it is hosted. It has an International Board appointed by the University's Vice Chancellor and an Executive Committee. The Board appoints the scientific reference groups for each programme to advise the programme directors on the granting of financial support to RGs and SNs. There is an IPS secretariat comprised of a director, programme directors and assistant directors with supporting administrative staff.

³ Research Groups have at least one senior scientist and one postgraduate student and are supported directly by ISP. They will also partner with a Collaborator who supports the research. The collaborator may be based in the region or in a northern country. Funding is normally in cycles of about three years. A Scientific Network consists of a group of scientists in a number of developing countries that share interests, facilities, undertake exchanges and organise meetings.

2 The context

The ISP in its 2013 strategic plan positions its contribution as follows:

'[Its] vision is to efficiently contribute to a significant growth of scientific knowledge, so promoting development. The expected outcome is more well-qualified postgraduates, and an increased production and use of high quality scientific research results. Collaborating universities all gain an expanded global perspective. Support to basic sciences is important for the development of applied sciences, of quality education and of technology. The nurturing of evidence-based, critical thinking, also impacts on democracy development, economic growth and poverty alleviation.' (ISP, 2013:1)

In essence this position paraphrases the arguments made in the 2011 evaluation of ISP⁴ (GHD, 2011) on the role of science in contributing to development and poverty alleviation. This places ISP's contribution at a relatively high level of capacity development and at an institutional level. The GHD evaluation offers a number of reasons why aid investments to support enabling science are justified. These comprise both issues of principle (research in basic sciences is a public good; market forces rarely provide this; science is not easily afforded in the global south; and research and training requires long-term investments) and more instrumental aspects (the links between research outputs and poverty reduction; the links between science, productivity and competitiveness; and the role of science in providing the evidence base to meet development challenges). GHD (2011) also noted that while good science might be a necessary condition, it is far from being a sufficient condition for development and poverty reduction.

A striking feature of ISP is the continuity of its programme model over the last three decades or more. Although it started with an individual fellowship programme, it fairly quickly evolved to the research group and scientific network model that has been kept to this day although elements within this have changed. The key interventions of modest but repeat research grants, equipment provision and training in various forms, were all seen as contributing to capacity development. But we need to be clear about the scope and dimensions of capacity development and practices to build it in evaluating the ISP and its contributions to capacity development. There is also a need to take account of the changing landscape in higher education, particularly in Africa and what this might imply for the ISP (and its capacity development model),

⁴ GHD Pty Ltd (2011) Report on the Evaluation of the International Science Programme. Swedish International Development Cooperation Agency.

as well as critically consider the instrumental assumptions being made about the contribution of the ISP. These issues are discussed in the three sections below.

2.1 THINKING ABOUT CAPACITY DEVELOPMENT

Capacity development as a concept and practice has been described as confused, contested, contextual, counteracted and complex.⁵ What is capacity, what shapes it, where is capacity located and how it can be influenced? We follow the findings of Morgan⁶ in breaking capacity down into five specific capabilities that successful institutions (e.g. Universities) demonstrate and that can be seen as outcomes of capacity development:

- *The capability to self-organise and act:* the ability to mobilise resources (financial, human, organisational), to create space and autonomy for independent action, motivate unwilling partners and to plan, decide and engage collectively to exercise other capabilities;
- *The capability to generate results:* the ability to produce outputs and outcomes and sustain production over time and add value to society, citizens or beneficiaries;
- *The capability to establish supportive relationships:* the ability to establish and manage linkages, alliances and partnerships with others to leverage resources and actions; build legitimacy in the eyes of stakeholders; and deal effectively with competition, politics and power differentials;
- *The capability to adapt and self-renew:* the ability to adapt, modify plans and operations based on monitoring of progress and outcomes; proactively anticipate change and challenges; and cope with shocks and develop resilience;
- *The capability to achieve coherence:* the ability to develop and share short and long term strategies and visions; balance control, flexibility and consistency; integrate and harmonise plans and actions in complex, multi-actor settings; and cope with stability and change;

Thus the more capacity development efforts manage to support and integrate the development of these five capabilities, the more capacity to achieve a desired collective purpose is generated and enhanced. Accordingly strong overall capacity to generate results is not just the presence of resources or a sufficient level of scientific knowledge. It is also a set of ‘soft’ skills for key personnel and the creation of

⁵ James, R and Wrigley, R (2007) Investigating the mystery of Capacity Building: Learning from the Praxis Programme’ Praxis Papers 18, International NGO Training and Research Centre (INTRAC). To address those five challenges, the authors propose that stakeholders need to articulate more clearly (‘confused’) and negotiate a shared understanding (‘contested’) of capacity development; root that understanding in the specific context and culture (‘contextual’); mitigate the obstacles to capacity development in the aid system (‘counteracted’); and appreciate the degree of difficulty inherent to capacity development (‘complex’).

⁶ Morgan, P (2006) The Concept of Capacity, Maastricht: European Centre for Development Policy Management (ECDPM):8-16.

institutional environments that support cross-sector collaboration and constructive negotiations.

Our understanding of ISP's mandate as evidenced in its practice is that it works almost entirely at an individual and group level rather than at an institutional/university level. It contributes at the individual/group level to the second of these capabilities, the capability to generate results. To a certain extent it also contributes to the 'capability to establish supportive relationships', mostly with respect to scientific/academic linkages between groups and networks. However the broader issues of competition, politics and power that these groups and networks face within their university environment is beyond ISP's mandate. The other three capabilities largely lie outside ISP's reach, thus raising questions over the ambitions of ISP's vision stated above.

As Morgan makes clear, capacity is not just a technical issue determined by an individual's knowledge or an organisation's administrative limitations. Rather it is a function of a broader socio-political and historical context of the university in which the RGs or SNs with which ISP engages are located. The university and national contexts within which the RGs and SNs operate influence the levels of capacity that can be exercised and the potential for capacity development and the design of ISP support needs to take this into account.

Within a university where ISP operates there are three key levels to consider: first, the key actors or agents (research leaders and scientific members of that group); second, at the organisational level of the department or faculty level; and third at the systems level of the university (the broader administration and its practices). There are also cross-organisational processes of governance across these levels such as procurement systems and delivery chains. The actions of researchers are mediated by the norms, procedures and mandates of the organisation in which they work. Despite these interrelations, capacity is not developed in a linear way. The graduation of new PhD students does not necessarily translate, for example, into higher aggregate capacity at the research group, departmental or university level although it might.

It follows that support to capacity development can be targeted in various ways and for different purposes. The extent to which a particular capability can be referred to as strong or developed depends on the right mix of factors or conditions being in place. There are broadly five different way in which capacity can be targeted that can contribute to the strengthening of capabilities:

- *Resources* (who has what): e.g. money, equipment etc.
- *Skills and knowledge* (who knows what): academic training
- *Organisation* (who can manage what): management skills
- *Politics and power* (who can get what): governance in the university and society
- *Incentives* (who wants to do what): university procedures, accountability structures

Our understanding of ISP is that its support to capacity development primarily focuses on the first two of the above – resources and skills and knowledge. However the ISP research grant process also contributes to the development of research and education management skills. More recently specific short-term training programmes on management skills have been run. This understanding informs our analysis of the ISP contribution to capacity development with its partner organisations. It also provides the lens through which we will consider the functioning of the ISP Secretariat itself.

2.2 THE CHANGING HIGHER EDUCATION LANDSCAPE

Over the last decade and particularly in Africa there have been marked changes in the higher education landscape and context. From a position of neglect, which might have been the setting in which the ISP model was developed, there has been a resurgence of interest and support for higher education in Africa. There has been a dramatic expansion in the number of universities and students over the last decade, much of it driven by private universities to meet a growing demand from school leavers. This expansion in numbers has had effects on quality and generated in turn problems of unemployed graduates.⁷

But there has also been a growing interest in promoting the role of investments in science and technology to move African countries to knowledge-based societies and to strengthen the role of applied science, engineering and technology in the development agenda.⁸ Diverse actors have been involved in this. Sixteen leading African universities have formed an African Research Universities Alliance (ARUA) in order to develop centres of excellence and are seeking international funding to leverage that position. The second Next Einstein Forum⁹ was recently held in Kigali, Rwanda drawing scientists from throughout Africa. It not only promoted a new journal launched by Elsevier publishers for African Science, *The Scientific African*, but it also saw presentations by ‘New African Einstein’ fellows, many working on more basic science issues. Many of these were located in academic institutions outside Africa though. The World Bank through its African Higher Education Centres of Excellence I(ACE) project is promoting centres of excellence in order to support the role of science in development. A regional scholarship and innovation fund in

⁷ The Economist, April 12th 2017: More can be less: African universities recruit too many students.

⁸ The World Bank and Elsevier (2014) *A Decade of Development in Sub-Saharan African Science, Technology, Engineering & Mathematics Research*.

⁹ <https://www.nexteinstein.org/next-einstein-forum/?lang=en> accessed April 25th, 2018.

Applied Sciences, Engineering and Technology has been funded by the Government of Senegal, Ethiopia and Rwanda with support from the World Bank to address gaps in skills and knowledge in Sub-Saharan African and build the capacity of African education and training institutions.¹⁰

The question arises, particularly in Africa where the majority of ISP's partner universities are located: what does this mean for ISP's model of engagement which is based on a collaborative partnership that is needs based, process driven and long term which contrasts strongly (see section 4.2.7, evaluation question 16) with the World Bank support, for example. What is ISP's future niche and to what extent and in what ways will it need to engage in more collaborative arrangements and build synergies with the processes of change that are underway or seek to focus where such programmes do not reach? A case in point is the extent to which the ISP should work with the African Institute for Mathematical Sciences, which the Einstein initiative has supported and which is now setting up regional centres to promote practical mathematical and scientific skills for African graduates.

2.3 SCIENCE, TECHNOLOGY AND DEVELOPMENT

In the increasingly dominant view of the instrumental value of higher education, and the role of science and technology in particular in contributing to economic development, the public good role of higher education should not be neglected. This speaks to the intrinsic merits of scientific knowledge and the empowering aspects of that knowledge to ISP's partners and the countries within which they work. As one formidable critic of the assumed links between higher education and economic development in the UK argued, education in itself has wider public good values.¹¹

Moreover, and noting ISP's vision statement, science and technology is not a sufficient condition for development or poverty reduction. As a recent analysis of rural poverty reduction rates made clear,¹² politics is central to the ways in which economic growth does or does not contribute to poverty reduction. Relatively speaking Ethiopia, Cambodia, Burkina Faso and Uganda (all ISP partner countries) have had relatively fast rates of poverty reduction although under different conditions of structural transformation, while Bangladesh, which has an advanced scientific programme, has not. As the Economist recently observed¹³ the answers to economic

¹⁰ <https://www.rsif-paset.org/about/>

¹¹ Alison Wolf (2002) *Does Education Matter?: Myths about Education and Economic Growth*, Penguin.

¹² International Fund for Agricultural Development (2016) *Rural Development Report*.

¹³ The Economist: Root and Branch: Economists understand little about the causes of growth, April 14th, :70.

growth lie more in history and politics than in elegant mathematics or in science and technology *per se*.

All of which suggests that it is the public good arguments, given the nature of the ISP, that are as important to make as the instrumental ones for the value of the programme and ISP's contribution.

3 Evaluation methods

The evaluation took place between February and June 2017. During the inception phase¹⁴ there was a review of primary documentation, an informal meeting with the Director of ISP and a request was made for disaggregated data (see Annex 5) on the programme, which was collated by ISP by the time of the start of the data collection phase.

In late March a week was spent by two of the NIRAS team at ISP offices in Uppsala University discussing the programme with the ISP staff, meeting the three programme directors, interviewing staff members, reference group members, Uppsala-based collaborating partners and reviewing documents.

The team collected data from its two major focus countries for the evaluation, (Cambodia and Ethiopia) with field visits to each for a week during April and May by one each of the team members. During these field visits (see Annex 2 for a list of people met) interviews were held with RG and SN leaders, RG members and current and past graduates from the ISP supported Masters and PhD programmes. In addition interviews were held with key informants outside the university. The reports on ISP support to Cambodia and Ethiopia are presented separately in Annex 3.

Data was also collected by a third member of the team from the ISP supported RGs and SNs for the evaluation's minor focus countries (Bangladesh, Burkina Faso and Uganda). This was done through telephone and skype interviews with RG and SN leaders and a review of documentation. The schedule of skype interviews is provided in Annex 2. A set of five standard questions was asked of each of the interviewees as follows:

- What capacities have been developed over the period of ISP funding?
- What role has mentoring by ISP played in this?
- What have been the key areas of support from ISP and how does this compare with other funders that they have had?

¹⁴ During the inception phase a review of the ISP logical framework and the programme monitoring was undertaken. It was concluded that the approach to monitoring did not address country and university context and did not provide a basis to systematically question the overall programme logic or formally learn from the process of implementation. A broader Theory of Change was needed to relate programme activities to overall outcomes and goals was developed. There was a thorough review of the original 15 evaluation questions. Based on this it was proposed to expand the scope of the evaluation to address not just the DAC criteria of effectiveness and sustainability but more clearly those of relevance and impact. Issues of gender and environment were positioned separately. The original questions were developed to address these issues and a revised set of questions including new ones were developed incorporating key elements of the original ones.

- Who have been their principle collaborators and what role have they played in the development of the research group?
- What do they see as their future trajectory (scientific content, funding etc.) and what expectation do they have of future ISP support?

The third member of the team also analysed the disaggregated data provided by ISP and the findings from this analysis are presented in Annex 5.

The evaluation methods followed the approach developed in the inception report. It was participatory in approach, implemented according to a Theory-Based Evaluation model and applied a contribution analysis perspective that allowed a detailed investigation of the ISP programme structure. The evaluation was guided by a reconstructed Theory of Change (ToC) for the 2014-2018 programme period (see section 4.2). The participatory approach aimed to ensure that the evaluation was a learning experience for all stakeholders and a shared dialogue between the evaluation team and the participants of the evaluation process. In line with this, the evaluation incorporated feedback throughout the process of evaluation, and a debriefing with the ISP secretariat at the end of the Uppsala visit.

The design of the ISP evaluation addressed primarily three levels of analysis. First there was the overall ISP programme level with its constituent programmes of the IPICS, IPMS and IPPS. Second was the research group or scientific network level within a country and university, and third was the individual level of RG and SN leaders and members, and current and past students of the MSc and PhD programmes.

The evaluation design centred on the deployment of contribution analysis, mapped against the various levels and sub-levels of analysis. This assessed the contribution of the ISP to capacity development at individual and group (RG and SN) level consistent with the focus of its interventions and to a limited extent at departmental level, although the IPMS has a greater departmental focus. The contribution from the range of activities and support provided by ISP was assessed in relation to the impacts seen at various individual and group levels. The analytical framework sought to capture data relating to all levels of analysis and the spectrum of phenomena relating to ISP activities, across the time period covered by the evaluation.

The evaluation design incorporated a case study approach, in line with the scope of the evaluation, capturing country contextual contrasts, duration of ISP support and research content. As required by the nature of the evaluation, a mixed method approach was adopted, using qualitative and quantitative methods of data collection. An evaluation matrix was formulated, with the contents mapped against the analytical framework. This was developed during the desk review, after the submission of the inception report, using additional documentation provided by ISP.

The evaluation adopted a gender-sensitive framework to ensure that the analytical design, the process of data collection and analysis, and the synthesis of findings, was effective in capturing and understanding patterns of gender mainstreaming.

3.1 LIMITATIONS

As ISP's annual reports indicate, the ISP is rich in data and indeed ISP's ability to meet our request for disaggregated data, although it provided some challenges, was met. However little of these data has been systematically analysed to provide information (except across-programme averages) and even less has been systematically documented to provide programme knowledge and learning. In our attempts to analyse the data we have come across a number of issues which bring into question what the data are actually telling us.

A case in point is the number of Masters and PhD graduates supported by ISP. ISP practice is to collect numbers for any Masters or PhD graduate who has had any form of support either indirect (e.g. use of equipment provided by ISP), or direct but partial (contribution to subsistence) or complete (e.g. sandwich PhD student). These are very different categories of support, and one would expect the effects of the ISP in terms of outputs and trajectory of each of those categories to be very different. The fact that the data on graduates does not distinguish between categories of support does not enable an analysis of the distinct effects they might have and questions the relevance of this as an indicator for programme monitoring.

Equally it is not evident to us that the annual activity reports that provide the key monitoring data follow a consistent method across groups – e.g. what is reported as funding other than ISP, or whether everyone treats collaboration in the same way. We have considerable doubt therefore that the average values of indicators produced by ISP are systematically handling comparable data across the various research groups and networks. This has made it difficult to be clear about what the monitoring data are actually telling us.

It should also be noted that our analyses primarily focus on the 2014-2018 period. To have extended the analysis back to the start of funding for each RG and SN would not only have challenged the ISP to produce the data, but would have required more resources and time to analyse. In that sense our analyses of the data and our conclusions from the analyses should be seen as indicative and contributing towards a debate, rather than as absolute truth. Fuller analyses need to be developed, working with the complete set of time series data for each RG and SN, which, to our knowledge, have not been produced yet. Notwithstanding the focus on the 2014-2018 programme period, some of the monitoring data did cover slightly longer or shorter periods. Such differences have been duly noted in the analysis presented in Annex 5. Similarly, discussions with ISP stakeholders during the interviews often encompassed

the entire history of engagement with the programme, and not only the period since 2014.

Finally, as explained later in the report, reporting on uptake does not provide evidence that these effects can be attributed to ISP.

It had been hoped to have an intermediary stage of debriefing in Stockholm after the country field visits had been completed. However because of New Year celebrations in Cambodia, the university was closed in early April and the fieldwork there had to be delayed by several weeks leaving insufficient time to hold a debriefing meeting on the findings from the fieldwork and to draft this final report to meet the deadline.

4 Findings

4.1 SUMMARY ASSESSMENT

The ISP programme has considerable strengths and all those who have benefited from its support speak to how responsive it has been to their immediate needs and priorities, to its supportive and participatory approach and to its long term flexible funding. Its support through funding for skill development, equipment provision, consumables, as well as its ability to facilitate international links and exposure has done much to bring its grantees¹⁵ into a wider community of research. Its pragmatic approach to problems and issues has been effective. Much of the research that has been supported has clear relevance to country-specific development needs and where the application is less clear, the research has been of intrinsic merit. In this sense ISP has contributed significantly to the public good in its domain of activities. The evidence from the field (see Annexes 3 and 4) strongly supports this conclusion.

ISP management has done much to bring in routines and systems in order to bring coherence to the programme, and this started before the 2014-2018 period. However it has been working to a results framework that is not coherent and not helpful to formal programme learning and reporting. Data is collected for compliance purposes and limited analysis has been done. ISP is drowning in data but short of information, and formal systematic learning from monitoring of change processes is limited. At the heart of its challenges is a disconnect between what ISP actually does in relation to capacity development and its monitoring framework, which gives insufficient attention to the chronology of the development of those capacities it is engaged with and to what its activities can and cannot deliver with respect to the development of capabilities. We also sense that the insufficient attention to the chronology of capacity development that ISP supports and ISP's long term funding and commitment to RGs and SNs may have trapped these groups into forms of financial dependency on ISP. ISP has no mandate or means to build the capacities of the institutions where the RGs and SNs are located and since many of these institutions suffer severe capacity constraints and the RGs and SNs are financially dependent on ISP, they cannot progress to independence and sustainability. The evidence from the analysis of the monitoring data (see Annex 5 and 6) speaks to this assessment.

¹⁵ The term grantee is applied to both individuals and RGs and SNs.

4.2 SPECIFIC ASSESSMENT

4.2.1 Theory of Change

The inception report for this evaluation noted the absence of an overall coherent framework in the ISP to relate activities and outputs to higher level outcomes. Accordingly, based on a reading of its programme documentation, a retrospective Theory of Change (ToC) was developed in the inception report for the 2014-2018 period to situate the ISP interventions in relation to what it seeks to contribute to. This working draft of this ToC drew on ISP's existing log frame, separating out clearly its outputs and intermediate outcomes from outcomes and goals, and was accepted as a working argument at the start of the data collection phase.

Our subsequent analysis and learning, and drawing from the framing of the five specific capabilities identified in section 2 and the five different ways in which capacity can be targeted, suggests that this initial draft ToC is too ambitious in terms of the role that ISP plays. It was made very clear in our discussion with the reference groups and collaborators that ISP cannot be compared to a research grant application process with a Swedish funding body. Rather it aims to support research groups to reach a state where they can apply for competitive research grants. Our understanding of ISP's support to capacity development indicates that it is very clearly limited to resource provision and supporting skills and knowledge development in the three science areas in its mandate.

This is not a criticism but a statement of the strengths of ISP in that its programme essentially addresses the first generation of capacity development processes. Without these basic skills and basic equipment no basic science would happen, and a second generation of capacity development could not be achieved. The development of capabilities by RGs and SNs, let alone the institutions in which they are embedded, to self-organise and act, establish supportive relationships, adapt and self-renew and achieve coherence lies beyond the direct reach of the ISP interventions, although it might indirectly contribute to them.

Accordingly we have proposed scaling back the ambitions of the ToC to focus on the first generation of capacity development issues. If the ISP can demonstrably contribute to achieving Intermediate Outcomes 2, and within a time bound period, then it has been effective.

Table 1 - A working Theory of Change for ISP

Outputs		Intermediate Outcomes 1: The ability to produce scientific outputs (1st generation CD)		Intermediate Outcomes 2:		Longer Term Outcomes (2nd generation CD)
- Production of Post graduates - Better equipped departments ▲ Activities - Funding - Training - Mentoring - Meetings - Coordination ▲ ISP & collaborating partners core organisational functions ▲ Internal Enablers	»	Available skilled scientists to undertake research Improved conditions for carrying out scientific research The development of relevant research programmes supported Research leadership supported Academically strong Masters and PhD programmes supported Improved gender balance promoted ▲ External Enablers	»	Improved quality of research grant applications More quality research publications Increase in non ISP funding More qualified women scientists Stronger research groups Supportive institutional environments ▲ External Enablers	»	The capability to self-organise and act The capability to establish supportive relationships The capability to adapt and self-renew The capability to achieve coherence Supportive and receptive national contexts ▲ External Enablers

4.2.2 Relevance

1. Is the ISP 2014-2018 programme consistent with Sida's strategies for research cooperation and research in development cooperation?

The ISP's support to the development of research capacity in Ethiopia and Cambodia in the basic sciences is broadly relevant to and aligned with the two Swedish policies

for research in development cooperation that span the period under review.¹⁶ The latter was developed after the start of the 2014-2018 phase of the programme but the ISP remains relevant to the most recent Sida policy iteration. Swedish policies and strategies focus on building scientific research capacity in developing countries and regions and on promoting the production of high quality research that is relevant to addressing poverty reduction and developing countries' priorities and problems.

In Cambodia (see annex 3) it is significant that ISP support and the establishment of a basic science capacity is seen to have provided the basis for the establishment of a Sida bilateral programme to further develop research capacity. Accordingly ISP will now withdraw from direct support to basic science although it will continue to play a role at the minimum in coordination of the bilateral programme.

In Ethiopia (see Annex 3), there is some alignment between Sida's bilateral support to Addis Ababa University (AAU), which includes supporting the expansion of PhD programmes and strengthening research capacity, and ISP's support to the six RGs and one network in the basic sciences. The similarity in objectives between the bilateral and ISP programmes and the fact that they offer complementary forms of support to AAU suggest that there are good opportunities for mutual learning that could usefully be developed further. It also raises questions about how to optimise ISP's positioning in relation to the bilateral programme.

The evidence from the secondary case studies in Bangladesh, Burkina Faso and Uganda is consistent with the ISP support being broadly relevant to Sida's strategies. Several RGs and SNs are engaged in applied research directly addressing issues affecting people living in poverty and the resilience of communities and society. As is the case in Cambodia and Ethiopia, ISP support in Uganda is aligned with the Sida bilateral research support programme in that country.

2. To what extent does the ISP ensure the relevance of its support to the development of scientific research capacity?

ISP has not articulated specific objectives or an overarching strategy for developing scientific research capacity. It follows from this that it does not carry out and document systematic baseline assessments of individual RG's capacities or analyse whether the university contexts within which different RGs function provide a favourable or discouraging environment for research. Where basic science capacity is very limited, as in the Royal University of Phnom Penh RUPP in Cambodia or Daffodil International University in Bangladesh, the need for an analysis of research

¹⁶ Government Offices of Sweden: 'Policy for research in Swedish development cooperation 2010-2014 and strategy for Sida's support for research cooperation 2010-2014' and 'Strategy for research cooperation and research in development cooperation 2015-2021'.

capacity and of the research environment was perhaps not great. In these cases it was more relevant to identify key people and to start building capacity from there. It is also clear from interview data from all the case study countries that RGs and SNs supported by the ISP see this support as highly relevant to their needs.

The ISP's approach is to identify capacity needs on a case by case basis, mainly through discussion with each RG and SN. This is done through a process of dialogue and assessment which culminates in a presentation by RGs/SNs of their proposed research topic, plan and budget in which they engage with reference group members in detailed face to face discussions. Several RG/SN leaders appreciated this process as an opportunity for learning and for improving the research focus, activities and plans for equipment purchase and/or graduate training.

A number of RG leaders also mentioned the assistance that their overseas collaborators, who are often identified or facilitated by ISP, as being helpful in this regard. Similar appreciation was expressed for the relevance and comprehensiveness of the ISP's reviews of progress during ISP's periodic visits to RGs/SNs.

While the face-to-face defence of their funding applications may be challenging, ISP is seen as broadly responsive to and supportive of the needs and priorities that RGs/SNs themselves identify as relevant to building capacity in scientific research. For example, many RGs are located in countries and universities where it is difficult to procure the equipment and materials that are prerequisites for implementing research activities, sometimes because they lack contacts with suppliers or access to hard currency, or because of slow and cumbersome procurement procedures. For many RGs, ISP has been their main source of equipment and materials, which has contributed to building a scientific infrastructure and to allowing experimental work to proceed on a much more continuous basis than would otherwise be the case. The ISP's facilitation of international engagement – though funding of sandwich training, fellowships, participation in conferences and regional networking – is particularly highly valued because postgraduate students learn from the exposure that it provides to new and less familiar ideas and perspectives and from the experience of working in well-resourced laboratories.

It should be noted that there were variations in the extent to which RGs/SNs considered that they needed support from ISP to develop their capacity, other than in equipment and materials. RG/SNs that were more confident in addressing the 'softer' aspects of capacity themselves tended to be from among those that had been supported over a longer period, but it is unknown whether or not this is due directly or indirectly to ISP support. However, some among this group also pointed out that support to capacity development would continue to be needed as older RG leaders retired and as new generations of postgraduates came through. The ISP does not have procedures or criteria for determining when a RG or SN has attained the level of maturity which means that its support to capacity development is no longer a relevant

intervention so that these RGs/SNs can be phased out, allowing the ISP to take on new RGs that are still in the early stages of development.

3. To what extent has the ISP provided support to partner research groups and networks to ensure that research topics are relevant to local development challenges?

Applicants for ISP funding are required to explain or justify their proposed research focus and activities under the heading of relevance, understood as relevance to addressing development needs and priorities in the national context. It is clear from the written assessments of applications that reference group members are concerned to see that funded research should include plans for outreach to government, the private sector and/or the public. In one case, this led a researcher working with biopesticides in Burkina Faso to shift her research focus from the laboratory to engaging directly with farmers and other stakeholders in sustainable agriculture. The picture is uneven, however, as the ISP's concern to see RGs engaging in outreach is not reflected consistently across all assessments – as one would expect to be the case if relevance is a criterion in assessment - and nor does there appear to be much in the way of follow-up where doubts are raised about the relevance of research to national development challenges.

In any event, the ISP's Strategic Objective 3 of its 2013-2017 Strategic Plan (Increased use by society of research results and of graduates in development) appears over-ambitious. The truth is that ISP is very limited in its capacity to influence the uptake of research results, since this is largely determined by the very different national political contexts in which RGs and SNs operate. . Cambodia is beginning to see a shift and a focus on development of science and technology is closely aligned with government strategies. There also appears to be an associated strong ethos amongst the researchers of focusing on problems that are of relevance to their country and addressing local needs.

By contrast, in Ethiopia, government and academia appear to function largely within quite discrete spheres with little or no engagement or interaction between them, and researchers face an uphill battle to promote the uptake of research results in either the private or public sectors. Moreover, for some RGs, one of ISP's strengths is that – unlike some other donors – it is willing to finance fundamental research that cannot be shown to have immediate application to national development problems but, rather, that facilitates engagement with an international science community. In several cases of ISP-supported RGs – for example the biomedical physics and technology group in Bangladesh or the water and clays research group in Burkina Faso - advances in fundamental research were essential for RGs to progress to applied science that directly address societal needs.

The extent to which RGs and SNs in Cambodia and Ethiopia which were visited by the evaluation team have successfully addressed national development priorities is discussed below (Impact).

4.2.3 Effectiveness

The evaluation questions on effectiveness address the extent to which ISP has been able to contribute to the building of research capacity through providing equipment, supporting improved research proposals and promoting research leadership. The section first starts with a review of the extent to which the ISP, in response to the 2011 evaluations has responded to the recommendations in relation to programme governance.

4. To what extent has the governance of the ISP programme responded to the recommendations made in the 2011 evaluation?

Four specific recommendations were made by the 2011 evaluation (GHD, 2011:49-50)¹⁷ with respect to the governance of the ISP programme and they will be considered in turn.

- *Uppsala University should consider the benefits of broadening the skill set of the ISP Board to include members with experience in development cooperation and in the politics and bureaucracy of the focus countries. (SR14)*

The 2011 evaluation noted the clear lines of accountability and management arrangements, ISP's strong external orientation and its reliance on relationships with Swedish government agencies. It recommended that it might be useful to broaden the membership base of the ISP Board to foster improved awareness of the external environment in order to ensure that the Board was aware of emerging pressures and challenges.

The current ISP Board consists of five members who are academics at Uppsala University, three academics from other Nordic Universities, one member from an International Organisation (The Global Network of Science Academies) and one from a developing country institution (The Nelson Mandela African Institution of Science and Technology). There is also one retired Swedish diplomat on the Board. The Board membership remains strongly academic.

The Board meets once a year and from a review of the minutes its primary function is concerned to receive reports, discuss and approve the annual financial workplans, grant applications and activities related to the strategy implementation. There is also

¹⁷ GHD (2011), 'Report on the Evaluation of the International Science Programme'.

an Executive Committee of seven members that meets on a quarterly basis consisting of the three ISP programme directors and four Uppsala University academics who are also members of the Board. It is here that the planning of the development of the ISP programme is mandated and where a broader skills set might be required.

We therefore conclude that in spite of improvements in diversifying Board membership during the current programme period, the ISP Board would benefit from broadening its skills sets even further, particularly in relation to strategic planning and monitoring.

- *ISP and Uppsala University should review membership, selection and performance management of the Reference Groups, especially considering the emphasis on focus countries and further integration with the bilateral programmes of Sida (SR15).*

The 2011 Evaluation concluded that the selection and management of the performance of the Reference Group members were unclear and suggested that changes to the membership were rare. The Terms of Reference for the Reference Group (updated 2017) indicate that a Reference Group member is appointed for a term of five years, which can be extended for two further terms (a total of 15 years). They are appointed on the basis of academic qualifications and relevant experience and are expected to do the following:

- Assist in identifying suitable research groups and networks to invite for application, in accordance with the ISP strategy;
- Assess applications from research groups and networks, following given criteria; beside the scientific quality also the development potential is essential to consider;
- Assist in providing feedback to research groups and networks;
- Participate in the formulation of recommendations to the Board of ISP for decisions on the applications from research groups and networks;
- Visit research groups and networks to provide mentoring and guidance and to gather more knowledge about the work conducted; and
- Assist ISP to plan exit strategies for support to research groups and networks.

Given the possibility of a 15 year term on a reference group, and the fact that it is only seven years since the 2011 evaluation there does not appear to have been a major turnover of Reference Group members although a younger generation of members is emerging. There do not appear to be formal measures for assessing the performance of Reference Group members or the Reference Group as a whole, a point to which we return. From the interviews with six Reference Group members it appeared that there was very variable understanding of context and capacity development processes.

We conclude that the issues of membership and selection to the Reference Groups seem to be adequately addressed (despite the limited time to observe significant changes in membership), but that performance management remains underdeveloped.

- *ISP and Uppsala University can improve the effectiveness and efficiency of delivery by adjusting the roles of Reference Groups. More use of peer review to evaluate progress reports and outcomes, might strengthen ISP core activities. (SR16)*

The 2011 evaluation noted that Reference Groups did not review annual progress reports, but only considered progress when an extension of ISP support is requested. It also noted that it understood that the Reference Groups undertook a subjective assessment of whether or not a RG or SN had developed its skills sufficiently to graduate from ISP support, in effect questioning whether this was a sufficiently robust or transparent process.

Matters do not seem to have changed much. It was noted in a discussion with an Executive Committee Board member during the review that he was emphasising the need to have a clearer chronology of capacity development in order for such decisions to be made. This is consistent with our view of the need for much greater clarity on the capacity development processes.

We conclude that this recommendation has not been fully responded to by ISP during the current programme period.

- *The invitation and selection of Research Groups should be made in a more objective, explicit and transparent manner. Those groups that have attained a certain level of self-sufficient capacity, or are part of strong universities, should be encouraged to apply for support on a transparent competitive, basis, while groups with limited capacity might be fostered and supported to a greater level for their initial period. (SR13)*

The 2011 evaluation noted that the selection of a RG for funding was more personal and intuitive rather than open and structured by guidelines. It also saw the positive side of the process given the focus of ISP on building up capacities where they were limited but had potential. There appear to have been few selection mistakes made through this approach. ISP has moved in establishing new RGs and SNs to have a more open discussion at a university level across potential research groups and proceed on the basis of applications made. This has happened for example in the case of IPPS East African Astrophysics Research Network. However the absence of a chronology of capacity development and more systematic judgement as to when a certain level of self-sufficient capacity has been reached has meant that weaning RGs or SNs off ISP funding has not happened. Interviews with RG and SN leaders revealed that despite ISP's frequent encouragements to apply for other funding, none have developed a schedule or targets for the scaling back of ISP funding. This

includes at least one case where an end date is already set for the ISP support, namely the RG on organic pollutants in food and the environment at Dhaka University in Bangladesh.

We conclude that this recommendation has been responded to only to a small extent. The questions raised in the 2011 evaluation over programme governance are consistent with this evaluations view on processes not being sufficiently systematic.

5. To what extent has the logical framework enabled the ISP to monitor programme progress and to demonstrate the achievement of outcomes? How far has it facilitated learning about what works well and less well in the programme? Has it enabled adjustments to be made to improve programme effectiveness?

The inception report contained a detailed analysis of the logical framework and the analysis and arguments are attached as Annex 6. Drawing on this, a number of comments can be made. First, there is redundancy in the five tiers of the goal hierarchy (vision, overall goal, general objective, expected outcomes and specific objectives) and the relation between each tier is not self-evident. Moreover the monitoring framework is confined entirely to the achievement of the bottom tier (specific objectives) and therefore the causal connections between achievement of specific objectives (SOs) and higher-level results are assumed rather than systematically argued and evidenced.

Second, there are points of disconnect: the expected outcomes for collaborating partners are not underpinned by any SO and are not clearly connected to higher level results. In addition SO3 should not be at the same hierarchy level as the first two SOs and it is more likely to be an outcome of them. Moreover, it is doubtful that this is a realistic objective. While ensuring that proposed research is relevant to a country's development challenges is within the reach of ISP, ensuring that there is uptake of research results is not.

Third, there are assumptions made about relevance and contribution to development challenges that are not tested and monitored. Relevance and contribution are positioned at too general a level e.g. fight against poverty and need to be much more specific e.g. knowledge and monitoring of pollution of water resources.

Fourth, the bias to quantitative metrics and average values in the outcome indicators for the SOs are not helpful to understanding and learning about causal relations between programme interventions and outcomes, and strip out the specifics of country, university context and time. Indeed it is not clear that ISP has seen the results framework as a basis for learning what works well and less well in the programme, and while they draw on it to some extent, their comments to the evaluation team emphasised more the learning that took place outside the framework.

While the collection and reporting of monitoring data may have served an accountability function, this has not helped formally monitor progress, demonstrate outcomes, facilitate learning or guide adjustments to the programme. We stress the emphasis on formal because we find evidence of informal and intuitive understanding of what is happening in individual RGs and SNs, but this is neither systematic nor documented. Thus ISP in discussions noted that they saw the reduction in number of PhDs on sandwich training and an increase in the number of home-grown PhDs as a useful indicator of capacity change. Tracking this (see Annex 6) would be a means of formally recognising a process of change.

6. What are the results (adequacy, functionality, use and maintenance) of ISP's efforts to contribute to the improvement of scientific research facilities and technical resources?

The field evidence from both the two main focus case study countries, as well as from the three minor focus countries present a consistent story of the contribution by the ISP programme to the improvement of scientific research facilities and technical resources being a core strength of the ISP.

The evidence from Ethiopia illustrates the point:

The ISP's provision of equipment and materials was identified as an exceptionally useful aspect of its support, without which it would be difficult for RGs, particularly those working in experimental fields, to carry out any research at all. There is a particularly acute problem at AAU because procurement procedures are cumbersome and slow, supplies need to be procured overseas, and researchers have little or no access to the foreign exchange required for these purchases. A PhD graduate who had completed his studies in Taiwan¹⁸ observed that in that country a researcher could order supplies in the morning and receive them in the afternoon, whereas at AAU a researcher might put in an order for supplies and have to wait for months or even years before they arrived. The ISP's role in identifying good suppliers and then managing the whole procurement and payment process is therefore seen by RGs as a core strength of its support.

Specific examples of this include funding for the seven stations that have expanded the national seismic data collection network (IPPS ETH:02) and funding of the consumables required to run the nuclear magnetic resonance NMR spectrometer in the Department of Chemistry (IPICS ETHALNAP), which had been provided under Sida/Sida's Department for Research Cooperation support. Although supplied for IPICS ETHALNAP, the equipment is available to and used by other researchers at

¹⁸ This student had received a scholarship from Taiwan and had not been supported by the ISP.

AAU. In 2011 a similar spectrometer was provided by Sida/SAREC for the Department of Pharmacy at the College of Health Sciences.

This was still standing unused in its packaging in the college foyer when the RG leader (IPICS ETH:02) returned to Ethiopia in 2012. The first inspection of the equipment commissioned by the college concluded that the spectrometer was broken. However, ISP staff located an engineer in South Africa who examined it and judged that it could be fixed and installed. After a long period of inactivity since the equipment arrived, this is now in hand. This is an example of where ISP has been able to add value to equipment provided by other donors, as well as being a source of essential equipment and materials itself.

Source: Annex 3.

Similar accounts were provided from the Physics (IPPS CAM:01) and Chemistry (IPICS CAB:01) in Cambodia, as well from grantees in Uganda and Bangladesh, where constraints in procurement similar to those described for Ethiopia seem to be frequent. Note should also be made of the support provided by ISP to the Network of Instrument Technical Personnel and User Scientists of Bangladesh (IPICS NITUB), where according not only to its coordinator, but also to leaders of RGs benefitting from NITUB's services, the ISP support has been instrumental for ensuring quality and timely installation and servicing of research equipment.

The pragmatic support of ISP to keep equipment functioning and maintained is undoubtedly a strength. But it is not a long term solution to the underlying institutional capability requirement for universities to be able and willing to fund and support equipment maintenance and have procurement procedures that are supportive of research activities. There is one example where this has happened. In Bangladesh (IPICS BAN:04) the University Grants Commission has provided state of the art equipment bound to a commitment by Dhaka University to guarantee operation and maintenance costs.

7. How has the programme increased the capacity to formulate research problems and proposals, as well as designing research projects and attract external research funding?

The simple answer to the question of whether or not the program has increased the capacity to formulate research problems and proposals and design research projects is that there is not systematic evidence to address this question and therefore we do not know. It may well be that research groups or their leaders have this capacity. Indeed it is clear in the case of IPPS CAM:01 for example that the research leader's sandwich PhD experience in Sweden and the training that he received endowed him with those capacities. The benefits of the sandwich PhD experience in developing these

capacities is likely to be widespread¹⁹ and further supported by the collaborations that endure after the PhD training and continue with the establishment of RGs. In addition facilitating international collaborations and exposure also has capacity benefits, as the Ethiopia case study shows (Annex 3) and as observed by several interviewees from the three minor focus countries.

But the absence of systematic and documented baseline assessment of RG or SN capacities at the start of ISP funding, the lack of any model and chronology of the development of specific capacities that provides a basis for tracking and documenting change and the limits of the assessment process by the Reference Groups means that this question cannot easily be answered. A wider analysis of the data on change in the quality of applications to ISP (See Annex 5, Figure 12) could find no evidence that over time groups produced better proposals that received progressively higher grades by the reviewers. Moreover, there were striking differences between how some applications were assessed by different reviewers and there is no evidence that ISP Reference Groups apply common criteria in their assessments. Assessors fill in a chart giving their grading against various criteria, but are then not required to justify why they have given that grade, making this something of a box ticking exercise. The lowest ranking on the scale used by ISP is ‘to be improved’. We have found examples where there is text about what needs to be improved, but only occasionally are comments found on why it needs to be improved and we have not seen any comments on how this improvement should be done.

That said, it is also clear from the case studies of Cambodia and Ethiopia, and from about one third of the interviews with grantees in Bangladesh, Burkina Faso and Uganda, that the applicants for the research grants found the meetings and discussions with the reference groups extremely helpful and valuable and in certain cases written feedback to which they gave a written response helped them improve their proposal. Unfortunately this process does not seem to have been systematically documented or practiced or linked with a chronology of capacity development.

There is no systematic evidence that links changing capacities (the proxy for which is duration of funding) and the ability to attract external research funding (see Annex 5. Figures 1-5). This was true both for the entire population of ISP programmes and for each of the three individual programmes.

The review of the second minor case studies found that the majority of the grantees, in the three countries have been long term partners to ISP, and depend heavily on ISP funding. Based on the figures for 2014-2016 supplied by ISP, of the 19 grantees included in the study, only ten report less than 80% average dependency on ISP for

¹⁹ Andersson, R (2017) The Sandwich Model: A Successful Case of Capacity Building. *Internationalisation of Higher Education: A Handbook*, 1, 53-65.

their budget, and six report an average dependency between 90 and 100 percent. ISP therefore remains essential to the very survival of several of the groups. No distinction was found between older/more established groups and networks, and newer ones in terms of this financial dependency – which suggests that the length of the ISP support does not increase the likelihood of grantees being able to attract other sources of funding.

A slight geographical variation was found though, with grantees from Burkina Faso reporting slightly lower average financial dependency rates than groups in Bangladesh, and lower than grantees in Uganda. This may be because grantees in Burkina Faso have access to funding from donors and collaborations in French-speaking countries (especially France and Belgium), funding which is not accessible to grantees in the two other countries.

The contrast between Cambodia and Ethiopia is interesting in this respect. Given its history and the relatively short period of time that Cambodia has been supported by ISP in comparison with Ethiopia, it is unlikely that the Cambodia programme has reached the same level of scientific capabilities as that of Ethiopia. Yet because alternative funding sources have emerged in Cambodia, including a Sida bilateral programme, ISP is deliberately withdrawing. In the case of Ethiopia, where arguably scientific capabilities are more fully developed, ISP has not withdrawn because of the absence of other funding sources.

8. What effects does ISP support have on the development of research leadership among groups and networks and how has this, and if so in what ways, impacted on research quality and a scientific research culture in the supported groups and networks?

ISP's monitoring does not address research leadership and nor, in the absence of a chronology of capacity development, is research leadership identified as a key attribute of capacity development to be systematically addressed. More broadly, one may justifiably ask 'What does research leadership mean?', in particular in the contexts in which ISP operates. In a resource-constrained environment it is likely to mean being able to keep things going despite the many uncertainties. For PhDs it is a professor who makes sure the conditions to do a PhD are available (See Ethiopia case study), which in such environments might demand great creativity in combining funding from different sources. It probably implies rather more of an entrepreneurial streak than would be required in a Swedish university and which one therefore might not directly associate with the term 'research leadership'. Informally and as much by intuition, ISP has selected RGs where they see potential, much of which is related to the qualities of individuals. There clearly are many examples of RGs led by charismatic individuals who have what it needed to drive a research group forward. Cases were found of such individuals in both the primary and secondary case study countries.

Whether it is simply ISP support that has enabled those leaders to exercise their skills, or whether the support has contributed to the development of those skills is unknown. Nor can effects of leadership skills on research quality and research culture be answered. One aspect of leadership and research culture is nurturing the next generation of research leaders and it is known that in certain cases that has not happened, as in the phased-out groups. The evidence from the 57 groups and networks phased out from ISP support between 2003 and 2014 found that over 80 percent of them were still active.²⁰ For the minority (9) that were not active, loss of leadership through either retirement or moving to another position was a common reason for non-continuation. All of which suggests that most of the supported RGs and SNs have good leaders, but whether ISP has contributed to this or not is unknown.

In the last two years ISP has been undertaking short training courses in Africa on research management, which may contribute to the development of research leadership, but it is too early to judge effects.

9. To what extent has the ISP contributed to enhanced research capacity in the basic sciences in selected institutes of higher education in the target countries in supported groups and networks (with particular reference to capacity development, long-term support, improved research environments, collaborative links and sandwich model of training)?

There is no doubt, as the case study material evidences, that ISP has contributed to capacity development in the areas of basic sciences that it has supported. All grantees in the second tier case studies for example (see Annex 4) acknowledge that ISP support has been and remains key to their operations and to improving the quality of their scientific work. It should be remembered that annual grants are relatively modest ranging from 100 – 500,000 SEK a year. In some cases that support was essential to the very establishment of the group or network, and in those cases where financial dependence is higher, also to their survival.

The three areas of capacity where ISP support has made the greatest contribution include:

- Equipping research facilities, which has been essential for a small fraction of the groups and networks to start doing any research work on their own, and in other cases to advance to more complex analyses;
- Developing human resources, primarily through financial support to graduate students (both full and short-term scholarships) and senior staff;

²⁰ Andersson, R (2017) Phased out groups and networks, 2003-2014 – Experiences and continued activities. ISP, Uppsala University.

- Promoting and facilitating scientific cooperation, at the national, regional and international level, mainly through the following mechanisms: support to scientific networks (in some cases established with the support of ISP), support to student and staff mobility, support to the acquisition of equipment that is shared by different groups, and support to scientific meetings and workshops;

The extent to which ISP provides mentoring or other types of advisory support varies significantly. Some groups receive close to nothing, others have more regular contact and some even benefit from support for improving the grant applications.

Those with closer ties/collaborations with Swedish research groups seem to enjoy more proximity to ISP, which could in part be due to the regular exchange visits. The support from ISP has been particularly useful for establishing collaborations with other groups and in some cases for adjusting the content and direction of the research. This latter aspect appears to be connected to decisions on the size and implementation of the ISP grants. ISP reviews the research plan (and the way the grant is spent) jointly with the grantee to make sure that money is spent wisely and coherently. Those that do not get much mentoring support did not express any discontent with the situation; they commonly observed that ISP is available should they have any particular request, but that generally they can cater to their own needs.

In sum there is not coherence between how ISP carries out capacity development in practice and what is contained in its strategy and results framework for capacity development. This leads to a lack of clarity about capacity development objectives and the processes that ISP uses to achieve them. ISP does not specify what the capacity gaps are for each RG or SN, or establish baselines of capacity at the time that funding starts to a RG or SN, or set out specific strategies that will be used to address these. Its monitoring data, both because the indicators poorly address the development of capacities²¹ and because ISP averages its metrics across the total population of its grantees offer no systematic understanding of ISP's contribution to enhanced research capacity.

4.2.4 Impact

²¹ Of the monitoring data provided by ISP, the two indicators that relate to scientific capacity are the number of graduates and the number of publications. The usefulness of these indicators is limited by two main factors: first they pertain to a very limited sub-set of the much broader set of capacities that ISP aims to develop. Second, we believe there are differences in how RGs and SNs report their data in those two categories, which affects the validity of comparisons across grantees. Please see Annex 5 for details.

As indicated above (section 4.1) the ISP's strategic objective 3 (Increased use by society of research results and of graduates in development) is set at too high a level to be achievable, since ISP has little or no influence over whether and how research results are disseminated or taken up by the public or private sectors. Connected to this, the related logframe indicators – which list examples of uptake – are an inadequate measure of any contribution that the ISP may have made to the achievement of the objective.²² Simply enumerating examples of results in this way does not provide evidence that they can be attributed to the ISP.

10. How have ISP-supported groups and networks gained recognition for their research or achievements (e.g. through awards, promotions, appointments to committees, patents, etc.)? What have been the effects of such recognition on the ability of ISP researchers and alumni to address development challenges?

With respect to awards, honours and promotions, ISP Annual Reports itemise an impressive number of such distinctions achieved by members of the supported groups and networks. It is pleasing to see progress in the careers of group and network members, but listing these changes provides insufficient evidence of the ISP's impact on career development. Information that a recently graduated PhD has been appointed to a university post, or that a RG leader has received an academic distinction or been appointed to a national committee may be proof of academic quality, but it does not tell us whether or how far support from ISP played a part.

It is not possible to draw conclusions about the effects of such recognition on the ability of ISP researchers and alumni to address development challenges.

11. To what extent have ISP-supported research groups, networks and alumni used research findings and results to engage in debates on national priorities and challenges with external stakeholders (public institutions, industry, civil society actors)? Can this engagement be attributed to support and encouragement from the ISP?

A degree of attribution to ISP can be assumed where there has been uptake of outputs from research that was made possible only because of ISP funding. The most significant example of this is ISP funding for the seismic network (IPPS ETH:02). Ethiopia's national development plans (the Growth and Transformation Plan I and II)

²² The indicators associated with SO 3 are the number of outreach activities carried out by groups and networks, of awards, appointments to committees, etc., of instances of use (including in teaching); of external assignments; patents, etc.. and of staff trained who leave for positions relevant for development.

prioritise construction and hydro-electric power. Ethiopia's location in the Rift Valley and consequent vulnerability to earthquakes mean that the country needs to have access to comprehensive, reliable and timely data on the strength and distribution of seismic activity. These national priorities together with Ethiopia's geographic location have positioned the seismic network to be a key source of data for government and the construction sector. This has enabled the RG to make critical inputs to improving safety standards in construction, both with respect to the Grand Ethiopian Renaissance Dam²³ (Africa's largest hydro project) and to domestic and commercial buildings.

For Ethiopia, this appears to be a rather exceptional example, however. In general, government and academia appear to function within quite discrete spheres with little or no engagement or interaction between them. Although the Growth and Transformation Plan I and II and other official policies and strategies see a crucial role for science and technology in driving national development, the perception of RG leaders is that government interest in their work is intermittent at best. This perception may, in turn, have discouraged researchers from making greater efforts to bring their work to the attention of the public and private sectors. A notable exception is a PhD graduate in mathematics who is initiating discussions between private and publicly-owned companies and academic mathematicians on the importance of mathematics in the economic sphere. This is an idea that he brought back to Ethiopia from an ISP-funded fellowship at a German university, which has strong links between industry, the private sector and the German university's department of mathematics.

Further examples of influence on policy or practice from ISP-funded research include contributions from IPICS ETH:04 on pesticide residues in agriculture and hazardous wastes from industry to a national committee on major chemical pollution. The committee's deliberations were then followed up with training on the use of pesticides for farmers and agricultural development agents. In Bangladesh, Burkina Faso and Uganda results from ISP-supported research have been significant inputs to legal and policy changes on food safety and the use of harmful pollutants, to improvements in child nutrition and to the delivery of health services through smartphone apps. In another example, the SN IPICS RABiotech, hosted by the Research Centre in Biological, Food and Nutrition Sciences at the University of Ouagadougou in Burkina Faso has been instrumental in developing a post-graduate curriculum in biotechnology and food sciences that has been taken up by most universities that engage with the network.

In instances where there has been uptake of outputs from ISP-funded research, we can reasonably assert that the ISP contributed to making this possible. Obviously,

²³ The dam is being constructed on the Blue Nile to generate hydro-electricity for Ethiopia.

however, the national development priorities in each country are a far more significant determinant of whether research outputs feed through into policy and practice. In general, resource-constrained governments are concerned to address development challenges over a medium term timeframe, and they are therefore far more interested in applied than in basic research. As an astrophysicist in EAARN put it: African leaders want something tangible that can transform society; they want “downwards astrophysics” (i.e. remote sensing) rather than “upwards astrophysics” (i.e. space science). In Cambodia there is as yet little evidence of uptake, which may reflect in part a difficult political environment. Findings for example on levels of pollutants in water by IPICS CAB:01 cannot at the moment be easily translated into policy action given the interests of key political players.

12. Have positive changes been made in development policies or programmes and can they be associated with ISP-supported research? To what extent can such changes be attributed to (a) engagement by the research groups, networks and alumni supported by the ISP and (b) the support provided by the ISP to those research groups, networks and alumni?

The ISP needs to reflect on whether strategic objective 3 is realistically achievable, given the limits on the ISP’s scope of activities and bearing in mind the primary role played by contextual factors in determining whether uptake happens. If it is not a realistic objective, then the ISP needs to be clear to itself and to others what level of change it does have the capacity to influence and effect. Some indications of this are given in Annex 6. In general, we consider that the effects of the ISP support on the policy level are too far removed from ISP’s actual operations and sphere of influence to be meaningfully measured.

4.2.5 Gender

13. How far has the ISP itself analysed factors influencing rates of participation by men and women in the programme (in target countries, research groups and networks)? How does the ISP identify potential barriers to equitable gender participation and what steps has the ISP taken to address barriers which it has some capacity to influence, and with what results?

This section discusses the gender balance in basic sciences in case study countries, factors contributing to low rates of female participation and efforts made locally to address this. It then assesses how the ISP has sought to improve the gender balance in target RGs and SNs during the period under review. Finally, it considers how the ISP might build on the initiatives that have been started.

Annual ISP reporting includes some basic gender-disaggregated data i.e. on the number of men and women in PhD and MSc student cohorts. In line with most global

trends, these show low rates of participation by women, and they generally indicate no significant change in the gender balance in RGs and SNs since 2014. Global averages and averages for Asia and Africa on female representation among Masters and PhD levels in ISP-supported RGs and SNs are shown in Table 2 (data at national or institution level in ISP target countries are not available).

Table 2 - Percentages of female Masters and PhD students in ISP-supported RGs and SNs 2014-2016

	2014	2015	2016
Global			
<i>Masters</i>	31	29	31
<i>PhD</i>	23	20	26
Asia			
<i>Masters</i>	25	29	31
<i>PhD</i>	28	20	26
Africa			
<i>Masters</i>	33	28	29
<i>PhD</i>	21	17	20

Data on the gender composition of RGs and SNs show similar minor variations with only a small number progressing towards a greater gender balance.²⁴ On the whole, chemistry RGs and SNs have higher proportions of women than either physics or mathematics. Findings from the evaluation did not clarify the reasons for this.

Global data provided by the ISP on PhD drop-out rates and on number of years to completion of PhDs in RGs and SNs show no discernible variation by gender, suggesting that the main source of gender imbalance is in recruiting females for postgraduate studies, rather than in retaining female postgraduates once they have embarked on their studies. This premise tends to be supported in the responses from RGs and SNs to enquiries made by the ISP in 2014 about the then gender balance in their groups. Across different countries, and regardless of whether affirmative action policies and strategies existed at national or university levels, RGs reported similar types of problem in recruiting women to study science at postgraduate levels. Even Cambodia, which has more or less equal numbers of female and male undergraduates in chemistry, reported a marked drop in the number of women continuing to postgraduate study.

ISP reporting tends to attribute lower female participation rates to a lack of encouragement for girls to take up science subjects in the first place, to socially imposed restrictions on their freedom of movement, and to increasing domestic and family demands on women's time as they get older. Similarly, the evaluation found

²⁴ See Annex 5.

that interviewees in the case study countries usually attributed lower female enrolment to cultural traditions concerning men's and women's roles and to family pressures on women, factors that most of them saw as beyond their capacity to influence or control.

The very different contexts in which RGs and SNs are located mean, however, that cultural norms alone cannot explain the small number of female postgraduates in science. Other country- and institution-specific factors need to be considered. It is also important to examine whether there are factors connected to how postgraduate training is delivered. In Cambodia, Masters courses are specifically designed to upgrade high school science teachers who may have completed their first degrees some time ago. They are offered on a part-time basis that extends over a minimum of two years with teaching taking place at weekends, with many of the teachers travelling in from the provinces to attend. It seems likely that the weekend format, as well as having to travel into Phnom Penh from outside, presents a considerable barrier to women who, in addition to their jobs as teachers, also shoulder the main burden of domestic and family responsibilities.

The only female RG leader in Ethiopia (IPICS ETH:02) considered that, although cultural barriers to female participation in science exist, they are neither insurmountable nor necessarily decisive. While acknowledging that, as a woman, it is easier for her than for male colleagues to invite female undergraduates to join her department, she noted that male staff in her department also actively encourage and promote participation by women. This may be at least part of the reason that her department has more female than male Masters students. It may also be that the nature of her research into traditional medicine appeals to female students. Other RGs/SNs reported that they had attempted to attract female postgraduates by designing research that they considered would attract women e.g. mathematical modelling for malaria, bilharzia and mother-to-child HIV transmission (Burkina Faso) or research on women's health (Bangladesh). A RG in Bangladesh in chemistry achieved gender parity through operating a policy of gender quotas. Some RGs focused their efforts further downstream, aiming to increase the number of female school leavers opting for science at university. For example in Ethiopia, physics summer schools were run for high school students, targeting girls, where students were given hands-on experience of experimental lab work.

Mainstreaming gender equality in development cooperation is a Sida priority, and ISP's intentions with respect to promoting gender equality in target countries have featured in annual review meetings with Sida. Reference Group assessments have frequently stressed the need for RGs/SNs to increase the number of their women postgraduates, although with little or no evidence of follow-up from these initial

comments. In its 2013-2017 strategic plan,²⁵ ISP committed to initiating a focused approach to promoting gender equality in its PhD and MSc intakes (pp.1, 12-13) and a Gender Equality Working Group was accordingly set up.

The working group formulated a Gender Equality Plan²⁶ for 2015-2018 with three overarching aims to: (1) collect and analyse data on the female:male ratio in RGs and SNs; (2) raise knowledge and awareness of gender issues in supported institutions and (3) (in the long-term) achieve a gender balance (i.e. at least 40% of women among staff and PhD students. Strategies included conducting context analyses to identify barriers to female participation, offering gender training, making available grants to RGs and SNs for local gender promotion activities, and promoting gender equality policies in all ISP supported institutions.

In commenting on the lack of women postgraduates in their disciplines, several RG leaders noted that they could seek to redress this more effectively if ear-marked funds were available to support women students.²⁷ The grant-making facility established by the ISP in 2015 partially responded to this need by funding one-off outreach activities to young women. Grants were made for a conference for undergraduates in Uganda and for outreach to secondary school students in Uganda, Tanzania and Kenya. Some preliminary results from these investments look promising: the conference in Uganda is reported to have significantly increased the number of young women applying to join the maths and physics departments and to take up leadership positions in their colleges.²⁸

ISP later concluded that supporting initiatives over the longer-term was likely to produce more sustainable results than single initiatives, and from 2017 they began making three-year grants. The first of these was funding for a female PhD student in Bangladesh that will allow the grantee to combine part-time work and study with domestic responsibilities. The importance attached to this was signalled by the presence of the Pro Vice Chancellor and Dean of Science at the award ceremony for the first beneficiary. RGs in mathematics and physics in Ethiopia, Burundi, Kenya and Rwanda and the MSSEESA SN have also been awarded three-year grants. The RG in mathematics in Ethiopia will use the grant for a series of affirmative actions (due to start in 2018), including tutoring for female undergraduates by female postgraduates and staff, providing additional financial resources for female students, and forming female mathematics clubs.

²⁵ ISP (2013) Strategic Plan, 2013-2017.

²⁶ ISP (2015) ISP Gender Equality Plan, 2015-2018.

²⁷ One interviewee noted that the ISP's flexibility over budget allocations did allow some funds to be directed towards women.

²⁸ Grants made in 2016 for similar activities in Bangladesh, Kenya and for MSEESA have not yet been reported on.

Other aspects of the 2015-2018 Gender Equality Plan appear to be over-ambitious (and in practice not all have been followed up). For example, because ISP works at RG and SN levels it has very limited capacity to promote gender equality policies at a university level. Similarly, it does not appear realistic for ISP to have an objective of reaching a gender balance among all staff and students, given the range of national and institutional contexts in which RGs and SNs are located and the different factors and influences beyond the ISP's control that will therefore determine how gender relations develop. It would be more realistic for the ISP to have an objective of promoting greater gender equity among RG leaders, since this is the level at which the ISP works and where its decisions on funding could be influential.

4.2.6 Environment

14. To what extent did the ISP ensure that potential environmental impact was considered in identifying, designing and implementing research projects and programmes? Where possible, assess whether the impact on the environment from the ISP-supported research was positive, negative or neutral?

The ISP collects information in its activity reports (yes or no answers) on whether RGs and SN have implemented any of the 9 measures listed to reduce negative natural environmental impact. The questionnaire format is shown in Table 3

Table 3 - ISP questionnaire on the implementation of environmental impact mitigation measures

Does your group/organisation have/use:	Yes	No
A strategy to reduce negative environmental impact caused by travelling and transportation?		
The use of e-meeting techniques?		
A strategy to reduce the use of electric power?		
Consider environment impact criteria in procurement?		
Practice sorting of waste categories for recycling?		
A system for scrapping decommissioned equipment?		
A management system for chemical and hazardous waste?		
Internal discussions of how any negative environmental impact of your activities can be reduced?		
Engagement in external activities – in research, dissemination and/or society outreach – on how negative environmental impacts may be reduced?		

If there are any 'no' answers the form then asks for explanations for this, what future plans are and if there are any obstacles to implementing the measures. The same format is used in the grant applications. It is understood that the format is derived from one that is applied as Uppsala University.

The data on the implementation of environmental impact mitigation measures was not analysed by group or network, because the data are not complete. Further the organisation did not enable inter-year comparison for each group or network (annual

data in rows and not in columns, for each group/network) and there was insufficient time to reorganise it to enable group- and network-based analyses. The average level of implementation of environmental management measures as reported by groups and networks has generally improved in the period 2009-2016 (Annex 6, Table 24). Although a generally positive trend can be observed, the significant inter-annual variation in the number of groups and networks reporting makes a more disaggregated analysis difficult.

The scoring approach on predefined issues might speak to some of the environmental issues faced by individual RGs but not necessarily all of them. It does not reveal what impacts were identified and addressed by design. They tell us even less about the environmental impacts of activities of ISP supported research. The approach therefore speaks more to ensuring compliance to a prescribed format rather than potential effects in given contexts.

4.2.7 Sustainability

15. What is the potential sustainability of ISP and the supported groups and networks?

The prospects for financial sustainability of most ISP-supported groups and networks are poor. An objective of ISP support is for RGs and SNs to reduce their financial dependence on ISP over time by diversifying their funding sources. Reference Group assessments frequently recommend only partial funding of requested budgets and for applicants to seek alternative and complementary sources of funds. From time to time ISP has also warned individual groups that funding will cease after a number of years, although end dates have not always been specified, which may leave groups in a state of uncertainty. ISP does not systematically request details of grantees' plans for fund-raising or to offer guidance on this, and follow-up on the extent to which grantees have sought and secured alternative funding has been inconsistent. This was the case even in the RG included in the case studies (IPICS BAN:04) that already has a date set for the end of the ISP support.

The analysis of financial data made available to the evaluation for the period 2014-2016 shows that most RGs and SNs remain highly dependent on ISP. The sixteen RGs/SNs that have received ISP support for 20 years or more had funding levels that varied between 32 percent and 100 percent with a median of 79 percent. Similarly, funding levels to groups and networks in the case study countries ranged between 13 percent and 100 percent, with most lying between 60 percent and 80 percent. When interviewed, most RG leaders were unable to set out fund-raising plans in other than the most general terms. According to them, ISP has never required concrete plans for attracting other funding, or set out plans for the phase-out of ISP support. On the face of it, it appears that high levels of funding from ISP over an extended period has relieved RGs and SNs from the need to make serious efforts to look for alternatives.

As most groups and networks were anticipating that ISP funding would continue for the foreseeable future, it also appears to have created an attitude of dependency on a single donor. The almost certainty of ISP funding removes the pressure to seek additional donors and alternative sources.

The situation in Ethiopia is typical of the programme as a whole, with ISP support ranging between 62 percent (IPPS ETH:01) and 85 percent (IPPS ETH:02) of total funding. Each RG leader cited approaches that had been made to other donors and foundations, including through consortia that they had joined in order to apply for grants, but on the whole their applications had been unsuccessful. Where grants had been awarded they were typically for relatively small amounts. In what they saw as a very competitive funding environment, most RG leaders were discouraged and pessimistic about their chances of success, and at something of a loss as to what else to try. They considered that, if they were reliant only on support from AAU, it would have a significant negative impact on their research activities and on the level of support that they were able to provide for postgraduates. Grantees in Bangladesh, Burkina Faso and Uganda also felt that they lacked sufficient capacity or experience to succeed in the arena of large international competitive grants, and some requested more support from ISP in drafting and reviewing applications to such grants.

Cambodia presents an atypical case. Sida bilateral funding will replace ISP support towards the end of 2018. In addition, major funding will come from the World Bank Science, Technology, Engineering and Mathematics project. This has been a fortunate development in that new funding has come on board allowing the ISP to withdraw. It means that the ISP supported science activities will have guaranteed funding for the medium term, will have a relatively secure future and can build on what ISP has contributed to. As ISP funding was initiated in 2005, this has been a relatively short period of support in comparison with other country programmes. It is early days to say whether or not the research capacities that ISP has contributed to building will be sustained under new funding modalities.

16. What complementary funding opportunities would be conceivable for the continued operation and development of ISP?

There are few if any donors that would have been prepared, as Sida has been, to fund in the way that it has, long term under a relatively open ended commitment ISP's programme. In an era of results based management where output and results trump process, the allocation of public money in this manner to deliver a public good is a difficult to defend, even though in the scheme of things we are not talking about large sums of money to each RG and SN (as noted earlier 100 – 500,000 SEK a year).

But a contrast with the World Bank Development and Innovation Grant scheme, USD \$23 million over five years, rolled out in Cambodia (2010-2015) is also instructive.²⁹ A component of this grant (USD 4.58 million) gave awards to Cambodian universities to improve quality of research, training and learning, to be allocated on a competitive basis in order to ‘enhance the capacities of HEIs (Higher Education Institutions) to seek innovative solutions to address national/local development issue’. Tied in closely to the World Bank’s procurement and operations guidelines, the project largely failed to produce research, let alone ‘innovation’. Few researchers were in a position to write grant proposals to the specifications of the World Bank, let alone negotiate the procurement process. As the reviewers noted the funding for research component would have been better spent giving young promising Cambodian researchers with a Master’s degree the opportunity to do a PhD or support a post-doctoral scheme to give PhD holders time for research. The comparison with what the ISP has been able to achieve in Cambodia between 2008 and 2018 is worth bearing in mind.

However the example illustrates the challenge that ISP faces in attracting complementary funding to Sida. Few if any donors are prepared to focus on capacity development processes and give the time for it that Sida is. But it also has to be said the chances of getting significant complementary funding for ISP given its current mode of operation and structural weaknesses in the programme are also slight. ISP has also not communicated well on what it has done and a more articulated and managed process that could speak more convincingly to external actors of the strengths of the ISP approach and achievements might be more likely to find co-funding. There are actions that ISP could take in the design and development of its programme that could make it more attractive to complementary funding and these are discussed in the conclusions.

²⁹ These comments are derived from Rapple, J and Un, L (2018) What drives failed policy at the World Bank? An inside account of new aid modalities to higher education: context, blame and infallibility, *Comparative Education* <https://doi.org/10.1080/03050068.2018.1426534>.

5 Conclusions

A core conclusion that emerges from this evaluation, strongly supported by the field evidence (Annexes 3-4), is that ISP's core programme delivers a significant public good from its support to the development of basic scientific research capacity with the RGs and SNs that it works with in Sida's focus countries. In speaking of a public good we emphasise the value of the skills and knowledge that the ISP funding encourages its partners to develop, enabling them to engage with the international research community. Much of the focus of the work has strong development relevance. The modalities of programme engagement – long-term, supportive, collaborative, facilitative and pragmatic – have built relationships of mutual trust and respect. These modalities are to be admired, are highly valued by partners and they are strengths to be built upon.

However there is a disconnect between what the ISP does in practice and its formal programme structure and monitoring framework which positions ISP's contribution at too high a level. This leads to a lack of clarity over its contribution.

Theory of Change and monitoring framework

ISP has not developed a robust Theory of Change based on a clear understanding of where it positions itself in capacity development. As a result it has not developed an appropriate results framework that clarifies what is useful to monitor, suggesting that the contribution that a strong results framework could make to ISP has not been fully institutionalised. The indicators that it tracks do not enable it to follow up on the full range of support that it provides. For example, in the debriefing meeting in May 2018 it was learnt that ISP aims to increase local training of Masters and PhDs (leading to an associated decrease in overseas sandwich courses) and to encourage networking. These objectives are not reflected in the current results framework and current outcome measures therefore do not track what the ISP is aiming to achieve.

The instructions it gives to grantees create inconsistencies in reporting and render comparisons difficult. ISP has been recording averages that cut across the entire grantee population, but this says little about change over time for each individual grantee and whether or not each grantee is diversifying funding, expanding collaborations, or doing anything about gender. As a result individual grantee analyses are not used in decisions for continued funding in a consistent manner. Reference group members at present are not analysing the evolution of each grantee's time series for the selected indicators jointly with applications for new funding. As a consequence of these weaknesses, ISP's reporting, as evidenced by the Annual

Report is both lengthy and descriptive and does not do justice to what ISP does. Moreover it provides no evidence of programme learning.

We understand that the results framework was developed in line with Sida's requirements but it has not been helpful to ISP for it to be required to monitor and report against goals and objectives that do not fit with its mandate and capacities.

Capacity development processes

ISP supports capacity development primarily through providing resources and skills and knowledge to research groups and scientific networks. These contribute to the ability of these research groups and the individuals within them to build research capacities and generate results. The provision of resources, notably of equipment has been a core strength of the ISP programme. The development of human resources and facilitation of scientific cooperation has been a key contribution of ISP. Much of the research that has been undertaken has strong development relevance.

But the specific capacity development processes that ISP has been involved in have not been fully and clearly set out. Systematic baselines when initiating new collaborations have not been explicitly established. Thus a clear chronology of stages in capacity development for each RG/SNs has not been outlined addressing issues, for example, of ability to formulate research problems, design research projects, develop research leadership or seek additional funding. The absence of systematic detailed procedures for the role and activities of reference groups in mentoring and monitoring progress indicate in our view weaknesses in the internal procedures for performance monitoring, accountability and learning, notably with respect to following up the implementation of the programme's strategic plans. We conclude that much of the support to RGs and SNs has been intuitive rather than transparent, and it has not supported systematic programme learning and renewal. In our view a greater attention to the detail of capacity development that ISP is involved in would not only clarify for ISP its monitoring needs, it would encourage greater programme learning and leverage the case of what is unique and important about ISP. The analogy to be made is with the study programmes and key stages of progress through which a PhD training would pass although stretched of course over a much longer period and at a different level.

Progression of RGs/SNs to independence from ISP

Support to most of the RGs and SNs has effectively been allowed to continue indefinitely with no formal evidence of graduated increases in capacity. This long-term support without clearly including support to fund-raise as part of capacity development or setting out of explicit time-tabled phased out plans has contributed to financial dependency on ISP.

Synergies between the ISP and Sida bilateral programmes

The synergy between the ISP and Sida bilateral programme that was found in Cambodia was not the case in either Ethiopia or Uganda in the past, where gaps in

funding in the period 2009- 2011 had negative effects on the capacity to carry out research. To what extent this reflects country specific factors or Sida strategies is not known.

Gender

The gender equality grant mechanism has the potential to gather context-specific experience in how to promote gender equity which can generate lessons that are of wider relevance and application. The mechanism is essentially demand-driven, with grants applied for on a competitive basis by people who daily confront issues of gender inequity. The funding enables them to test out new initiatives and possible practical measures for addressing gender inequity in their disciplines and institutions. Applicants for funding should be encouraged to consider the barriers that need to be addressed in their own practice and within their institutions (e.g. in terms of course formats and/or research topics), as well as in culture and society. Reporting on funded initiatives should give attention to results that were disappointing, as well as setting out what worked well, and should identify the key lessons learned from both. ISP has a good track record in promoting regional collaboration and networking among RGs. Networking between RGs and SNs has been initiated through the gender equality grant mechanism and ISP can use this experience further to encourage the sharing of lessons learned so that positive lessons may be incorporated into common practice across ISP-supported RGs and SNs.

Maintaining relevance

We acknowledge the extent to which ISP has moved during the 2014-2018 in following up through tracer studies and phased out groups on the effects of the programme on ISP. The innovation in establishing the gender equality grant is commended and offers an important route forwards in addressing gender issues in science. But at a time of major changes in the higher education landscape, particularly in Africa both with stronger support for higher education in general and the specific focus on science and technology skills, the question of the ISP's future positioning arises. On the one hand ISP clearly has a specific niche in supporting RGs/SNs in weak institutions and its mode of operation reflecting a long term commitment is distinctive. It is unlikely that there will be many more Cambodia's amongst the countries that Sida cooperates with, where starting building basic science capacity from the ground floor is required. There will be cases, Afghanistan for example, where the current ISP model may well be appropriate, but in most other contexts the challenges lie rather in advancing research that has passed that very basic level and, more importantly, where there is a wider and dynamic landscape of funding sources and modalities. In sum a core conclusion is that ISP may need to more explicitly leverage its distinct contribution and seek synergies with other actors, including Sida's bilateral programme, in order to maintain its relevance in view of the changing landscape in higher education.

6 Key findings and recommendations

There are many strengths in the ISP programme and it delivers a significant public good in supporting skills and knowledge development that allows its partners to engage with global science and be in a position to contribute to their country's development needs. It offers a modality of working that has been successful in capacity development support that is all too rare in being long term, needs based and process driven rather than short term and output oriented. It has also been appreciated by its partners. The ISP Secretariat has many capabilities – to self-organise and act, to generate results and establish supportive relationships. ISP's strengths can be leveraged in new ways.

It needs to focus on adapting and changing to the shifting landscape in support of science education with new actors and networks, greater levels of funding and an increased global emphasis on science and technology. ISP needs to be more strategic in leveraging its distinct contribution to capacity development in this changing landscape. It needs in its governance structures a wider range of skills and experience to draw on to do this.

ISP needs to strengthen its comparative advantage from working at the RG/SN levels and develop synergies with, for example, Sida's bilateral programme. This is likely to be the case with the new Sida Cambodia programme. This would combine the bottom-up approach of ISP with Sida's focus on capacity development at an institutional level. Greater coordination between ISP and the Sida bilateral programme in Ethiopia would facilitate learning about how institutional constraints impact on the activities of university researchers which should in turn generate thinking on how those constraints might be addressed and mitigated.

There are a number of specific recommendations to make on programme design and management and Table 4 identifies those findings where recommendations are made for specific changes. The current model of operation would provide the basis for these, albeit within a phased and time bound modality. A case could be made for defining a time horizon for support to RGs/SNs at the outset, linked initially to five three-year cycles of funding. This would then be subject to external review if a case was to be made to extend funding for a further defined period. This would encourage more systematic monitoring of capacity changes and assessment jointly by ISP and the concerned RG/SN of progress towards sustainability. This would take account of both baseline conditions in the institutional environment as well as any subsequent changes. In deciding how to position itself after 2018 and how to focus its support to groups and networks, ISP will need to consider whether it has the responsibility and

the capacity to assist RGs and SNs to develop and implement fund-raising plans so that, by the end of an agreed period of ISP support, they have diversified their funding and significantly reduced their financial dependence on ISP.

ISP should also consider moving its support a little more upstream and provide selective support to a post-doctoral scheme. All too often new PhDs or those in early career, have little opportunity to embark on an independent research career after graduating since they are quickly moved into positions of responsibility. Linking such a scheme to building collaborations or working in new research environments with existing RGs and SNs would provide real opportunities for career development and wider research experience.

ISP could also consider developing part of its programme and move towards a competitive research funding approach specifically designed to bring research groups up to competitive standards. This would be consistent with developing a graduated approach towards capacity development where RGs/SNs who are moving towards sustainability are exposed more to the competition process for research funding. The principle of this would be for ISP to identify core areas in the sciences that it considers are in the public interest, in need of support and are not being addressed by others. The funding could support all the modalities that ISP currently deploys, including training, mentoring, collaboration etc. However the funding should be fixed term: for example two or three rounds of funding over a 10 year period, subject to progress which should be closely monitored.

Table 4 - Overview of key findings and recommendations

	Key Findings	Recommendations to ISP
1	There is a lack of coherence between ISP's activities and achievements in capacity development and its results framework. The latter is pitched at too high a level.	ISP needs to be much clearer about the research capacities that it can contribute to and design a Theory of Change and Results framework that is consistent with this.
2	ISP's monitoring framework has not provided relevant data, information and knowledge. Many of the current indicators are inappropriate and its focus on assessing 'averages' that cut across the entire grantee population that exists in diverse contexts is not helpful to learning.	ISP needs to rethink its indicators in relation to a new Theory of Change and Results Framework. It should revise its set of indicators to capture essential aspects of capacity development it wants to develop and focus more on analysing time series data for each individual grantee. Such a revision should be done in dialogue with Sida (cf #8 below)
3	The ISP has not established systematic baselines and identified a chronology of capacity development that is assessed and monitored over time by the Reference Groups.	ISP needs to develop for each RG/SN that it supports a baseline and chronology of capacity development stages which must be assessed and monitored over time by the Reference Groups. These should contain a clear timetable of change.
4	The Reference Group procedures are not consistent across the programmes and do not appear to consistently review and assess research grant applications.	More formal procedures for the Reference Groups need to be implemented, including more structured review processes whereby judgements are supported by argument and recommendations followed up.

	Key Findings	Recommendations to ISP
5	ISP funding appears to have created a dependency for groups that it has been funding long term.	ISP needs to proactively support groups that it has been funding long term to attract new sources of funding and with a clear cut-off date for ISP funding.
6	The gender equality grant mechanisms offers a very useful mechanism for understanding gender constraints.	ISP should build on the early experience of implementing the gender equality grant mechanism and ensure that positive and negative lessons learned from this are disseminated widely and that good practice in promoting gender equality is taken up throughout the programme.
7	The higher education landscape is changing with new networks, forms of cooperation and funding for science and technology. ISP's strategy needs to take this into account leveraging its specific contribution to build synergies with other actors.	ISP should develop a new strategy that builds on its strengths and what it can contribute to scientific research capacity in a changing higher education landscape. It should consider a competitive grant approach in thematic areas of science where there is a public good interest.
		Recommendations to Sida
8	Sida's accountability requirements have not been helpful for ISP to establish a monitoring and reporting framework that supports learning within the programme. We understand a formal results based framework is no longer a statutory requirement for Sida funding.	Sida and ISP should negotiate and agree on a revised set of indicators that serve both the purpose of accountability towards Sida and learning for ISP and its grantees.
9	Synergies between the ISP programme and the bilateral programme have not been fully realised.	Sida should more systematically ensure that the complementarities between ISP and its bilateral programmes are supported.
10	ISP offers a model of cooperation that has immense value and is consistent with Sida's principles.	Sida should continue to support ISP but subject to the rethinking and re-positioning of its approach

Annex 1 – Terms of Reference

Terms of Reference for the Evaluation of the Sida supported programme “International Science Programme 2014-2018”

Date: 2017-11-27

1. Evaluation purpose: Intended use and intended users

The purpose or intended use of the evaluation is to 1) provide Sida with input to Sida’s assessment of supporting a possible new phase of the International Science Programme (ISP), and 2) provide ISP with input of what works well and less well in order to inform decisions on how the implementation of the programme may be adjusted and improved in the new phase.

The primary intended users of the evaluation are Sida’s Unit for Research Cooperation and the management team of ISP.

2. Evaluation object and scope

The object for this evaluation is the Sida supported programme International Science Programme (ISP). ISP was established at Uppsala University, Sweden in 1961, to support low-income countries to build and strengthen their domestic research capacity in the basic sciences chemistry, mathematics and physics, and to develop postgraduate education in these sciences. The ISP-model of support is based on five core features: capacity building, long-term support, improved research environments, collaborative links, and sandwich model training.

ISP provides long-term support, coordination and mentoring to research groups and regional scientific networks at universities and research institutes in Africa, Asia and Latin America. Supported groups and networks use ISP-funding to improve their research quality, environments and conditions by purchasing e.g. laboratory equipment, consumables, literature, and computing tools. Funds are also used for organizing and attending conferences and workshops, and for exchange of scientists and postgraduate sandwich students with scientific hosts at collaborating research groups abroad.

The activities of the groups and networks are carried out in close, long-term, collaboration with one, or several, more established host groups within the same field of science at

universities or research institutes abroad. The host groups are mainly located in Sweden and Europe, but also in the regions of ISP's supported partners. ISP functions as a link between the supported groups and network and the scientific hosts world wide.

The ISP *vision* is to efficiently contribute to a significant growth of scientific knowledge in low-income countries, thereby promoting social and economic wealth in those countries, and, by developing human resources, in the world as a whole. In support of this vision, the *overall goal* of ISP is to contribute to the strengthening of scientific research and postgraduate education within the basic sciences, and to promote its use to address development challenge.

ISP therefore has the *general objective* to strengthen the domestic capacity for scientific research and postgraduate education, by long-term support to research groups and scientific networks in these fields. To achieve its general objective, ISP defines three *specific objectives*:

- 1) Better planning of, and improved conditions for carrying out, scientific research and postgraduate training.
- 2) Increased production of high quality research results.
- 3) Increased use by society of research results and of graduates in development.

The Swedish International Development Cooperation Agency (Sida) has been the main financial contributor to ISP since 1965, although support was channelled through the former Swedish Agency for Research Cooperation with Developing Countries (SAREC) during 1978-1992.

The scope of the evaluation shall cover Sida-funded activities for the period 2014-2018. However,

in order to have a broader view, and if relevant, the evaluators may allow their assessment to extend to earlier years. The geographical scope of the evaluation is to look specifically on ISP activities in Ethiopia, Burkina Faso and Cambodia. The analysis should be put into a larger context of Sweden's strategy on research cooperation, ISP's strategic direction, as well as the broader context of global and regional trends with relevance for scientific research and research training.

For further information, the project/programme proposal is attached as Annex D. The scope of the evaluation and the theory of change of the project/programme shall be further elaborated by the evaluator in the inception report, as the evaluator shall describe and analyse ISP's RBM logical framework.

3. Evaluation purpose: Intended use and intended users

The primary purpose or intended use for this evaluation is to:

- 1) Provide Sida with recommendations to be considered in upcoming discussions concerning possible continued cooperation (starting 2019).

- 2) Provide ISP with recommendations on future directions and initiatives to be taken by ISP, within the scope of its vision, to increase its effectiveness.

The intended users of the evaluation is the Unit for Research Cooperation at Sida and ISP's management team. The evaluation is of a formative nature, so it aims to produce substantial ideas on how to improve, besides reviewing activities and programmes.

4. Evaluation objective and questions

The main objective of this evaluation is to evaluate the effectiveness, impact and potential sustainability of ISP 2014-2018.

More specifically, the evaluation should provide answers to the following questions:

Effectiveness

To which extent has the program contributed to intended outcomes, in particular as regards:

Postgraduate training

1. To what extent and how has ISP's activities led to increased human and scientific research capacity in supported groups and networks?

-

Research

2. What are the quantity and scientific quality of the research conducted and results obtained by supported groups and networks, in terms of publications in scientific journals and presentations at international conferences? The assessment and analysis should consider possible challenges in the context of an increasing number of electronic publication venues, including so called "predatory publishers".
3. How has the program increased the capacity to formulate research problems and proposals as well as designing research projects and attract external research funding?
4. What are the adequacy, functionality (use and maintenance) and results of ISP's efforts to contribute to the improvement of scientific research facilities and technical resources?
5. What effects does ISP support have on the development of research leadership among groups and networks?
6. To what extent and how has ISP impacted on academic quality and a scientific research culture in the supported groups and networks?

Impact

7. How have ISP supported groups and networks interacted with public institutions, industry and civil society, and with what impacts?
8. How have ISP supported groups and networks gained recognition for their research or achievements (awards, promotions, appointments to committees, patents etc.)?

9. How is ISP working to increase gender equity in supported groups and networks? Could gender mainstreaming have been improved in planning, implementation or follow up?
10. Has the project had any negative effects on the environment? Could environment considerations have been improved in planning, implementation or follow up?
11. How has ISP worked with alumni to strengthen results and increase its impact?

Relevance

12. Assess the appropriateness of ISP's RBM logical framework and outcome indicators for measuring results and indicating the progress of the programme.

-

Sustainability

13. What is the potential sustainability of ISP and the supported groups and networks?
14. What complementary funding opportunities would be conceivable for the continued operation and development of ISP.
15. The evaluation shall further assess how ISP has approached and addressed the recommendations given in the latest (2011) evaluation of ISP, with special emphasis on ISP's Strategy Plan 2013-2017, and the yearly action plans for ISP's strategic work.

Questions are expected to be developed in the tender by the tenderer and further developed during the inception phase of the evaluation.

5. Methodology and methods for data collection and analysis

It is expected that the evaluators will visit ISP's partners in minimum two of the following countries: Ethiopia, Burkina Faso and Cambodia. It is also expected that the evaluators conduct interviews through telephone/Skype with ISP partners in Bangladesh and Uganda. It is also expected that the evaluators will conduct interviews with ISP's management and staff, with selected members (or former membes) of the ISP Board and Scientific Reference Groups, as well as representatives of Sida.

It is expected that the evaluator describes and justifies an appropriate methodology and methods for data collection in the tender. The evaluation design, methodology and methods for data collection and analysis are expected to be fully presented in the inception report.

Sida's approach to evaluation is utilization-focused which means the evaluator should facilitate the entire evaluation process with careful consideration of how everything that is done will affect the use of the evaluation. It is therefore expected that the evaluators, in their tender, present i) how intended users are to participate in and contribute to the evaluation process and ii) methodology and methods for data collection that create space for reflection, discussion and learning between the intended users of the evaluation.

Evaluators should take into consideration appropriate measures for collecting data in cases where sensitive or confidential issues are addressed, and avoid presenting information that may be harmful to some stakeholder groups.

Relevant documents and data will be made available to the evaluators by Sida and ISP. The evaluators are also expected to independently search for data and documents, when deemed suitable and necessary, for example in scientific databases.

Documents to be made available to the evaluators may include the following:

- Applications to Sida
- Agreements with Sida
- Minutes from Board meetings and meetings with the Executive Committee to the Board (the latter in Swedish)
- Minutes from Annual review meetings with Sida
- Annual narrative and financial reports
- ISP reports and publications
- Publications regarding ISP
- The Sida evaluation of ISP in 2011, including the management response
- The Swedish ‘Strategy for Sida’s support for development research cooperation 2010-2014’
- The Swedish ‘Strategy for research cooperation and research in development cooperation 2015-2021

6. Organisation of evaluation management

The evaluation is commissioned by the Unit for Research Cooperation at Sida. ISP has contributed to the ToR and will be provided with an opportunity to comment on the draft inception report as well as the draft final report, but will not be involved in the management of the evaluation. Hence the commissioner will evaluate tenders, approve the inception report and the final report of the evaluation. ISP will be participating in the start-up meeting of the evaluation, inception meeting, debriefing workshop, as well as in the workshop where preliminary findings and conclusions are discussed, and in the conclusion seminar.

7. Evaluation quality

All Sida's evaluations shall conform to OECD/DAC's Quality Standards for Development Evaluation³⁰. The evaluators shall use the Sida OECD/DAC Glossary of Key Terms in Evaluation³¹. The evaluators shall specify how quality assurance will be handled by them during the evaluation process.

8. Time schedule and deliverables

It is expected that a time and work plan is presented in the tender and further detailed in the inception report. The evaluation is expected to be carried out between February 5-9 and June

³⁰ DAC Quality Standards for development Evaluation, OECD, 2010.

³¹ Glossary of Key Terms in Evaluation and Results Based Management, Sida in cooperation with OECD/DAC, 2014.

11-15, 2018. The timing of any field visits, surveys and interviews need to be settled by the evaluator in dialogue with the main stakeholders during the inception phase.

The table below lists key deliverables for the evaluation process. Please note that the below time line give an indication of Sida's tentative planning of the evaluation process and that tenderers are expected to propose their own time plan in the tender.

Deliverables	Participants	Suggested deadlines
1. Start-up meeting at Sida HQ in Stockholm/or virtually	Evaluators, Sida, ISP	Week 6 (February 5-9 2018)
2. Draft inception report		Week 6-8, February, 2018
3. Inception meeting at Sida HQ in Stockholm/or virtually	Evaluators, Sida, ISP	Week 8, February, 2018
4. Comments from intended users to evaluators		March 1, 2018
5. Final inception report		March 15, 2018.
6. Debriefing workshop	Evaluators, Sida, ISP	Week 15 (April 9-14), 2018
7. Draft evaluation report		April 30, 2018
8. Presentation of draft report, Sida, Stockholm	Evaluators, Sida, ISP	May 7, 2018
9. Comments from intended users to evaluators		May 14, 2018.
10. Final evaluation report		June 1, 2018
11. Evaluation brief	Sida, Swedish Embassies with Research Cooperation, Uppsala/Stockholm University, other Research Donors	Week 23, (June 4-8), 2018
12. Conclusion seminar, Sida HQ/virtually	Evaluators, Sida, ISP, key stakeholders	Week 24, (June 11-15), 2018

The inception report will form the basis for the continued evaluation process and shall be approved by Sida before the evaluation proceeds to implementation. The inception report should be written in English and cover evaluability issues and interpretations of evaluation questions, present the methodology, methods for data collection and analysis as well as the full evaluation design. A specific time and work plan for the remainder of the evaluation should be presented which also cater for the need to create space for reflection and learning between the intended users of the evaluation.

The final report shall be written in English and be professionally proof read. The final report should have clear structure and follow the report format in the Sida Decentralised Evaluation Report Template for decentralised evaluations (see Annex C). The methodology used shall be described and explained, and all limitations shall be made explicit and the consequences of these limitations discussed. Findings shall flow logically from the data, showing a clear line of evidence to support the conclusions. Conclusions should be substantiated by findings and analysis. Recommendations and lessons learned should flow logically from conclusions. Recommendations should be specific, directed to relevant stakeholders and categorised as a short-term, medium-term and long-term. The report should be no more than 35 pages excluding annexes.

The evaluator shall, upon approval of the final report, insert the report into the Sida Decentralised Evaluation Report for decentralised evaluations and submit it to Citrus (in pdf-format) for publication and release in the Sida publication data base. The order is placed by sending the approved report to sida@citrus.com, always with a copy to the Sida Programme Officer as well as Sida's evaluation unit (evaluation@sida.se). Write "Sida decentralised evaluations" in the email subject field and include the name of the consulting company as well as the full evaluation title in the email. For invoicing purposes, the evaluator needs to include the invoice reference "ZZ610601S," type of allocation "sakanslag" and type of order "digital publicering/publikationsdatabas."

9. Resources

The Program Officer/contact person at Sida is Fanny von Heland, Unit for Research Cooperation. The contact person should be consulted if any problems arise during the evaluation process.

Relevant Sida documentation will be provided by Fanny von Heland, Unit for Research Cooperation. Relevant ISP documentation will be provided by Peter Sundin, ISP.

Contact details to ISP supported groups and networks will be provided by Peter Sundin, ISP.

The evaluator will be required to arrange all logistics.

10. Annexes

Annex A: List of key documentation

Agreement and Application

- Grant Agreement Sida-Uppsala University
- Application for financial support for the International Science Programme for the period 2014-2018

Board meetings

- Minutes from Board meetings and meetings with the Executive Committee to the Board (the latter in Swedish)

Annual Narrative and Financial reports

- Annual Report 2014
- Annual Report 2015
- Annual Report 2016
- Minutes from Annual Review Meetings with Sida

Former evaluations

- Report on the Evaluation of the International Science Program, ISP, 2011, including the Sida Management Response to the evaluation
- [The International Science Programme in Sri Lanka and Thailand: Three decades of research cooperation](#). Rebecca Andersson och Marta Zdravkovic, 2017
- [Evaluation Report of the Eastern Africa Universities Mathematics Programme](#) Martin Singull, Balázs Szendrői and Antonella Zanna, 2017
- [Tracing ISP graduates 2008-2013](#) Rebecca Andersson and Peter Sundin, 2016
- [The International Science Programme in Bangladesh: A case of self-interest, interconnectedness or social empowerment?](#) Tatjana Kuhn, 2012
- [Sida and Uppsala University evaluation of ISP](#) GHD, 2011
[Management Response](#)
- [International Science Programme, Uppsala University 1961-2001. Historical review and Participants Experiences](#). Editor: Torsten Lindqvist, 2001

Other relevant ISP publications

- [The Sandwich Model – A Successful Case of Capacity Building](#)". Rebecca Andersson, Internationalisation of Higher Education – A Handbook, 2017.
- [Experiences and perceptions of South–South and North–South scientific collaboration of mathematicians, physicists and chemists from five southern African universities](#). Marta Zdravkovic, Linley Chiwona-Karlton, Eren Zink, [Scientometrics](#), pp. 1-27, 2016.

Sida strategies

- [Swedish strategy for research cooperation and research in development cooperation 2015 – 2021](#)
- Policy for Research in Swedish Development Cooperation 2010-2014 and Strategy for Sida's support for Research Cooperation 2010-2014.

Annex B: Data sheet on the evaluation object

Information on the evaluation object (i.e. intervention, strategy, policy etc.)	
Title of the evaluation object	International Science Program, ISP, 2014-2018
ID no. in PLANIt	A5400630
Dox no./Archive case no.	14/000364
Activity period (if applicable)	2014-01-01 – 2018-12-31

Agreed budget (if applicable)	160 000 000 SEK
Main sector	Research
Name and type of implementing organisation	International Science Program (Uppsala University)
Aid type	Project type intervention
Swedish strategy	Forskningssamarbete

Information on the evaluation assignment	
Commissioning unit/Swedish Embassy	Unit for Research Cooperation, Sida
Contact person at unit/Swedish Embassy	Fanny von Heland, Unit for Research Cooperation, Sida
Timing of evaluation (mid-term review, end-of-programme, ex-post or other)	End-of-program evaluation
ID no. in PLANIt (if other than above).	

Annex 2 – Itineraries and people met

Country & Team Member	
ISP Secretariat: Adam Pain and Trish Silkin, March 27-29th 2018	
ISP Staff	
Leif Abrahamsson	Director, IPMS
Rebecca Andersson	Project Coordinator (interviewed by Skype,
Carla Puglia	Deputy Program Director, IPPS
Peter Sundin	Director, IPICS and Head of ISP
Ernst van Groningen	Director IPPS
Cecilia Oman	Deputy Program Director (interviewed by skype)
ISP Executive Committee	
Professor Kersti Hermansson	(Chairperson), Department of Chemistry, Uppsala University
Professor Lars Österlund	Department of Engineering Science, Solid State Physics
Professor Maciej Klimek	Department of Mathematics
Reference Group Members	
Professor Charlotta Turner	(IPICS) Lund University (by phone)
Professor Iqbal Parker	(IPICS) International Centre for Genetic Engineering and Biotechnology, Cape Town, South Africa (by phone)
Professor Christer Kiselman	(IPMS) Department of Information Technology, Uppsala University
Professor Krishna Garg	(IPPS) University of Rajasthan, Jaipur, India (by skype)
Professor Magnus Willander	University of Linköping
Professor Roland Roberts	Uppsala University
Supervisors / Collaborators	(Various Departments)
Boschloo Gerrit (Physical Chemistry) Ingemar Kaj (Maths), Roland Roberts (Geophysics), Bjorn Lund (Geophysics), Christer Kiselman (Mathematics), Mate Erdely (Chemistry) Patrice Godonou (Engineering)	
Alexander Sellerholm	Program Manager Research and Humanitarian Affairs Embassy of Sweden, Ethiopia
Dr Adil Zakaria	Department of Civil and Environmental Engineering, Addis Ababa Institute of Science and Technology

Dr Atalay Ayele	Associate Professor, Director of the Institute of Geophysics, Space Science and Astronomy (IGSSA), Addis Ababa University (AAU)
Dr Ermias Dagne	Emeritus Professor of Chemistry Department of Chemistry, College of Natural and Computational Sciences, AAU
Dr Ketsela Hailu	Vice President for Administrative Affairs, Addis Ababa University of Science and Technology Chair of the Department of Mathematics
Dr Lemi Demiyu	Assistant Professor of Physics, Department of Physics, College of Natural and Computational Sciences, AAU
Dr Mariamawit Yonathan	Department Head, Department of Pharmacognosy, College of Health Sciences, AAU
Dr Mekonnen Ababayehu Desta	Department of Chemistry, College of Natural and Computational Sciences, AAU
Dr Mulugeta Bekele	Associate Professor of Physics, Department of Physics, College of Natural and Computational Sciences, AAU
Dr Negussie Megersa	Professor of Chemistry, Department of Chemistry, College of Natural and Computational Sciences, AAU
Dr Tadesse Abdi	Head, Department of Mathematics, College of Natural and Computational Sciences, AAU
Dr Tilahun Abebaw	Mathematics Research Group Leader, College of Natural and Computational Sciences, AAU
Dr Wendimagegn Mammo	Professor of Organic Chemistry, Department of Chemistry, College of Natural and Computational Sciences, AAU
Dr Zewdneh Genene Wolkeba	Department of Chemistry, College of Natural and Computational Sciences, AAU
Tamirat Bekele Jimma	MSc in Computational Physics, IGSSA
Ambachew Bizuneh	BSc in Electronic Technology, IGSSA
Birhan Al Kadir Abdulahi	PhD Candidate, Department of Chemistry, College of Natural and Computational Sciences, AAU
Birhanu Abera	MSc in Seismology Geophysics, IGSSA
Daniel Mamo	MSc in Geophysics, IGSSA
Royal University of Phnom Penh, Cambodia; Adam Pain, April 30 – May 4th, 2018	
Dr Chan Oeurn Chey	Physics Department
Dr Sou Kalyan (F)	Physics Department
Dr Khun Kimleang	Physics Department
Meng Long Seng (F)	Physics Masters Student, Batch 6 MSc, not graduated
Ngok Sreymean	Physics Masters Student, Batch 6 MSc, not graduated
Yann Rem	Lecturer, Physics Department, Batch 1 MSc
Ty Bunly	Physics Masters Student, Batch 7
Dr Sorya Proum (F)	Lecturer, Chemistry Department

Mr Chey Thavy	Head of Chemistry Department
Ngon Putheary (F)	Lecturer, Chemistry Department
Touch Hun	Lecturer, Mathematics,
Ham Karim	Lecturer, Mathematics,
Ngov Simrong	Deputy Head, Mathematics
Magnus Saemundsson	First Secretary, Education, Swedish Embassy
Dr Chhem Rethy	Director, Cambodian Development Resource Institute
Simeth Beng	Senior Education Specialist, World Bank
Santosh Khatri	Chief, Education Programme, Unesco
Bangladesh	Gonçalo Carneiro, 18-30 April 2018
Dr Mohammad Shoeb	Dep Chemistry, University of Dhaka, IPICS BAN:04 group leader
Prof Nilufar Nahar	Dep Chemistry, University of Dhaka, former IPICS BAN:04 group leader
Dr Md Rausan Zamir	Daffodil International University, IPICS BAN:05 group leader
Prof Begum Rokeya	Bangladesh University of Health Sciences, IPICS ANRAP coordinator
Prof Altaf Hussain	Dep Chemistry, University of Dhaka, IPICS NITUB coordinator
Prof Md Feroz Alam	Dep Physics, Bangladesh University of Engineering and Technology, IPPS BAN:02 group leader
Prof K Siddique-e-Rabbani	Dep Biomedical Physics and Technology, University of Dhaka, IPPS BAN:04 group leader
Dr K Sadaat Hossain	Dep Physics, University of Dhaka, IPPS BAN:05 group leader
Burkina Faso	Gonçalo Carneiro, 25 April – 3 May 2018
Prof Yvonne Bonzi-Coulibaly	Dep Chemistry, University of Ouagadougou, IPICS BUF:01 group leader
Dr Boubié Guel	Dep Chemistry, University of Ouagadougou, IPICS BUF:02 group leaders
Dr Issa Tapsoba	Dep Chemistry, University of Ouagadougou, IPICS ANEC coordinator
Prof Alfred Traoré	Centre de Recherche en Sciences Biologiques, Alimentaires et Nutritionnelles, University of Ouagadougou, IPICS RABiotech coordinator
Uganda	Gonçalo Carneiro, 18 April – 2 May 2018
Dr John Wasswa	Dep Chemistry, Makerere University, IPICS UGA:01 group leader
Dr Emmanuel Tebandeke	Dep Chemistry, Makerere University, IPICS UGA:02 group leader

Dr Simon Anguma	Muni University, IPPS EAARN coordinator
Prof Tom Otit	Dep Physics, Makerere University, IPPS MSSEESA coordinator and IPPS UGA:01/1 group leader
Dr Edward Jurua	Dep Physics, Mbarara University of Science and Technology, IPPS UGA:01 group leader
Dr David Sseviiri	Dep Mathematics, Makerere University, IPMS EAUMP coordinator in Uganda
Dr Fred Tugume	Uganda Geological Survey, IPPS ESARSWG coordinator

Annex 3 – Primary case studies: Ethiopia and Cambodia

UNIVERSITY OF ADDIS ABABA, ETHIOPIA CASE STUDY

Context

Ethiopia has the second largest population in Africa at 102 million (2016). Its recent annual growth rates at above 10 percent are well above regional averages, based mainly on agriculture, construction and services. Though declining, the poverty rate is still above 30 percent and it has a per capita income of US\$783. Recent years have seen improvements in child mortality and access to clean water, and primary school enrolment has quadrupled. For the period under review, Ethiopia's development has been guided by the Growth and Transformation Plan I (GTPI) (2010/11-2014/15) and by its successor GTPII (2015/16-2019/20), which give priority to investment in infrastructure, agriculture, industry and renewable energy. Support to the development of traditional medicine is included in the national strategy for the pharmaceutical industry. The Ethiopian government aims for the country to reach middle income status by 2025.

Since 2000, Ethiopia has embarked on a major programme of expansion in higher education. The number of universities has risen from two at the beginning of the century to more than 33 (public and private) in 2016 with 11 more planned under GTPII. In 2013, undergraduate enrolment was above 500,000 of whom 30 percent were female, Masters' enrolment was above 28,000 of whom 20 percent were female, and PhD enrolment was 3,165, of whom just over 11 percent were female. For Ethiopia to reach the government's middle income status target, it will need to significantly increase enrolment at undergraduate and postgraduate levels but concerns have already been raised that the recent expansion in numbers has led to a significant decline in standards. There is also concern about the marked gender disparity, particularly among postgraduates.

Addis Ababa University (AAU) is the oldest and largest tertiary education institute in Ethiopia, founded as a university college in 1950. With Ethiopia's major expansion of higher education, there is a commensurate demand for increased numbers of Masters and PhD graduates for both academic and administrative posts. AAU, described as the Ethiopian 'mother university', is the main source of postgraduates for the rest of the country. AAU is implementing a gender policy with strategies that include

strengthening female scholarship programmes and allowing women extra time to complete their studies.

Sweden has provided a block grant to AAU since 2009 for the development of graduate programmes with a focus on addressing national development needs, supporting the expansion of higher education and remedying the gender disparity in higher education. Independent assessments of AAU have criticised the quality of its PhD programmes and ISP-supported Research Groups also express concern at the poor quality of the recent cohorts of students which, together with difficulties in procurement of essential materials, is believed to have a negative impact on the quality of research.

According to <http://www.webometrics.info/en/Africa> in January 2018 Addis Ababa University was ranked 25th out of just under 1500 universities in Africa, down from 18th in 2015³². AAU also went from first to second place in Ethiopia, overtaken by Jimma University.

Overview

Support to Research Groups (RG) and networks at AAU are among the ISP's longest-term commitments to the development of research capacity, with support to the Natural Products Research Network for East and Central Africa (NAPRECA), initially located in Ethiopia, dating from 1988 and support to the physics RG IPPSETH01 dating from 1990. During the period under review (2014-2018) the ISP supported 6 RGs and one network at AAU. These were:

CHEMISTRY

IPICS ALNAP: The African Laboratory for Natural Products (ALNAP) is a network based in universities in Burundi, DRC, Ethiopia, Rwanda and Uganda. Most network coordination has taken place from AAU. ISP funded the network between 1996 and 2015, with the last funding round in 2013-2015. ALNAP's objectives are to promote research and training, to engage in collaborative research in the sub-region, to provide analytical services and to develop health care products based on natural products. There were diverging views in the Reference Group on the application for funding for 2013-2015, one referee holding that ALNAP was performing well in its core activities but another considering that it tended to repeat its activities year on year without showing tangible progress towards objectives. This divergence appears to be the basis for providing a final 3 years funding up to 2015.

³² The first five places in this ranking were taken by South African universities.

IPICS ETH:01: This RG is concerned with the synthesis and characterization of conjugated polymers and biomaterials for solar energy conversion, storage and sensors. The ISP has funded this RG since 2002, with a gap in funding during 2009-2011 when Sida's block grant to AAU through the bilateral programme was initiated. The RG does not appear to have benefited directly from Sida's block grant, leaving a hiatus in funding for research during this period. IPICS ETH:01 made two applications covering the period under review, for the periods 2014-2016 and 2017-2019. The Reference Group has rated the activities of this RG highly from both fundamental and applied science perspectives. They considered it to offer excellent training and international exposure for students, and to have a good track record in terms of publications and MSc and PhD graduations. The RG was awarded funding for 2017-2019 but was warned that funding beyond this could not be guaranteed and that the RG should seek alternative and complementary funding, particularly as the ISP was unable to meet the full budget request of just under SEK 2.1 million.

IPICS ETH:02: This RG is located in the Department of Pharmaceutical Chemistry and Pharmacognosy in the College of Health Sciences (Black Lion Hospital). The ISP has funded the RG since 2012 (coinciding with the return to Ethiopia of the RG leader, an alumnus of the Sida bilateral programme graduating from Uppsala University). The RG's main objective is to carry out broad and long-term research on plants used in traditional Ethiopian medicine. For the period under review the RG made successful applications to the ISP for 2014-2016 and for 2017-2019. The Reference Group considered that research plans demonstrated potential and innovation, with good opportunities for training. In response to the second application, however, the Reference Group judged progress to have been slower than expected and considered that the RG should begin to demonstrate greater autonomy from the RG leader's PhD supervisor in Sweden. ISP facilitated a productive collaboration between IPICS ETH:02 and IPICS ETH:01.

IPICS ETH:04: The ISP has funded this RG since 2013. The RG is concerned with creating capacity in Ethiopia for chemical analysis of organic and inorganic environmental pollutants (from agrochemical, industrial and municipal waste discharges) by the use of modern instrumental methods. The research has potentially relevant applications in agriculture and industry, and the RG has related objectives in terms of advising and influencing users of chemicals (e.g. farmers using pesticides) and policy makers. The RG made two successful applications for funding covering the period under review: for 2013-2015 and for 2015-2017, with a no-cost extension awarded for 2018 (due to the RG leader's health problems which prevented an application being made). The Reference Group considered that the scientific quality and degree of innovation in research proposals were good. While recommending continued funding for 2015-2017, however, the Reference Group noted that the scientific approach needed stronger justification and that the RG needed to provide more evidence of outreach to Ethiopian authorities, given the high relevance of the research to problems of development in different sectors.

MATHEMATICS

IPMS ETH:01: This RG has been funded since 2005, with a gap in funding from 2009-2011 as with IPICS ETH:01. The current RG leader was one of the first two PhD students whose postgraduate studies in Uganda were funded by ISP. The emphasis in the RG's activities has been on support to postgraduate education with its objectives specified as being to increase the contribution of research and postgraduate education in Mathematical Sciences at national and global levels. This involved both building the capacity of the Department of Mathematics at Addis Ababa University and also training Masters and PhD students who would go on to staff mathematics departments in the new universities in Ethiopia. During the period under review the RG has made two successful applications for the periods 2014-2016 and 2017-2019.

PHYSICS

IPPS ETH:01: This RG has been funded since 1990 with a gap in funding between 2009 and 2011 as with IPICSETH01 and IPMSETH01. The RG's objectives are to carry out basic and applied research on modelling, computer simulation, and device characterization, with specific reference to the electrical and optical properties of conjugated organic polymers. The RG made successful funding applications for 2012-2014, 2015-2017 and 2018-2020. The Reference Group considered that the RG had a good track record in the number of qualified postgraduates it had produced, as well as in publications and in regional collaboration. The Reference Group also noted that progress in experimental physics had lagged theoretical physics, mainly because of personnel problems and weak collaboration within AAU. Specifically, the experimental physics side has suffered from a lack of qualified technicians to maintain lab equipment, contributing to difficulties of retention of academic staff and a loss of experimental physicists to other countries. In 2014, the Reference Group recommended lower funding for experimental than for theoretical physics because of these issues. Reference Group comments on the 2018-2020 application were positive, with full support recommended.

IPPS ETH:02: This RG has been funded since 2005, with the same break from 2009-2011 as for other RGs. The RG's overall objective is to build an active seismic network in Ethiopia (connected to stations in neighbouring countries), that will provide the human resources and equipment to enable monitoring of earthquake and volcanic activities in the country and the wider region (of the Rift Valley). The RG aims to provide information on seismic activity to decision makers and stakeholders in order to prevent and mitigate risks to property and human life. During the period under review, the RG submitted two successful applications for funding: for the periods 2014-2016 and 2017-2019. The Reference Group considered the focus of research to be highly relevant and noted that in this area of work it was of particular importance to organise outreach to policy makers and politicians. The Reference Group further noted that the RG had strong international collaborations but was weakly supported within AAU and that this went some way to explain the RG's lack

of students. However, they felt that the project offered good potential as a regional training centre in seismology. The centre has provided training for the ESARSWG network, which is coordinated from Zimbabwe.

Assessment

Relevance

Alignment with Swedish policies

The ISP's support to the development of research capacity in Ethiopia in the basic sciences is broadly relevant to and aligned with the two Swedish policies for research in development cooperation that span the period under review³³. Swedish policies and strategies focus on building scientific research capacity in developing countries and regions and on promoting the production of high quality research that is relevant to addressing poverty reduction and developing countries' priorities and problems. In Ethiopia, there is some alignment between Sida's bilateral support to AAU, which includes supporting the expansion of PhD programmes and strengthening research capacity, and ISP's support to the six RGs and one network in the basic sciences. The similarity in objectives between the bilateral and ISP programmes and the fact that they offer complementary forms of support to AAU suggest that there are good opportunities for mutual learning that could usefully be developed further. Greater coordination between ISP and the Sida bilateral programme would facilitate learning about how institutional constraints impact on the activities of university researchers which should in turn generate thinking on how those constraints might be mitigated.

Relevance to scientific capacity development

In designing its programmes of support in Ethiopia, the ISP did not systematically analyse the strengths, weaknesses and challenges in the research environment at AAU nor assess existing levels of research capacity. The lack of a systematic approach, however, does not mean that the ISP's support was inappropriate. To the contrary: in interviews for this evaluation, members of RGs and SNs provided consistent and credible examples of the relevance of ISP support and compared it favourably in this regard with support received from some other sources. Scientists at AAU work in a resource-poor environment, lacking easy access to the equipment and materials that are prerequisites for implementing scientific research activities. At the most fundamental level, therefore, the equipment and materials provided by the ISP enabled experimental work to proceed on a much more continuous basis than would otherwise have been the case. Similarly, in facilitating opportunities (e.g. for international engagement by funding fellowships, attendance at conferences etc.) the

³³ Government Offices of Sweden: 'Policy for research in Swedish development cooperation 2010-2014 and strategy for Sida's support for research cooperation 2010-2014' and 'Strategy for research cooperation and research in development cooperation 2015-2021'.

ISP helped to mitigate the sense of isolation engendered by a difficult working environment, not least in the fact of Ethiopia's frequent power and internet outages.

Relevance to national development

Applicants for ISP funding are required to explain or justify their proposed research focus and activities under the heading of relevance, understood as relevance to the Ethiopian context. Applications during the period under review justified relevance in different ways – some RGs showed how research results could be directly applied to national development problems (e.g. industrial pollution, earthquake risk) while others made the case for building centres of academic excellence. It is clear from the written assessments of applications that Reference Group members were concerned to see that funded research should be relevant to Ethiopia's development problems and/or to the realities and challenges of the Ethiopian research environment. The picture is uneven, however, as this concern is not reflected consistently across all assessments and nor does there appear to have been much in the way of follow-up where doubts about relevance were raised. Certainly, the question of relevance did not emerge as a major theme during interviews for the evaluation when RG leaders were asked to reflect on the Reference Groups' comments on their applications. For some RGs, one of ISP's strengths is that – unlike some other donors – it is willing to finance fundamental research that cannot be shown to have immediate application to national development problems but, rather, that facilitates engagement with an international science community.

Effectiveness

Contribution to facilities and resources

As indicated under Relevance, the ISP's provision of equipment and materials was identified as an exceptionally useful aspect of its support, without which it would be difficult for RGs, particularly those working in experimental fields, to carry out any research at all. There is a particularly acute problem at AAU because procurement procedures are cumbersome and slow, supplies need to be procured overseas, and researchers have little or no access to the foreign exchange required for these purchases. A PhD graduate who had completed his studies in Taiwan³⁴ observed that in that country a researcher could order supplies in the morning and receive them in the afternoon whereas at AAU a researcher might put in an order for supplies and have to wait for months or even years before they arrived. The ISP's role in identifying good suppliers and then managing the whole procurement and payment process is therefore seen by RGs as a core strength of its support.

Specific examples of this include funding for the seven stations that have expanded the national seismic data collection network (IPPS ETH:02) and funding of the

³⁴ This student had received a scholarship from Taiwan and had not been supported by the ISP.

consumables required to run the Nuclear Magnetic Resonance (NMR) spectrometer in the Department of Chemistry (IPICS ALNAP), which had been provided under Sida/SAREC support. Although supplied for IPICS ALNAP, the equipment is available to and used by other researchers at AAU. In 2011 an NMR spectrometer was also provided by Sida/SAREC for the Department of Pharmacy at the College of Health Sciences. This was still standing unused in its packaging in the college foyer when the RG leader (IPICS ETH:02) returned to Ethiopia in 2012. The first inspection of the equipment commissioned by the college concluded that the spectrometer was broken. However, ISP staff located an engineer in South Africa who examined it and judged that it could be fixed and installed. After a long period of inactivity since the equipment arrived, this is now in hand. This is an example of where ISP has been able to add value to equipment provided by other donors, as well as being a source of essential equipment and materials itself.

ISP carried out a review of equipment in 2016. Based on self-reporting, it appears that, either partially or to a significant extent, all the RGs had access to the equipment that they needed to carry out research, although none of them had full access to all necessary equipment. Almost all equipment was in working order, including instruments supplied by the ISP and those provided from other sources such as the university. Data on costs is lacking so that it is not possible to judge the ISP's relative contribution to the complete register of equipment. Two significant problems were reported by RGs in using equipment. The first is that there were no university policies or guidelines governing access to scientific instruments, including how running costs were to be allocated and spare parts replaced, which tended to discourage researchers from sharing their equipment with others. There was also the issue, mentioned above, of a lack of technicians to maintain equipment used in experimental physics.

Effects on research capacity

The ISP treats the approvals process for RG and network applications as an opportunity to improve the quality of research proposals and plans via face-to-face discussion between RG and Reference Group members. One Ethiopian RG leader described this process as 'defending' the application in a similar way to defending a postgraduate thesis. In Ethiopia, for the period 2014-2018, the discussion does not appear to have significantly changed the nature of the proposed research. In only one case could a RG leader remember being asked to redraft and re-submit an application. During interviews, RG leaders recalled that among Reference Groups' chief concerns were the small number of female postgraduate students in science (see below: Gender) and the need for research results to be disseminated beyond an academic audience (i.e. to government, the private sector and/or the public) (see below: Impact). The written assessments recorded by Reference Group members typically focus on issues such as high levels of requested funding and an associated need for RGs to seek complementary finance, on encouraging regional collaboration (seen as beneficial in its own right and as a means for securing new funding) and, in some cases, on possible over-ambition in the number of Masters and PhD students to be

trained and supervised. There does not appear to have been consistent and systematic follow-up on these issues by the ISP.

The ISP's contribution to the development of research capacity is seen very clearly in its facilitation of international exposure, via funding for sandwich training and fellowships in overseas universities, as well as through lectures from visiting academics and participation in international conferences. Sandwich training and fellowships have not only enabled students to carry out their research in well-equipped and well-resourced facilities, but these opportunities were also valued by one RG leader because they lessen a sense of isolation and discourage 'in-breeding' in terms of ideas and approaches to problem-solving. Interviewees who had spent at least part of their PhD training abroad felt strongly that they had benefited from having to present their work to a range of researchers who offered critiques from new and less familiar perspectives. They felt that their dissertations and their confidence to defend their dissertations were strengthened as a result. One PhD graduate noted that before this exposure his work had been rather narrowly academic and that comments and criticisms from researchers from different backgrounds encouraged him to focus his research more on real world issues. He has taken this orientation into his current role as a senior university administrator.

ISP has played a pivotal role in encouraging RGs to participate in international networks. As a result of contacts made initially by the ISP, the mathematics RG is working on proposals for joint initiatives with the universities of Makerere, Dar es Salaam and Rwanda, and is planning to sign memoranda of understanding on sharing resources with other East African universities. Teaching exchanges with universities in the region have also taken place. RGs in chemistry are not strongly represented in formal networks or consortia, but participation in international fora and debates is a strength and, through ISP contacts, one RG member was teaching a course in China at the time of the evaluation. It should be noted that in AAU there is little encouragement towards regional engagements or collaboration. A recent evaluation of the Association of African Universities found that AAU had weak South-South links and was poorly connected to other African universities³⁵. Ethiopia has also not engaged significantly with the Next Einstein Initiative, even though the RG leader for IPICS ETH:02 was an ambassador for Ethiopia at a Next Einstein Forum in 2016.

Where increased capacity to conduct research is understood in terms of generating a cadre of Masters and PhD graduates for the new universities, then the ISP's support to RGs at AAU has made a measurable contribution. Of 20 PhDs tracked by the ISP who graduated from ISP-supported RGs between 2014 and 2016, 12 are working in one of the new universities while seven are teaching a new generation of

³⁵ Adam Pain et al, 2018, 'Evaluation of AAU core programmes and projects 2013-2017, with a particular focus on Sida's institutional and programme support 2013-2017. Final Report'. NIRAS Sweden AB.

undergraduates and postgraduates at AAU. (One had been appointed to a position in local government). Of 29 Masters Graduates tracked by ISP who graduated over the same period, all but two were in Ethiopia either teaching in a regional university or in schools or, in one case, working in a community pharmacy.

Effects on research leadership

The nature and quality of leadership in the Ethiopian RGs is influenced by the level of development of each RG and by the research environment at AAU. While several of the Ethiopian RGs are of relatively long-standing, their focus on training successive generations of young postgraduates means that in some respects they are always being newly formed. This factor, taken together with the rather difficult operating environment at the university, particularly for researchers carrying out experimental work, means that much of a RG leader's time is taken up with ensuring that postgraduate students have the resources, exposure to ideas and close follow-up that they need to complete their studies to a satisfactory standard and on time. While the ISP does not have an explicit objective concerned with nurturing research leadership skills – and its effects on the development of leadership cannot easily be measured – in the Ethiopian context it can nevertheless be seen to make a contribution towards effective leadership through its provision of equipment, materials and student stipends and through its facilitation of overseas supervision and fellowships³⁶.

A further dimension of leadership is the extent to which RG leaders have a view of the future and a vision for where the group is heading. The evaluation found that this varied significantly between RGs, with only a few being able to clearly articulate at what point they felt that the group would have matured sufficiently to be fully independent of the ISP's support. Because of factors related mainly to external conditions, most RG leaders had difficulty in envisaging how they would manage to continue their research activities without funding from ISP. Those who had a clearer view of when full capacity would have been achieved mainly expressed this in terms of having sufficient numbers of qualified staff to fulfil teaching and supervision requirements independent of external support.

Impact

As indicated, several RGs have a focus on research topics that are relevant to addressing current development challenges in Ethiopia and in the context of Ethiopia's GTP. These include solar energy, research into the properties of plants used in traditional medicine, measuring risks from seismic activity and finding new ways of treating industrial and other pollutants. Associated with this, applications for

³⁶ Of the 21 PhD students who graduated between 2014 and 2016, seven completed their studies in 4.5 years, 12 in 5.5 years and two in 6.5 years.

funding have often included plans for outreach activities to public and private sectors, and in their comments Reference Groups have encouraged such initiatives.

The extent to which plans for outreach have been followed through in practice has been variable. There has been significant dissemination and application of the data from the more extensive seismic network made possible through ISP funding (IPPS ETH:02). For example, the data indicated that to secure the safety of downstream communities the water level in the Great Ethiopian Renaissance Dam needed to be lowered³⁷. The data also contributed to the formulation of a new National Building Code that is in line with European construction standards. The availability of more extensive geographic and time-based data enabled the drafting committee to stipulate that the strength of new buildings should be doubled and that some towns should be moved from lower to higher risk categories. The RG working on pollutants (IPICS ETH:04) contributed to a national committee on major chemical pollution (e.g. pesticide residues and hazardous wastes from industry) and to a training programme for farmers and agricultural development agents that resulted from the committee's deliberations. In chemistry and mathematics there has been some dissemination to the public via television programmes.

In Ethiopia, there appear to be structural barriers to the uptake of research results that have potential industrial and commercial applications. One factor is that government and academia in Ethiopia appear to function within quite discrete spheres with little or no engagement or interaction between them. Although the GTP and other official policies and strategies recognise that science has a crucial role to play in driving national development, the perception of RG leaders is that government interest in their work is intermittent at best. Having said that, the evaluation also found little evidence of RGs proactively making efforts to bring their work to the attention of relevant authorities. One notable exception is a PhD graduate in mathematics who is planning a conference that for the first time in Ethiopia will bring together private sector representatives and academic mathematicians to discuss the importance of mathematics in the economic sphere. This is an initiative that he brought back from an ISP-funded fellowship at a German university which has strong links between industry, the private sector and the department of mathematics.

Gender

Disaggregated data on gender representation in the basic sciences at AAU are not available but ISP data for 2014-2016 for RGs and SNs in Africa as a whole show that women were 33 percent, 28 percent and 29 percent of PhDs and 21 percent, 17 percent and 20 percent of Masters students. As gender inequality is identified as a

³⁷ The GERD is being constructed on the Blue Nile to generate hydro-electricity for Ethiopia. It is the biggest hydro-electric facility in Africa.

critical national issue in all sectors in Ethiopia, it can be assumed that the representation of women in the basic sciences is at least as low as these figures. As noted, Reference Group comments on applications regularly refer to this poor gender balance. Male RG leaders tend to explain this as being due to cultural factors, which deter girls and young women from pursuing science. The one female RG leader (IPICS ETH:02) agrees that culture has a role in deterring young women from science but feels that it can be over-stated. Her RG has more female than male MSc students which she attributes to a succession of supportive male senior staff and to the fact that, as a woman, it is easier for her than for her male colleagues to approach female undergraduates to suggest that they join her department.

Some RGs have taken actions to address the shortfall in female students, although the results of their efforts are undocumented. In 2014 and 2015, a physics group (IPPS ETH:01) ran summer schools for high school students, targeting girls, to give them experience of experimental lab work. The mathematics group noted in 2013 that the AAU's gender policy – specifically scholarships for females – had contributed to an increase in the number of women Masters' students. More recently, the mathematics group has won a 3 year gender equity grant from ISP for a series of affirmative actions including tutoring for female undergraduates from female PhD students and staff members; providing additional finance resources for female undergraduates and postgraduates, and forming female mathematics clubs. The activities will begin in 2018.

Sustainability

The available financial data indicate that support from ISP represents between 62 percent (IPPS ETH:01) and 85 percent (IPPS ETH:02) of total funding to each RG. Despite the encouragement from Reference Groups for RGs to diversify their funding sources, the evaluation did not find evidence that RGs had been successful in securing alternative funding. Each RG leader cited approaches that had been made to other donors and foundations, including through consortia that they had joined in order to apply for grants, but on the whole their applications had been unsuccessful. Where grants had been awarded they were for relatively small amounts. In a competitive funding environment, most RG leaders seemed discouraged and pessimistic about the chance of success and they considered that it would have a significant negative impact on their research activities and on the level of support that they were able to provide for postgraduates if they were reliant only on support from AAU.

THE ROYAL UNIVERSITY OF PHNOM PENH, CAMBODIA CASE STUDY

Context

The violence of the Khmer Rouge regime between 1975 and 1979 and the subsequent Cambodian – Vietnamese war 1979-91 had devastating effects on Cambodia's economy and society and left it deeply impoverished. However since the turn of the century there has been a strong recovery. The economy grew by 7.8 percent on average per year during 2004-2014 and an estimated 7.0 percent in 2015, ranking it among the 15 fastest growing economies in the world. GDP per capita has increased more than fourfold over the twenty years since Cambodia emerged from conflict, from US\$253 in 1993 to around US\$1,090 in 2014. An initial peace and stability dividend and Cambodia's opening up to trade have been seen to be the key drivers of the rapid growth. From the early 2000's, policies were enacted for an export-led economy, particularly for garments/ manufacture, tourism, and agriculture.

Poverty rates have declined rapidly, although most formerly poor people remain not far above the poverty line. In 2004, 52 percent of the population, an estimated 6.6 million people, lived below the national poverty line. By 2012, only 17 percent of the population, or an estimated 2.6 million people, were below the national poverty line of US\$1.25 per day. The economic growth has been relatively pro-poor. Consumption for the bottom 40 percent of the population grew at an annualized rate of 5.9 percent for the period between 2008 and 2012, compared to a 4.9 percent growth for the total population. The Gini coefficient fell from 32 to 28 during the same period. However, most households that escaped poverty are vulnerable to falling back into poverty. In 2012, it was estimated that a small shock of US\$0.35 per day would cause the national poverty rate to double.

Under Cambodia's Constitution, "men and women have equal rights in participation in political, economic, social and cultural life; equality in marriage and family; and employment and equal pay for the same work". Women dominate the labour force in some key sectors of the economy, accounting for 85 percent in the garment industry and 75 percent in agriculture. However, the gender wage gap remains substantial, with women earning around 30 percent less for the same work than men. Fewer than 18 percent of ministerial and secretary of state positions in all government ministries are held by women. At the commune level, women hold fewer than 18 percent of commune councillor positions. The gender gap has closed for primary and secondary education, but remains for higher education. Cambodia's latest National Gender Strategy (2014-2018) identifies several key priorities including gender and health, women's economic empowerment, leadership and decision-making.

The factors that have driven growth and poverty reduction in the past are unlikely to support it in the future. The agreement with the European Union that facilitated the development of an export-oriented garment industry is facing new competitors e.g.

Myanmar; new regional trade agreements (e.g., the Trans-Pacific Partnership); and increasing domestic wage pressures are emerging. Further trade and income growth and poverty reduction will increasingly depend on strengthened competitiveness and diversification of exports, which in turn will depend on investments in a better trained and skilled workforce, and in energy and infrastructure. The agriculture sector, which has been a key contributor to poverty reduction, is likely to face new challenges to sustain productivity growth, having so far relied largely on the expansion of cultivated areas, a process that has now reached physical and environmental limits.

The Khmer Rouge forced the cessation of formal education in Cambodia and the Phnom Penh University was close. They targeted the educated, and many school teachers and University's faculty members were killed. In the 1980s the university began to reopen focusing mainly on training teachers. It was formally established as the Royal University of Phnom Penh (RUPP) in 1996 with four faculties one of which is the Faculty of Science. According to one ranking system³⁸ RUPP is the top ranking university in Cambodia and occupies the 2241 rank in a listing of 12823 Asian Universities. The University at present faces many structural challenges, including a lack of autonomy, no established academic career framework (e.g. no professorial positions) and a minimal salary level that can only be supplemented with additional teaching. Research time is not funded.

According to the Education Strategic Plan 2014-2018 of Ministry of Education, Youth and Sport (MoEYS), the Royal Government of Cambodia has the ambition to transform Cambodia to an upper-middle income country by 2030 and a developed country by 2050. In order to achieve this vision, the Royal Government intends to focus on human resource development to ensure competitiveness in an increasingly open regional labor market through many activities, including strengthening the quality of education and promoting scientific research, technology development and innovation. According to the RUPP's strategic plan 2014-2018, under the framework of the Law on Education, the Policy on Higher Education Vision 2030, and the Education Strategic Plan 2014-2018, RUPP aims to transform RUPP to become Cambodia's flagship university in teaching, research and community services.

Overview

Support by ISP to three Research Groups (RG) and one network at the Royal University of Phnom Penh (RUPP) has been built up in stages starting from initial connections in 2007 with the Physics Department, expanding to Chemistry in 2010 and then to Mathematics in 2011. During the period under review (2014-2018) the ISP supported 3 RGs, although the mathematics RG converted to a regional network

³⁸ <http://www.webometrics.info/en/Asia/Cambodia%20>

after two years. However with the impending start of a pilot phase of a Sida bilateral research cooperation with RUPP in late 2018, ISP will cease support to the RGs in Physics and Chemistry although the Mathematics network will continue. ISP will then move to the role of coordinating the bilateral programme which will change its formal relationship with the RUPP RGs although new forms of partnership may emerge. This time bound partnership of about a decade between ISP and the RUPP RGs contrasts strongly with its longer term relationship with Ethiopia and Bangladesh for example. In addition to the new Sida bilateral cooperation with RUPP, an agreement with the World Bank to provide a loan of US\$70 million over a six year period to the MoEYS for a STEM project (Science, Technology, Engineering and Mathematics), from which RUPP will receive some \$22 million will greatly increase the funding for support to capacity development to sciences at RUPP.

CHEMISTRY

IPICS CAB:01: This RG is concerned with environmental chemistry and the analysis of pollutants (pesticide residues, trace metals, heavy metals) in crops, fish and the natural environment. The ISP first funded this RG in 2010, with a research grant for the period 2011-2013. IPICS CAB:01 made two applications covering the period under review, for the periods 2014-2016 and 2017-2019. Given the capacities at which the RG started a key aim of the support has been to build research capabilities through supporting training at PhD level (in Brunei, Sweden and France), equipment provision and maintenance, chemical supplies, and support for the MSc programme in teaching and supervision of research projects. It should be noted that the Masters programme has been a part time course that runs over two years, designed specifically to upgrade High School teachers and taught only at weekends. A sixth batch of students started in 2017 and about 50 have graduated out of the programme since 2014. The department has lost a number of its PhD qualified staff to employment elsewhere and the lead researcher for the first two grant applications withdrew from research activities. The lead researcher for the third grant (2017-2019) is essentially working on her own. The third grant application was favourably reviewed by the reference group which suggested improving the sampling framework in the research, improving collaboration, research planning and a greater involvement of the masters in the research. However because of the Sida bilateral funding, further support will not be provided by ISP beyond the end of 2018.

MATHEMATICS

IPMS CAMB:01: ISP contacts with the Department of Mathematics started in 2011 and a first grant for a RG was awarded for the period 2012-2014. There was an existing taught Masters programme supported by the French through the International Centre for Pure and Applied Mathematics which had started in 2007. Although it was planned that under the research grant 2 PhD students would register in Sweden under a Sandwich programme this did not happen. For various reasons and through learning of the ISP Mathematics networks in Africa, the RUPP RG in Mathematics decided

they would prefer to establish a research network instead and focus on teaching and training of PhDs instead. ISP approved the formation of SEAMan (The South East Asian Mathematics Network) in 2014 for the period 2015-2017. Formed in partnership with the National University of Laos and the University of Myanmar the network focused on PhD training, Masters training and scientific exchange. The French supported masters ended in 2015, in part because there was not a sufficient supply of masters' students but also because the department could only provide limited teaching inputs into it. The Department started its own part time masters for High School teachers, which like the Chemistry one, was taught part time at weekends over 2 years. A new funding round for SEAMan was approved for the period 2018-2020 and will continue once the Sida bilateral funding starts.

PHYSICS

IPPS CAM:01: This was the first RG established by ISP in Cambodia, initiating the ISP country programme. It arose because ISP was working in the surrounding countries and the then head of ISP, a physicist, came on an exploratory visit to the country. This led in 2007 to a meeting with the now head of the group and an initiation of a master's programme for high school teachers (a weekend masters) with external professors sourced by ISP from Germany, Sweden and India coming in to teach and help establish the programme. With funding for equipment and two staff members funded for a sandwich PhD at Linköping the foundations for the RG were laid. The RG has been through three funding rounds (2010-2012, 2013-2015 and 2016-2018) and no further round is planned as the Sida bilateral funding comes on stream. They are now in their 8th batch of masters student and with the start of the Sida bilateral programme are planning to start a full time masters programme with clear selection criteria. Some 60 students have graduated out of a total of about 90 who have registered for the course since it started. The group now has three completed PhDs (one woman trained in Japan), three are nearing completion for their PhDs in Korea and Thailand and there are four others in the pipeline and they are now heading towards 10 PhD qualified staff. They hope in 2020 to start a PhD programme with five students. The group researches in the area of nanomaterials, which is linked to the development of sensors for chemicals in food, for use in LEDS and of potential application to medicine as well. The Head of the group has been a prolific publisher of papers since his PhD studies, often publishing with his main Swedish supervisor. As noted in Annex 5, this group is the third ranking in terms of publications volume of all the RGs and SNs supported.

Assessment

Relevance

Alignment with Swedish policies

Given the starting level of research capacity of ISP's Cambodian partners, the support provided by ISP is clearly closely aligned with the two successive Swedish policies for research in development cooperation. Indeed as was made clear by the First Secretary of the Swedish Embassy the contribution that ISP made to building research capacity in the basic sciences provided the foundations on which the forthcoming Sida bilateral research partnership is being established. This bilateral programme will take over support to the three basic sciences that the ISP programme has supported and in addition will provide support to biology and computing. This sequencing of a move from ISP support to basic capacity focused on individuals to bilateral support addressing institutional capacity is a synergy did not occur between ISP and Sida's bilateral programme in Ethiopia and Uganda but had occurred earlier in two cases in Sri Lanka³⁹. It may also create a new role for ISP in the future in relation to the bilateral programme.

Relevance to scientific capacity development

There was no systematic and documented assessment of the existing research capacities at either a departmental or institutional level at the start of any of the RGs. However there was a period of prefunding of activities before any of the RGs were invited to apply for research grants. These activities provided basic equipment, support to master's programmes and funded external support. The gradual build-up of support can be seen to reflect an understanding of existing capacities and have been clearly very relevant to developing these. The support for PhD training and the provision and maintenance of equipment and supplies has helped start and develop research activities. By fostering collaboration through ISP's regional and wider networks, Cambodian scientists have benefited from experience of broader research networks. They have seen this as highly relevant. The head of physics made the following comment:

'ISP has not just been money, but also access to networks; they linked us to partners in Sweden, in Thailand, let us learn from Africa; they linked us to a University in India, they sent a professor to train us, help establish a lab, they contribute to the masters programme, we used ISP to provide an air fare and accommodation for a retired English professor in Germany and in turn he brought a second professor to contribute'

³⁹ ISP, date, The International Science Programme in Sri Lanka and Thailand: Three Decades of research cooperation.

The IPMS CAMB:01 also stressed the importance of having regional level connections and the role of networks in this. They particularly valued the networks with professors in Sweden because they saw these individuals as being world class and willing to support them for the good of education. Their comment was that they did not get world class mathematicians in the region.

Relevance to national development

At the start of ISP's support to the Cambodian RGs there was little evidence of a policy environment that was either supportive of research or saw a role for research in addressing national development problems. The university environment was heavily oriented towards teaching. The early research grant applications focused on building basic capacities to teach masters, equip laboratories and provide support to PhD training and this has remained an important component of all the RGs. However over time the research component has become stronger with IPPS CAM:01 identifying its interest and developing expertise in nanophysics and IPICS CAB:01 in environmental chemistry. The focus areas in the latter have been on quality and safety standards in agricultural products, monitoring of pesticide levels in the environments and monitoring pollutants in environments. The leader of the IPPS CAM:01 was very clear that there was a strong justification for developing these capacities in Cambodia in order to address and solve local problems. A similar view was expressed by the lead researcher in the chemistry group. Individual researchers very clearly had a wish to address Cambodia's development challenges through science. The research leader in Chemistry made clear that her interest and commitment to research in environmental chemistry was to address chemistry issues that were in the public interest. A second female researcher in chemistry who is hoping to do a PhD under the Sida bilateral programme identified her research interest in pesticides as being for the benefit of farmers.

More recently government policy reflecting Cambodia's transition to a low middle income country have been concerned with developing policies to bring Cambodia to higher middle income status. Science and technology development is increasingly being advocated as the means by which this will happen. For the first time research funding has been given by the Ministry of Education to RUPP and while modest, this has been seen as a sign of changes to come. At a forum held in March 2018 at the Cambodian Development Resource Institute on 'Science and Technology for Industrialisation, Economic Growth and Development in Cambodia' the Prime Minister openly spoke about the need to support research for Cambodia's future. The head of physics is planning a workshop on how to use physics knowledge where he will bring in industry for the discussion and this will be supported by the ISP.

With respect to IPMS CAMB:01 they have identified three areas of research, pure, applied and statistics in which they feel the group should develop skills. They suggested that there were many applications for mathematics in these areas in the private sector.

In sum ISP's support can be seen to have been highly relevant to national development objectives as they have materialised.

Effectiveness

Contribution to facilities and resources

For both IPPS CAM: 01 and IPICS CAB:01 equipment provision has been central to the establishment of research facilities both to support a degree of experimental work in the taught masters programmes but also to start research activities. In both the physics and chemistry RGs it was clear that ISP played an important role in helping to select equipment and prioritise equipment needs so that facilities were progressively built up. The ISP procured the equipment for them which would have been extremely difficult to do through the University system. However both groups appear to have been supplied with some equipment, in one or two cases funded from the University but also from other partners. In the case of IPICS CAB:01 there has been modest but long term funding from a Korean university that has enabled them to buy computer and other laboratory equipment.

For both groups however the key issues is that of equipment maintenance and both saw that ISP support was essential to keeping equipment going. The University policy at present does not allow for laboratory technician posts and funding for equipment maintenance is minimal. A key support that has been provided by ISP in the maintenance of instrumentation, particularly the atomic absorption spectrophotometer and ISP has funded an expert to come on a regular basis to maintain them. A tour of the Chemistry laboratory indicated that there were a number of items of equipment that had not been funded through ISP that were not in working order.

Effects on research capacity

The three RUPP ISP groups all pointed to the contribution that ISP had made to provide funding for PhDs, either in full for a sandwich PhD in Sweden or partial support for other PhDs taken within Asia or elsewhere. They also talked in terms of the increase in the number of PhDs in their various groups since the start of the ISP support. In the case of IPPS CAM:01 most of these have stayed but in the case of Chemistry and Maths some of the returning PhDs have moved out. They also noted the contribution that ISP funding and support had made to their various masters programmes.

The research grant application process has also had its effects as described by the leader of the Physics group:

ISP opened my mind through its systematic support. It started small, gradually build up research capacity; we had to submit a proposal and were called to defend it ...sometimes in Sweden, sometimes in Asia. In the meeting there was a reference group, and some researchers. We normally had to revise, provide more details in the proposal, they always wanted more details, how will it be implemented, we need more

information on this. It has been a very useful process, supportive, encouraging, helping us to see how to make things happen in a good way, ISP always tried to support, we could keep in mind they are with us all the time; we faced a lot of difficulties in implementing, we needed their commitment.

Increased numbers of qualified staff was part of the account but as the both the head of the physics RG and the IPMS CAMB:01 noted in a joint discussion, capacity development had not just been about upgrading human resources or research facilities. They felt that they had gained sufficient confidence to start a proper masters programme and they are envisaging that they will shortly develop their own PhD programme.

Indeed the head of Physics when asked the question about when they felt they would have sufficient research capacity was very clear that they saw the building of sufficient human resources as only the first step. He reported that they had a target in the science faculty of 10 PhD holders for each department with each department running a research masters and having their own PhD programme. There would also be three priority research areas within each department. Achieving 10 PhD holders in each department he saw as a first generation of research capacity development and noted that currently the Maths group only had 1 PhD in each research area and this in his view did not constitute a research group. He then went on to suggest that there were second generation capacity issues. It was not just a matter of having new PhDs but they needed a mentoring programme for PhD holders to supervise.

In conclusion across the three RG/SNs it was clear that all felt that the ISP has made a significant contribution to the development of their research capacity but that there was still further capacity development needed.

Effects on research leadership

There had been no specific ISP activity to build research leadership as such and it is not an area that falls within ISP monitoring framework. Yet there are a number of ways in which the ISP support appears to have contributed towards building research leadership.

For some it was the PhD experience itself. A member of IPMS CAMB:01 who has just started on a sandwich PhD course in Sweden made the comparison between doing his masters in the US and in so doing identifying the issues of what needed to be developed in their department which could be seen as a sign of emergent leadership:

‘from my experience of my Masters in the US, I noted the different style of teaching, if I had questions I could ask, there were clear grading systems and good professor; from what I have experienced from six months in Sweden I think it is much more flexible than the US; in Sweden there is a lot of talking about research, we have to read and have to make presentations and strong processes of collaboration; they

have groups, they share but also have a lot of responsibility; the question is how to build a research culture of this type in RUPP; we lack this culture of debate, having monthly workshops, clear time planning etc.;

Similarly both the first two sandwich PhD students from the Physics group commented on how their time at Linköping University had taught them what made a good research environment – the need for well-structured systems, systematic organisation, resources, open discussion, working with students and a collegiate system.

The effects of this experience has supported one of these students to move into a leadership position in the faculty where he is now vice dean and many of his ambitions for the faculty reflect the lessons he has drawn from his training but also, he noted, subsequent support from ISP.

ISP did not just ask the question, they helped us put things in place. For example they funded an external audit on the programme in 2013 and then 2015. They found room for improvement on financial management, on the procurement process, we have been working on procedures (financial, tors), we have had financial trainings, we have developed operational manuals. Sida gave us a small grant to implement the manual. They have helped us in a good way, they have really encouraged, been supportive, seen the way forward for us... Other funders are short term, they think about impact, not about sustainability, sometimes we feel used.

The University has many partners, the World Bank now will bring 23 USD M for 6 years; the way it is to be utilised is still under debate, we need to build up several documents, we need policies, we need to build up monitoring and evaluation systems, we need to report to government; it will be the first grant to university and there will be more if we make progress. We have learnt from ISP in doing this; learnt about processes of management, building up a team, the right research team. The experience from ISP helped us put the processes together and given us the knowledge.

Impact

Given the level from which research capacity development started and the relatively short time since this happened, in many respects it is premature to expect impacts from the research that has been supported in the three RGs/SNs in Cambodia. Research activities are relatively recent and a policy environment to support the use of findings limited. While baseline data on pollutants is gradually being built up, for example, and while chemical pollution is a major development challenge, it is also a challenging areas in terms of policy since a number of key power holders have interests in industries which are major polluters. Impacts will depend on wider changes in society.

Gender

The number of women at the undergraduate level in the sciences is marginally lower than those of men overall although the current final years in physics has more women than men. At the masters level the proportion of women is significantly lower. Part of the explanation however lies in the nature of the Masters courses. These are part time masters stretched over a minimum of two years with teaching at the weekends and they are specifically designed to upgrade high school science teachers. However many of these teachers travel in from the provinces every weekend and both the timing of the courses and travel distance and time, imposes a considerable barrier for women's enrolment. In addition, and there is a wider literature on the position of women in Cambodia that speaks to this claim, and it was a point reiterated in the interviews, Cambodia's cultural norms are a significant constraint for women. Both spoken and unspoken rules regarding a woman's place in the social structure of Cambodia are fairly fixed, they are considered to be under the protection of their husbands or families, and are expected to defer to the wishes and judgments of the men in the household, limiting their mobility. The pool of women from which sciences at the PhD level can draw is therefore quite limited. That said no programmes that have specifically targeted the recruitment of women were reported to have been implemented under ISP in Cambodia.

Sustainability

ISP funding for the RGs will end with the start of the Sida bilateral programme towards the end of 2018. This is a synergy that we have not observed elsewhere in the ISP supported activities. In addition major funding will come from the World Bank STEM project. This has in ISP terms been a relatively short period of support in comparison with its other country programmes. On the one hand as suggested by the First Secretary at the Swedish Embassy in Phnom Penh the ISP support has laid the foundation for the bilateral programme and without those inputs a bilateral programme would not have been possible. The ISP supported science activities have guaranteed funding for the medium term and in that sense have a relatively secure future and can build on what ISP has contributed. However there are formidable challenges ahead in terms of building an institutional environment that will allow the expression of individual research capabilities. At one level therefore ISP has laid the groundwork, operating within its mandate. It has been fortunate, and it cannot be said to have entirely happened by design that new funding has come on board allowing the ISP to withdraw. It is early days to say whether or not the research capacities that ISP has contributed to building will be sustainable.

Annex 4 – Secondary case studies: Bangladesh, Burkina Faso and Uganda

INTRODUCTION

The evaluation team conducted three shorter case studies of ISP grantees in Bangladesh, Burkina Faso and Uganda. The purpose of these remote studies was to gather evidence of the experiences of grantees in these countries of engaging with ISP and of the results of that engagement.

The analysis is based on an analysis of selected documents for each of the grantees, namely annual activity reports, grant application documents, and application review reports; and on telephone interviews with the group and network coordinators. These interviews were conducted between 18 April and 3 May 2018, and involved a discussion of the following five questions:

1. What capacities have been developed in the group/network over the period of ISP funding?
2. What mentoring support (or comparable) has been provided by ISP in that period?
3. What have been the key areas of support from ISP, and how does this compare with the support provided by other funders (if any)?
4. Who have been the main collaborators with the group/network, and what role have they played in its development?
5. How do you see the future of the group/network (e.g. scientific content, funding, personnel, etc.), and what expectations do you have relative to future ISP support?

This document presents first a synthesis of the findings of this analysis, followed by a summary of the analysis for each of the groups and networks included in the study.

SYNTHESIS OF KEY POINTS

1. Documentation used for the analysis

The assessment reports produced during the review of grant applications are of very variable quality. Some are very complete and detailed, whereas others barely have any text. Moreover, there were a number of cases where one evaluator gave high/very

high marks, whereas the other one gave low ones. While we acknowledge that differences in how reviewers perceive the value of applications can be justified and even desirable, we wonder whether very different marking of criteria that are relatively objective might suggest that reviewers are not following a common assessment grid in an entirely consistent manner.

We also found differences in the quality of the annual narrative reports and grant application documents submitted by grantees, something that we understand ISP is well aware of.

2. *Financial dependency on ISP*

The majority of the grantees included in this analysis depends heavily on ISP funding; based on the figures for 2014-2016 made available by ISP, only a few report less than 80% average dependency on ISP for their budget, and several report above 90% and up to 100%. ISP therefore remains essential to the very survival of several of the groups. We could not see any distinction between older/more established groups and networks, and newer ones in terms of this financial dependency – which suggests that the length of the ISP support is not a factor affecting the ability of grantees to attract other sources of funding.

We did observe a slight geographical variation though, with grantees from Burkina Faso reporting slightly lower average financial dependency rates than groups in Bangladesh, and lower than grantees in Uganda. In this comparison, grantees in Burkina Faso seem to be able to benefit from donors and collaborations in French-speaking countries (especially France and Belgium), which are not accessible to grantees in the two other countries to the same extent.

3. *ISP contribution to capacity development*

All grantees acknowledge that ISP support has been and remains key to their operations and to improving the quality of their scientific work. In some cases that support was essential to the very establishment of the group or network, and in those cases where financial dependency is higher, also to their survival. The three areas of capacity where ISP support has made the greatest contribution include:

- equipping research facilities, which has been essential for some groups and networks to start doing any research work on their own, and in other cases to advance to more complex analyses.
- developing human resources, primarily through financial support to graduate students (both full and short-term scholarships) and senior staff.
- promoting and facilitating scientific cooperation, at the national, regional and international level, mainly through the following mechanisms: support to scientific networks (in some cases established with the support of ISP), support to student and staff mobility, support to the acquisition of equipment

that is shared by different groups, and support to scientific meetings and workshops.

Several interviewees acknowledged that the ISP support was essential for them to acquire a minimum level of capacity that made it possible for them to attract funding from other sources.

4. Mentoring and other types of advisory support

The extent to which ISP provides mentoring or other types of advisory support varies significantly. Some groups receive close to nothing, others have more regular contact and some even benefit from support for improving the grant applications. Those with closer ties/collaborations with Swedish research groups seem to enjoy more proximity, which could in part be due to the regular exchange visits. Those that do not get much mentoring support did not express any discontent with the situation; they tended to observe that ISP is available should they have any particular request, but that generally they can cater to their own needs.

Those that have received mentoring/advisory support from ISP mention that it has been particularly useful for establishing collaborations with other groups (i.e. ISP suggests collaborations that the grantee might not have thought of, and facilitates initial contacts) and in some cases for adjusting the content and direction of the research. It seems that this latter aspect comes hand in hand with decisions on the size and application of the ISP grants, i.e. ISP reviews the research plan (and the way the grant is spent) jointly with the grantee to make sure that money is spent wisely and coherently (e.g. not spreading the grant between four research projects, but instead concentrating it on one single project – which has consequences for equipment purchases, graduate training plans, research exchanges, etc.).

One area where about one fifth of the interviewees expressed a desire for more support from ISP is the drafting and submission of proposals for larger international competitive grants, which they claimed they lack experience in.

5. Comparative advantages of ISP relative to other funders

Those groups that have other funders than ISP praise ISP fundamentally for two aspects

- the length of the funding; while three years might not sound like much in other contexts, it is much more than most other funders, that typically award one-year grants. One interviewee remarked in this regard that three years is sufficient to see the results of the support, which is seldom the case with one- or two-year grants.
- ISP grants have 'less strings attached', i.e. they are more flexible and can be used to cover a wider variety of expenses. In this regard they resemble core funding to the groups and networks. Some of the networks interviewed noted

in this regard that ISP is the only source providing funding to regional activities – i.e. countries in the network fund their own groups, but only ISP funds the regional elements (e.g. regional training, regional meetings, harmonisation efforts etc.).

All interviewees expressed great satisfaction with how the grants are administered. Keeping with the Swedish ‘hands-off’ aid style, ISP was praised for giving grantees sufficient freedom for how to use the grants – provided they keep to the agreed plan and report on what the money was used for. All interviewees praised the closeness and ease of contact with ISP, and no one expressed any discontent or discomfort with the grant submission and assessment process.⁴⁰ Some interviewees observed that the application review process is a very constructive process, in which ISP engages in a dialogue with applicants with the aim of improving the proposal in a way that is satisfactory to both parts. Others compared the ISP grant review process to other review processes, where dialogue with the review panel did not occupy any prominent role.

6. *Collaborations and their importance*

Most of the grantees included in this analysis have collaborations with other research groups, both bilaterally or through formal networks. It seems that the more established groups have wider networks than the newer ones. Not all grantees have collaborations with ‘Northern’ partners, including in Sweden. In this regard, some grantees in Burkina Faso were particularly appreciative of the fact that ISP supports collaborations with European partners outside Sweden, which for them is an advantage because of greater ease with the French than with the English language. It was observed that donors seldom support cooperation with groups from countries other than the donor’s own.

Collaborations seem to play relatively similar roles for the groups and networks contacted. Most use collaborations for research exchanges, often for sending or receiving graduate students, and less often for exchanges involving more senior staff. Several interviewees observed that such research stays are of great value for graduate students, enabling them to perform work and learn techniques and methods that they would not be able to otherwise. A smaller number use them for organising joint scientific meetings, and an even smaller number for joint research projects. The ability to attract funding for such joint research projects seems to be the limiting factor here, and several grantees admitted that they lacked the capacity to compete for international research grants.

⁴⁰ Important to note in this regard that the analysis did not include unsuccessful applicants, and that these could have a different view on the grant application and review processes.

7. *Future outlook and the role of ISP*

Most groups and networks included in this analysis are rather conservative in what concerns their plans for the future, and do not anticipate any significant shifts in the next 5-10 years. There will be changes in the content and methodologies for research in some of the groups, but none expects a major shifts in how research will be organised or funded.

Networks revealed a desire to continue expanding and serve more members. Groups did not express similar growth plans, but did refer to the need to continue training researchers, in particular at the graduate level. Enhancing support to MSc students was particularly highlighted by a few grantees in all three countries.

Most research groups also see a need to continue investing in facilities and equipment, for new acquisitions, maintenance and upgrades. This is seen as important for the group to develop new research methods and in some cases venture into new areas of research.

Across all grantees interviewed, ISP is seen as an important, if not essential cooperation partner, since it is the main provider of funds for the areas of future development envisioned. This implicit acknowledgement of the continued dependency on ISP support is accompanied by the recognition by most grantees that they need to diversify sources of funding to reduce that very dependency. However, none of the grantees included in the analysis had a clear road map for how to achieve this, ore had agreed on a plan or targets for increasing the proportion of non-ISP funding in the coming years. It therefore seems that the future development of most groups and networks contacted will rely strongly on the volume and type of support provided by ISP.

BANGLADESH

IPICS BAN:04

Studies of Organic Pollutants in Food and the Environment

Overview

The ISP support is provided to the group led by Dr Md Shoeb at the Dep. Chemistry at the University of Dhaka. Support started in 2000 as part of former IPICS BAN:01 (1977-2004; natural products chemistry), and from 2002 support has been provided separately to research on environmental chemistry. It is planned that support will continue until 2023. The group collaborates with the group led by Prof Henrik Kylin at Linköping University (PhD supervisor of current RG lead), and has other collaborations with research groups in Korea, Lao, Cambodia, Bangladesh and UK.

Funding for the period 2014-2016 is summarised in Table 5. Other sources of funding include the Ministry of Education and the Ministry of Science and Technology of Bangladesh, the Bangladesh University Grant Commission, the World Bank (mostly for acquisition of equipment and support one PhD student). No funding has been received from regional sources, but support by the Organisation for the Prohibition of Chemical Weapons has been granted for the acquisition of equipment and consumables.

Table 5 - ISP funding to IPICS BAN:04 2014-2016

	2014	2015	2016
ISP funding (10³ SEK)	400	400	379
ISP funding % of total	43	12	19

The objectives of the support are to strengthen research capacity for the identification and quantification of toxic chemicals in different food items, to produce skilled manpower by giving training to students and young scientists, to disseminate knowledge in conferences and seminars and to publish scientific papers in peer reviewed journals. The focus of the last application (2017) was on chemical contaminants in food, and in aquatic environments.

The group was assessed as very strong in the latest ISP review (2017), and considered the pillar of the regional network ANFEC, as well as a key partner of groups in Bangladesh and the SE Asia region. The group has been able to train and keep a number of MSc and PhD-level researchers, including a significant number of female researchers. The relevance of the group for the region led the ISP reference group in its latest assessment to observe that it should be able to attract substantial co-funding from regional sources.

Assessment

1. Capacities developed

The greatest contribution of ISP to the capacity of the group has been in terms of the human resource base, with a large number of MSc and PhD graduates over the years (*NB: 17 MSc and 1 PhD in the period 2014-2016*).

Secondly, ISP support has been critical for equipping the laboratory; without that equipment the group would not have been able to advance its research. It was noted that the ISP contribution was complementary to the equipment support provided by other funders, but has helped the laboratory become the top one for environmental chemistry in the country.

ISP has also contributed to the group becoming more aware of the importance of gender balance among staff and students. There have been efforts to attract more women – namely by giving preference to women in cases of equal qualifications. (*NB: among staff, the percentage of women has not changed much in the period 2011-2016 though, fluctuating around 20%*).

Finally, the group leader observed that ISP has helped establish several of the regional scientific networks through which the group has developed several of its collaborations.

2. Mentoring and other support

In the views of the group leader, ISP is not only about financial support, but instead also about making good scientific contacts and collaborations, namely in Sweden. These have helped the groups design research questions, identify needs and way forward, and have provided scientific support. Such support has also been given by Peter Sundin and other ISP staff, and the network of researchers linked to ISP. These have all opened doors to exchange and research visits and greatly facilitated the sharing of knowledge.

ISP has also facilitated collaboration with groups in Thailand and South Korea, as well as with the Organisation for the Prohibition of Chemical Weapons, which is now one of the funders of the group.

Finally, the group leader praised the detailed reviews by ISP and evaluators during assessment visits, for their independence and comprehensiveness, and thinks these have contributed to the group improving their work.

3. ISP support vs. other funders

The support by ISP is diversified, covering equipment, training, research exchanges and travel to scientific meetings. This contrasts with the grants received from the Bangladesh government or the Organisation for the Prohibition of Chemical Weapons, which only support the purchase of equipment and consumables. The possibility given by ISP to students to travel abroad for part of their studies is particularly appreciated.

Moreover, ISP provides research advice and other forms of advisory support, which none of the other funders do. By doing so ISP ‘helps the group develop processes’ in a way that is unique among the group’s funders.

ISP has also been more responsive to specific requests by the group – the example was given of getting equipment from Europe, which was perceived as less cumbersome than with other local sources.

4. Collaborations and their importance

The group has collaborations with groups in China, South Korea, Laos and Cambodia, which the group mostly engages with for research exchanges, and especially in the case of Laos and Cambodia, providing training to researchers from those two countries. Through the FAO the group is also providing training more broadly for the entire South and South-East Asia region.

It also has collaborations in the UK and Sweden, and in this latter case the group both receives students from Sweden and send students to Sweden for doing parts of their work, ‘to get exposure to a different working environment’.

5. Future development and role of ISP

Plans for the near future include continuing the existing research activities, and expanding into developing laboratory standards for chemicals in food products. To these ends, there will be a continued need to upgrade and maintain laboratory equipment, for which support by ISP and other funders will be welcome.

With respect to standards for chemicals in food, this builds on the existing collaborations with government, and motivated by the growing attention paid to food safety. The aim is to establish a reference laboratory to assist government and other stakeholders in decision making affecting chemical food safety.

It is anticipated that the group will continue playing an important role with respect to training in the region.

With respect to the support by ISP, the group is planning to apply to EU funds. It is aware that ISP support is scheduled to end in 2023, and is actively looking into alternative sources (*NB: the current level of financially dependency on ISP is relatively low, at 19% in 2016*). The possibility of selling laboratory services is currently being discussed with the University and government. In recent years there has also been growing support to graduate students from other funders, such that ISP funds are mostly used for smaller expenses, and not the bulk of the costs of MSc and PhD studies.

IPICS BAN:05

Studies on Safety, Efficacy and Adverse Health Effects of Herbal Formulations of Bangladesh

Overview

The ISP support started in 2013, to the group led by Dr Rausan Zamir at the Dept. of Natural Science at Daffodil International University in Dhaka. Dr Zamir earned the first PhD in environmental chemistry from Dhaka University through support to RG IPICS BAN:04. The group does not collaborate with any Swedish university, but has several collaborations in Bangladesh, namely with researchers of IPICS BAN:04 and the SN IPICS ANRAP.

The overall objectives of the group are to identify toxic components (heavy metals, pesticides, microbes) in herbal preparations, to identify preservatives in herbal preparations and to study adverse health effect (genotoxicity, oxidative stress, cardiovascular effects) of the effective dose of herbal preparation.

Support to the group had a slow start. The group was invited in 2011 to apply to 1-year pilot support in 2012, but the application was considered weak, such that a reduced pilot grant was provided to start activities. The 2013 application was improved, but weaknesses were detected in terms of the excessively broad scope of the proposal and the vagueness of the results. It was decided to provide one additional year of funding, again at reduced level. The 2014 application was considered scientifically strong, but concerns were raised about the lack of scientific publications and references, and the weak results from the preceding years, as well as the lack of other sources of funding. The group did not receive any additional ISP funding that

year, but was allowed to use unspent ISP funds from the previous application. The latest application, from 2015, received a similar assessment, with criticism directed at the weakness of results from the preceding period, and of outreach activities. The group was then granted funding at reduced level for a 3-year period subject to yearly reassessment, “to keep students and allow for continued development of working collaborations [...], and to prove the value of the development of research direction and ability by securing other funding.” (IPICS Reference Group Assessment of Grant Application in 2015).

Funding for the period 2014-2016 is summarised in Table 6.

Table 6 - ISP funding to IPICS BAN:05 2014-2016. (*) Other funds amounted to SEK 97,000 in 2015.

	2014	2015	2016
ISP funding (10³ SEK)	230	0	100
ISP funding % of total	100	0*	44

Assessment

1. Capacities developed

The main contribution of the ISP support has been at the level of equipping the laboratory, which has enabled the group to initiate the research it is now conducting. The ISP support has also been important for establishing the animal house for animal testing. Training of group staff in operating, maintaining and repairing that equipment has been received from NITUB (see below), which is supported by ISP.

The support to the group facilities and equipment has contributed to the establishment of the group, which has started developing collaborations with Dhaka University, and recently applied for an MSc fellowship at that university.

2. Mentoring and other support

ISP has provided guidance and mentoring on several fronts, which has been especially useful since the group is still developing. ISP, through Peter Sundin, has provided support to the preparation of the project proposal and the planning of the research. According to the group leader, the ISP secretariat visited the country on several occasions prior to the creation of the group to discuss its establishment. ISP has also assisted with establishing collaborations with other groups, namely through a meeting with all Bangladesh groups organised recently.

Finally, mention was made of the fact that ISP conducts regular follow-up of the group's work for increasing gender balance, but it is not clear whether ISP also provides any mentoring or guidance in conjunction with such follow up (*NB: the percentage of women in the group has decreased from 50% to 33% between 2013 and 2016*).

3. ISP support vs. other funders

The core of the ISP support goes to equipment purchases and mobility grants to graduate students for short research stays at advanced research centres abroad.

The group has so far only received non-ISP funding from local sources (in-kind from the host Daffodil Univ). It had applied to the International Foundation for Science and the Japanese cooperation but so far without success. The group leader could not really compare ISP with any other funding sources.

4. *Collaborations and their importance*

IPICS BAN:05 collaborates with different groups in Bangladesh, including at the Atomic Energy Commission, the Bangladesh Univ. of Health Sciences, Univ. of Dhaka, North South Univ., Bangladesh Univ. of Science and Technology and Islamic Univ. These collaborations have been used primarily for exchange visits and collaborative research. Collaborations have been limited by the small number of graduate students, but the group leader is hopeful that this will be improved. The group is currently trying to establish links with Cambridge University, as well as with a group in South Korea, but that depends on the availability of funding to send students there. It is also looking into collaborations with Lund University and Stockholm University, the latter where the group leader conducted part of his PhD studies, and will seek the advice of the reference group on how to develop these collaborations.

5. *Future development and role of ISP*

Because the group is relatively new, the priority for the coming years is to ensure that it is sustained at Daffodil Univ. – this is a private university, and private universities are generally reluctant to invest in research because of its costs. So to maintain the group it will be necessary to secure other funds, in particular to establish an advanced research laboratory. ISP has encouraged the group to apply to other funding, but has so far provided little guidance on finding and attracting funding from other sources. There is also the intention of seeking funds from industry, in part by providing analytical services to producers of herbal medicines. Discussions have been held with industry but are still at an early stage.

In terms of collaborations, the group is trying to establish links with groups abroad where graduate students could conduct part of their work, as described above (4.). Finally, with respect to human resources development, the group intends to apply for its first PhD student at a public university (probably Dhaka Univ.), since Daffodil does not yet grant graduate degrees.

IPICS ANRAP

Asian Network of Research on Antidiabetic Plants

Overview

The ISP support to ANRAP started in 1994, the year that the network was established. The network was established on the initiative of groups in south and southeast Asia doing research on antidiabetic plants after a series of international seminars between 1992 and 1994. Some of those groups were supported by ISP,

hence ISP was involved in the establishment and support ANRAP from the very beginning. It is hosted by the Bangladesh University of Health Sciences (BUHS) in Dhaka and the current coordinator (Prof Rokeya Begum) is a former ISP fellow. The board of the network is composed of five representatives from member organisations in Bangladesh, India, Malaysia and Pakistan, but the network itself includes members not only from Asia (Bangladesh, Bhutan, India, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka, Thailand), but also Australia, Africa (Cameroon, Ghana, Mauritius), Europe (Croatia, France, Germany, Sweden, Turkey) and USA. The overall purpose of the network is to advance research on antidiabetic herbal medicines, and it does so through the following types of regional collaboration activities:

- organisation and hosting of national, regional and international scientific meetings, seminars and workshops
- exchange visits for network members, as well as external experts to interact with network members
- support to network members to attend relevant international scientific meetings
- hosting a fellowship programme for short collaborative research studies, given to young researchers (MSc and PhD) mostly from Asia, but also from other countries

ISP has also supported the acquisition of research equipment at BUHS, under the premise that it is made available to the network, which has been the case. Publications resulting from research supported by the network are required to acknowledge network support.

Funding for the period 2014-2016 is summarised in Table 7. In-kind support is provided by the organisations in the network, in terms of facilities and equipment for teaching and research. Seminars and conferences are generally also supported financially by different private and public organisations. The network also receives support from Sweden through the International Foundation for Science.

Table 7 - ISP funding to IPICS ANRAP 2014-2016

	2014	2015	2016
ISP funding (10³ SEK)	230	250	284
ISP funding % of total	79	91	94

Assessment

1. Capacities developed

The key contribution has been at the level of the strengthening of human resource capacity, through support to the training of scientists at MSc and PhD level, mostly from countries in the region (Bangladesh, India, Pakistan, Nepal, Mauritius), but also from outside the region. As a result of the support to these fellows, a number of papers have been published, from the work they have carried out. Adopting a broader perspective, the support to graduate students through the network has enabled fellows

to continue their studies and advance their scientific careers in the field of research on antidiabetic plants

The contribution of ISP to the organisation of international conferences in the region (eight so far, every 3rd year), plus national seminars (11 alone in Bangladesh) has been very important to advancing collaborations and knowledge exchange. Seminars held with the support of ISP have also served to produce information materials about the status of research and knowledge, not only for the scientific community, but also for society more broadly.

Finally, the ISP support has enabled a large number of exchange visits, not only within the region, but also beyond, which has contribute to strengthening the network of antidiabetic plants research regionally and globally. Such network has also been useful for technology transfer and pooling of resources between members in the network, using one another's facilities and equipment.

2. *Mentoring and other support*

On the whole there is little if any mentoring or other forms of advisory support from ISP. The application review process does not involve much exchange other than the written reviews by the reference group.

3. *ISP support vs. other funders*

The ISP grant has been used for mobility grants to graduate students, research exchanges involving members within and outside the network, the organisation of international, regional and national scientific meetings, and for acquiring equipment and consumables placed at BUHS for use by the network.

In comparison to the other funds the network receives, the ISP support constitutes a form of core support, which the network decides on how to allocate (within the agreed budget and work plan). ISP is considered a 'generous' donor and is flexible in how the grant is managed, allowing the network to transfer funds between budget posts if relevant for the network and compatible with its overall objectives and work plan. Moreover, ISP has been responsive to extraordinary requests by the network. Other contributors include in-kind support by the network members – for example the animal house provided by BUHS – providing equipment and facilities that can be used by other members.

In addition, the network receives support from companies or public funders for seminars and meetings, but these are limited to the specific events.

4. *Collaborations and their importance*

Collaborations from outside Asia serve primarily as advisors to the network, i.e. they generally do not participate or benefit from network activities.

The network is mostly to serve members in Asia. This membership is broad and diversified, so as to take advantage of different types expertise and knowledge in specific issues relevant for the purpose of the network. The key purpose of collaborations are training, exchange and scientific collaborations, supported by the sharing of facilities and equipment. The network provides fellowship for researchers who do not have the facilities/capacity in their home countries for antidiabetic plants

research. Such fellowships are short-term and mainly for researchers from developing countries, but there have been a few cases of fellows from developed countries (e.g. Mauritius), depending on the theme and the relevance for the network. Host institutions are often in Bangladesh, but can be (and have been) in any other laboratory in the region that is member to the network (e.g. Malaysia).

5. *Future development and role of ISP*

With regards to the fellowship programme provided by the network, the intention is that it could continue and be expanded. This would require continued support from ISP.

With regards to the research, the aim is to broaden the scope beyond antidiabetic plants to also include herbal medicines more generally. ISP has provided support to a first international meeting on this subject in October 2016. In this process the objective is to engage herbal medicine producers in the research, so that they use research results for developing new products, instead of engaging with the network only for the testing of products in the market, as is mostly the case today (such that ANRAP functions somewhat like a testing facility for them).

It is also intended that the network acquires greater capacity to do testing for producers and eventually starts charging for testing services.

In terms of financial support, it is unlikely that the network will manage to reduce its dependency on ISP significantly in the next few years.

IPICS NITUB

Network Of Instrument Technical Personnel And User Scientists Of Bangladesh

Overview

NITUB was established in 1994 mainly by IPICS fellows and IFS grantees with the aim of promoting collaboration and capacity development for improved use, maintenance and repair of scientific equipment. ISP has supported the network since its beginning (formally since 1995). It is hosted by the Dep. of Chemistry at the University of Dhaka, and its current general secretary is Prof Altaf Hussain, a graduate of Stockholm University and former research fellow of Uppsala University, who was the first ISP fellow from Bangladesh in 1973. The network has 203 members.

Funding for the period 2014-2016 is summarised in Table 8. The network also receives financial support from IFS and the Organisation for the Prohibition of Chemical Weapons (OPCW), as well as from Bangladeshi government. NITUB members also pay a small membership fee (BDT 200, approx. USD 2.4 per year), and training fees and service fees are charged to training participants and organisations receiving NITUB services. Because most research organisations in Bangladesh do not have the resources to cover the full cost of equipment servicing, NITUB provides such services at a reduced rate and uses ISP funds to cover the remaining difference.

Table 8 - ISP funding to IPICS NITUB 2014-2016

	2014	2015	2016
ISP funding (10³ SEK)	280	300	284
ISP funding % of total	86	87	68

NITUB carries out the following types of activities: 1) training scientists and technicians on handling, maintenance and repair of different kinds of scientific equipment, both through regional training courses/workshops and tailored training at organisations requesting NITUB's services; 2) providing technical services, including installations and repairs, to education and research organisations in Bangladesh; 3) maintaining a repository of scientific instruments and technical experts in Bangladesh available to conduct training and servicing of scientific equipment; 4) keeping a stock of spare parts for commonly used equipment for speedy repairs; and 5) publishing user manuals on widely used scientific equipment.

NITUB does not have own staff, instead it maintains a pool of trained experts who are engaged on a needs basis.

NITUB differs somewhat from most other organisations receiving ISP support in that it is not engaged in fundamental research itself, but instead provides a set of services to research organisations in Bangladesh. In recent years the network has also engaged with organisations outside the country, namely in Nepal, Myanmar, Cambodia and even Ethiopia.

Assessment

1. Capacities developed

ISP has been instrumental in the establishment of NITUB and in enabling it to train a pool of equipment experts in the country. That pool has expanded significantly with ISP support, but there is still continued support for training more people. That has been the key capacity development made possible by ISP.

Because ISP grants are used to cover part of the costs of the services provided by NITUB – including the acquisition of spares – the network coordinator was also of the view that ISP has contributed to the good status of research equipment in organisations throughout Bangladesh. With NITUB expanding its activities recently to Nepal and Cambodia, it is expected that such benefits will extend to those countries as well.

2. Mentoring and other support

NITUB did receive mentoring and advisory support from ISP in the late 1990s, i.e. the years following its establishment. At that time much of that support was in the form of technical experts sent to Bangladesh to provide training. With the growth of the pool of national experts, such support is no longer necessary, although it is still available if requested by the network.

There is little dialogue with ISP or the reference group about the applications which the network is invited to submit every third year. NITUB receives the feedback in

writing and usually takes it into consideration in implementing the programme of work.

3. *ISP support vs. other funders*

As indicated in the overview above, NITUB receives support from national sources and from the Organisation for the Prohibition of Chemical Weapons. These typically provide support for a given project or programme, and funding is earmarked for a specific set of tasks. In comparison the ISP support resembles core support in that it may be used for a greater variety of purposes, and thereby supports network activities more generally.

4. *Collaborations and their importance*

For every programme brochure is circulate to all public and private universities, who send participants to the trainings, or request equipment services. Hence NITUB does not have a fixed set of collaborators, but instead a variable one that changes every year and is made up of the organisations that NITUB serves

5. *Future development and role of ISP*

The vision for the future is that NITUB will continue providing the same type of training and equipment services to the research community as up to now. In recent years it has engaged with groups in Nepal, Laos and Cambodia, hence part of the aim for the coming years is to strengthen engagements in those countries, especially in terms of training local experts.

In terms of financial sustainability, the long-term aim is to increase the level of the fees collected from training participants and serviced organisations, such that fees cover the full costs of those trainings and services. Training fees currently cover 30-40% of actual training programme costs. However, the context in Bangladesh and other countries in the region is still that most research organisations cannot bear the full costs of equipment maintenance and repair, or of staff training. Support from ISP is therefore likely to remain necessary in the near future; the aim is that it be progressively reduced, though. No targets or deadlines have been set yet.

IPPS BAN:02

Magnetic, Structural and Electrical Properties of Ferrites, Nanocomposite and Perovskite Materials

Overview

The ISP support has been given since 1986 to a group called ‘Dhaka Materials Science Group’, composed by a group at the Dep. of Physics at the Bangladesh University of Engineering and Technology (BUET), headed by Prof Alam Khan and one at the Material Science Division at the Atomic Energy Centre, headed by Dr Manjura Hoque. The group split into BAN:02/1 and BAN:02/2 in 2017, as they were pursuing somewhat distinct research programmes.

Supported started late 1980, two groups then – very close, idea to merge came afterwards, philosophy of ISP: last year also idea of ISP to split, as groups have matured and able to pursue own work, but still maintain informal connection, exchange people and facility.

The research support to BUET targets the synthesis and characterization of bulk and nanostructured spinel and perovskites and study their magnetoresistive, magnetocaloric and multiferroic properties, and to the Atomic Energy Centre the synthesis of nanomedicine and performance study using rodent and cancer cells. It aims to continue training post-graduate students at PhD and MSc levels, both in the previous research programme and the new one initiated with a 2017-2019 grant. The research plan has three components, namely MSc-, MPhil and PhD-oriented research. Women constitute approximately 44% of the graduate students in the group (2016 application), but only 20% of the staff.

Collaborations exist with three groups in India, Vietnam and USA, and the departments of Engineering Physics and Materials Science at Uppsala University. The amount of ISP funding for the period 2014-2016 is given in Table 9. Non-ISP funding has been obtained from the two host institutions – BUET and the Atomic Energy Centre.

Table 9 - ISP funding to IPPS BAN:02 2014-2016

	2014	2015	2016
ISP funding (10³ SEK)	505	500	420
ISP funding % of total	78	86	100

Assessment

1. Capacities developed

ISP has been present since the establishment of the group and has been its main funder, hence ISP can be said to have contributed to all capacities of the group, including staff, facilities and equipment (some of the equipment was purchased with ISP support, other was made at the university workshop). ISP has enabled the group to become a hub for this type of research for the whole of Bangladesh, as well as helped the group establish collaborations through South-South exchanges.

2. Mentoring and other support

ISP provides advice on how to build research capacity and expand activities at visits that take place every 1-2 years. ISP draws on examples from other partners that ISP has contact with. ISP has also supported the visit of Uppsala researchers to Dhaka, who have provided additional advisory support to the group. ISP has also helped the group identify potential partners in the region. The group is appreciative of these forms of advice.

3. ISP support vs. other funders

The ISP support has been used mostly for purchasing equipment and for human resources development, notably through fellowships for research students for a

sandwich programme with Uppsala Univ. ISP has mostly supported Bangladeshi students' visits to Uppsala, but , but recently also (female) students doing minor field studies in Dhaka.

The two other host organisations are the other sources of funding, but this is small, hence there is great reliance on ISP. No particular comparative advantages of ISP funding have been mentioned, as ISP is the only significant funder of the group.

4. Collaborations and their importance

The main collaboration of the group is with Uppsala Univ., the main purpose of which is for student exchanges through sandwich graduate training programmes. No other collaboration has been established with groups in Europe.

South-South collaboration supported by ISP has enabled collaboration with Univ. of Hanoi to be established, but this has faded in recent years and seen little activity. On a more individual basis there is a collaboration with Univ. of Delaware, which is not supported by ISP.

5. Future development and role of ISP

Plans for the next five years involve pursuing the strategy of the last few years, without any significant shifts. The 2017 application did introduce a new area of research though, namely research into the design of filters for purifying drinking water using magnetic nanoparticles.

It is hoped that ISP will continue providing support along similar lines until the group has reached a greater degree of maturity. It is anticipated that the group will continue support for purchasing equipment, and to continue offering graduate scholarships. Without these it is very difficult to retain qualified graduate students in Bangladesh, where existing scholarships are few and small. With respect to the ISP fellowships, the group would welcome the possibility of granting support for periods longer than the current 3-4 months.

IPPS BAN:04

Biomedical Physics & Technology

Overview

The ISP support to the group led by Prof Siddique-e-Rabbani at the Dep. of Biomedical Physics and Technology of Dhaka University started in 2011. The focus of the group is on the development of affordable technologies for health screening and health care. The latest application included research on the following topics:

- Use of Electrical Impedance methods including Focused Impedance Method (developed by the group) for physiological studies and the detection and diagnosis of bodily disorders.
- Use of Distribution of F-Latency (another innovation of the group) to understand and diagnose several neurological problems of the human body.

- Developing low-cost solar-powered devices for producing safe drinking water.
- Developing ultrasound technologies for diagnosis and therapy.
- Developing instruments for improving bone healing, through electromagnetic stimulation and mechanical vibrations.

The support is also used for training of Post-doc, PhD and MSc-level students, disseminating results in scientific publications and workshops and conferences, conducting clinical research and/or trials for testing the new technologies, and exchange with groups in Bangladesh and abroad. The group has a practice of selling their innovations in the market at low prices, so as to maximise uptake in low-income settings. It also organises training of scientists and engineers from other countries so that they are able to manufacture the instruments in their countries and make them available at a low cost.

The group has a large number of collaborations in Bangladesh and abroad, namely in the UK, Norway, USA, Singapore, Korea, Australia, Switzerland, Germany, India, UAW, the Gambia and Cameroon. None with Sweden, though.

The reports of the reference group assessments are largely incomplete, and do not contain any detail of how the different components of the application have been assessed. ISP support seems to have been channelled to the first two research areas only.

Funding by ISP in the period 2014-2016 is given in Table 10. The group has secured funding in the last few years from organisations such as the Prime Minister's Office and the Ministry of Science and Technology of Bangladesh, Dhaka University, Beximco Pharmaceuticals and the Information Society Innovation Fund-Asia.

Table 10 - ISP funding to IPPS BAN:04 2014-2016

	2014	2015	2016
ISP funding (10³ SEK)	414	414	250
ISP funding % of total	100	43	34

Assessment

(NB: this part is based on the interview with the group lead and on a written contribution sent by him before the interview)

1. Capacities developed

The key contribution of ISP has been at the level of the development of human resources, to which ISP contributed with grants for MSc, MPhil, PhD and even one Post-doctoral studies. Those grants are essential for retaining talented students and graduates in research, since otherwise they would need to find jobs elsewhere, most likely in the business sector, according to the group leader. Those students and graduates have in turn contributed to the scientific production of the group, hence the ISP support can be said to have contributed to strengthening capacity at that level as well.

2. Mentoring and other support

The group does not receive any mentoring or other type of advisory support from ISP, other than feedback from the reference group or occasionally ISP experts on the content of the applications. Such feedback has helped the group refine the research programme and its targets.

3. *ISP support vs. other funders*

The support from ISP has been used primarily for the following purposes:

- Scholarships and allowances to researchers, field workers and supporting staff.
- Fellowships to graduate students to visit and work at groups abroad.
- Travel grants for teachers and graduate students to participate and present papers in conferences at home and abroad.
- Purchase of equipment, software licenses, spares and consumables, as required.
- Covering expenses with bringing experts from foreign universities and institutes to give lectures or to help in improving research quality, or for joint collaborative research.

In comparison to the other funder, ISP funds do “not have any strings attached”, in the sense that they are fully utility oriented and flexible, and solely targeted to the improvement and success of the group. Communication with the ISP management is deemed very good, the ISP directors exhibit a very positive and supportive attitude. The relationship with ISP is characterised by mutual dignity and respect. Such flexible terms and conditions, and such a conducive administrative environment are not usually available from other funding agencies.

4. *Collaborations and their importance*

The group leader Prof Rabbani provides the main mentorship to young researchers and students, both of the department and from other institutions, some from abroad. In a few cases researchers under this programme were sent abroad to work in the laboratory of experts in specific fields, or foreign experts were invited to visit this department for short periods. The idea was to exchange ideas and expertise, paving way to future collaborations. However, not all led to concrete programmes, but contacts were helpful for informal collaboration, as and when required.

The research also involves collaboration with local experts from other fields and the group has a network of such collaborators, which has contributed to enhancing the programmes of research. For these local collaborations the group had funding supports from government and non-government agencies as well, but ISP-funded personnel and facilities were used directly or indirectly in all these collaborative research programmes. The main collaborators and their roles are briefly described below:

Foreign collaborations:

- *Professor Adrian Wilson, Emeritus Professor, Dept of Physics, Warwick University, UK.* The group has a long association dating back to the academic link with Sheffield University during 1983-1992, funded by the then British ODA. Prof Wilson co-supervised a PhD student (Dr M A Kadir) who spent

one year at Warwick during 2012 and made a multi-frequency instrument based on Focused Impedance Method (FIM – a group’s innovation), which he brought back for further work, for completion of his PhD recently. The visit was organised under UK Commonwealth programme, but the continuation of the research programme of Dr Kadir (based on FIM) is funded by ISP. Prof Wilson was also invited to visit Dhaka twice (in 2011 and 2014), under ISP, to interact with students, to help areas of research, and to give lectures at the department.

- *Professor Orjan Martinsen, Dept of Physics, Oslo University, Norway.* Supervised one of the group leader’s ex-students, Dr Humayra Ferdous, to do a PhD in Oslo University on FIM, however not with ISP funding. Prof Martinsen has also been invited to visit Dhaka to give a series of lectures on the basics of bioelectrical impedance to students, under ISP, in 2011. Group members meet him sometimes at international conferences and have a working relationship in discussing research issues since their groups work in very similar areas.
- *Dr Youssoufa Mohamadou, Lecturer, Université des Montagnes, Cameroon.* Was invited to Dhaka, under ISP South-South Exchange programme for three months in 2017. He worked for collaborative development of a versatile multi-frequency instrument for FIM, the development work of which is still being continued at both groups through periodic interchange of information through email, after his departure. Versions of this instrument will be used at both groups when complete. The group has also shared with Prof Mohamadou other equipment they have developed, for further development and use in Cameroon and elsewhere in Africa.
- *Dr S Kaisar Alam, Visiting Professor, Rutgers University, USA.* Collaborates on breast tumour characterisation using Electrical Impedance Techniques that are carried out with ISP support. His visits to Dhaka are self-funded.
- *Professor Albert Mihranyan, Professor of Nanotechnology, Department of Engineering Sciences, Uppsala University, Sweden.* Current collaboration for developing nanocellulose filtration method for water purification and growing of particular varieties of algae needed to produce the nanocellulose material. This is funded by sources other than ISP.

Local collaborations:

- Professor Anowara Khatun, Dept of Microbiology, University of Dhaka, and Dr Latiful Bari and Dr Sharmin Zaman, Centre for Advanced Research in Sciences, University of Dhaka Collaborate on research involving water disinfection methods for safe drinking water.
- Dr Selina Husna Banu, Institute of Child Health and Shishu Hospital, Dhaka. Paediatric neurologist co-supervising PhD student Ehsan Alam Chowdhury. Collaborates on research involving Nerve conduction techniques and in Telemedicine
- Professor M Adnan Kiber, Dept of Electrical and Electronic Eng., University of Dhaka and Mr. Golam Dastagir, Associate Professor, Dept of Physics,

University of Dhaka. Collaborate on research involving Electrical Bioimpedance Techniques.

- Professor K Sadat Husain, Dept of Physics, University of Dhaka. Collaborates on research involving Electrical wound healing using hydrogels and nanotechnology.
- Dr Rezwan B Hussain, University of Liberal Arts, Dhaka. Collaborates on research involving dissemination of water disinfection methods for safe drinking water.
- Dr Abu Sayem Karal, Dept of Physics, Bangladesh University of Eng & Technology, Dhaka. Collaborates on a project involving Irreversible Electroporation for cancer cell ablation.

5. *Future development and role of ISP*

The expectation is that the group continues carrying out similar type of applied research and technology development as so far. A challenge according to the group leader is retaining the group ethos and principles, which are key to how the group operates and the direction of the research they undertake. For this it is essential to retain the staff and students trained and ‘raised’ within the group. With the retirement of the group leader, there are fears that the group might disintegrate, or at least lose part of its identity if the group leadership is replaced with people out of tune with the group’s history and principles. To avert such risk, the group leader is studying the possibility of establishing a new Institute where the group could be hosted. Irrespective of the future affiliation of the group, ISP support will remain important especially for strengthening the training and research exchange component of the group. Should the group migrate to a new Institute, ISP support could eventually be provided through one of the regional networks receiving support from ISP.

IPPS BAN:05

Nanophysics studies

Overview

The support to the Nanophysics Laboratory at the Dept. of Physics, Dhaka University led by Dr Sadaat Hossain was initiated in 2014. The group itself was established in 2012, and the ISP support has been requested for helping establish the group and launch new lines of research. Large sums were requested for equipment, especially in the 2013 application, which the reference group expressed concerned about. The group changed leader in 2016, and after a transition period resumed with a slightly different research plan.

The overarching objectives of the ISP support consist in helping 1) modernize the existing nanophysics laboratory with state of the art research facilities; 2) start an extensive research on nanomaterials, such as coordination polymers, as well as chemically converted graphene for nanoelectronic applications and 3) create a research opportunity for postgraduate students and researchers of Bangladesh in the

field of nanotechnology. The group has established collaborations with universities in Japan and China, and is looking into establishing new ones in the S-SE Asia region, in Africa and Europe. The group does not have any collaboration with groups in Sweden.

Interactions with society beyond the academic community are few, and limited to the presentation of research results in scientific meetings. Such meetings are also intended to help the group establish collaborations with other groups in Bangladesh. Two of the four group members are women (2017), and the group expects to retain a gender balanced composition by continuing to recruit equally from both sexes. So far the group has been successful with this strategy of having a fixed 50-50 quota for each sex.

Funding by ISP for the period 2014-2016 is given in Table 11. Other funding has been granted by Dhaka University, which in 2016 and 2017 amounted to SEK 5,000 per year.

Table 11 - ISP funding to IPPS BAN:05 2014-2016

	2014	2015	2016
ISP funding (10³ SEK)	350	350	250
ISP funding % of total	100	100	100

Assessment

1. Capacities developed

The group was established with support from ISP, which has been kept since. Because the group is almost entirely funded by ISP, all capacity developed since the establishment in 2012 is due to the ISP support. This includes:

- equipping the laboratory, that was empty before. (NB: the group was recently evaluated positively by the host Dhaka Univ., which agreed to provide it with a large laboratory).
- supporting students with scholarships, with a considerable proportion of the ISP grant spent on students. These are scholarships of up to six-month for MSc students for doing research in the lab. So far no students sent abroad due to lack of interest on the part of students, despite encouragement by supervisors.
- inviting foreign professors to the group for mentoring the students – e.g. Prof Otsuki from Japan stayed with the group in 2017 for several days mentoring students, and giving training on experimental research – and has been available since for remote support. ISP has also supported exchanges with researchers in Bangladesh.

2. Mentoring and other support

Mentoring support has not been extensive. The ISP programme director has occasionally provided some advice and ideas upon request from the group. No even during the discussion of the proposal for funding was there much discussion, other than revising the budget for equipment that was deemed excessive.

3. *ISP support vs. other funders*

The only other funding available to the group is from the Bangladesh Ministry of Science and Technology, which provides support to some students. Hence the group does not have any funders to compare with ISP.

There are plans for the group to apply for other funds, now that it has developed some fundamental capacity, which is a requirement of most research donors. Such requirement did not exist with ISP, which enabled it to support the group from the very beginning. Without this possibility by ISP it would not have been possible for the group to be established, as there is no other donor providing support of the size of ISP for the launch of new groups.

4. *Collaborations and their importance*

A collaboration has been kept since 1999 with Nihon Univ. in Japan, where the group leader did his PhD. Exchanges of staff and students have been maintained since, and occasionally the group receives smaller equipment and consumables from Japan through that collaboration. Larger equipment have been procured with ISP support. There is a joint research project with Japan that benefits in part from the ISP support. The group also has collaborations with other groups in Bangladesh (incl. IPPS BAN:04) and China, which are mostly used for joint supervision of graduate students, and occasionally the production of joint research papers.

5. *Future development and role of ISP*

The group expects to be able to attract an increasing number of students; the group leader believes that the fact that several of the graduates from the group have gotten positions abroad provides a good incentive for others to join. Similarly, the fact that the group is gender balanced renders it attractive for female candidates. In recent years he has witnessed growing motivation and interest by candidates.

However, if the group is to increase the number of PhD candidates, this will require additional funding, as PhD studies are more expensive. ISP support for that will probably remain necessary. The expectation is to have the first PhD student join in 2018 or 2019. In order to attract high quality candidates, the group will be advertising externally this year, which it has not done previously.

With respect to sources of funding, the group is trying to secure funding from other partners, and is confident that this will be possible in the near future. The group leader also thinks that national funding might be sufficient to sustain the group in a not too distant future; funding opportunities seem to be expanding, and it seems to be possible to secure funding for longer periods. At the same time, he recognises that it will take some time before the level of government funding will reach that of ISP – currently it corresponds to about 1/5 of ISP.

BURKINA FASO

IPICS BUF:01

Analytical Techniques for Analysis and Valorisation of Local Natural Products in Burkina Faso

Overview

The ISP support to this group started in 2008 as a common pilot grant with the designation IPICS BUF:01 to two groups, which after 2009 have been identified as BUF:01 and BUF:02, both at the Dep. of Chemistry of the University of Ouagadougou. The initial contact was established through the International Foundation for Science, whose grantees were contacted by ISP when it first came to Burkina Faso.

RG IPIC BUF:01 is led by Prof Yvonne Bonzi-Coulibaly, and is guided by three primary objectives: 1) to increase scientific knowledge for effective antifungal formulation based on local plants; 2) to improve with stakeholders technologies for accessibility to antifungal formulation based on local plants for sustainable crops protection in a context of climate change; and 3) to build sustainable research collaboration with partners at local, regional and international levels in order to increase the use of pesticidal plants in local agriculture.

The group has a research collaboration with the groups of Prof Olov Sterner at Lund University and Prof Åke Bergman at Stockholm University, and collaborates with several other groups in Burkina Faso, as well as two groups in Belgium and one in France.

The initial pilot grant of 2008 was given for two exchange visits, one to Ouagadougou by the IPS Reference Group, and one to Sweden by the applicant, in order to further develop the proposal and the research collaboration with European groups. The 2009 grant was awarded for “making contact with natural products chemists in East Africa”, and in 2010 the group was invited to Funding for the period 2014-2016 is summarised in Table 12. Note the large share of other funding in 2014, which has decreased in subsequent years due to the conclusion of externally-funded projects. Other funding has been obtained from different grants for equipment, international projects and individual fellowships and prizes.

Table 12 - ISP funding to IPICS BUF:01 2014-2016

	2014	2015	2016
ISP funding (10³ SEK)	160	350	284
ISP funding % of total	13	47	66

Assessment

1. *Capacities developed*

The ISP support has enabled the group to raise the quality of the research, and to expand into areas of environmental chemistry, such as research on biopesticides, phytopathology and biological screening.

The support has also contributed to strengthening the group's human resources through research exchanges and graduate fellowships. The competences gained were not only at the level of the ability to conduct research, but also of being able to engage with farmers and other stakeholders to conduct more applied research on sustainable agriculture. Particular mention was made of ISP-supported workshops intended to “take chemists out of the laboratory” and have them engage women farmers and other stakeholders in the field.

2. *Mentoring and other support*

The review process for the grant applications was considered very useful for the applicant to discuss possible improvements to the proposal. The decision of the group to start working with farmers came out of one such discussion with the review panel, and has been very useful for the group.

Occasionally ISP also provides information on conferences and meetings that could be of interest for the group.

Finally, ISP also conducts periodic follow-up with the group, and the assessment visits were deemed very useful for the group to receive ideas and recommendations for improvement from ISP experts. In the words of the group leader, “ISP really follows the proposal and works with the group to develop the proposal and make sure it can work”.

3. *ISP support vs. other funders*

There are two main advantages of the ISP support relative to the support provided by other donors. The first advantage is flexibility; ISP allows collaboration with any partner, without any requirement that such partner is in Sweden. The group's main collaboration is currently in Belgium, which is preferable due to the French language. Not all funders support collaborations with groups outside the donor's own country. Still with respect to flexibility, ISP enables combining different budget posts – equipment, training, visits, gender. Other funders tend to be more restrictive in the terms of the variety of expense types that can be covered. The group leader also praised ISP's flexibility in grant disbursements, in particular the fact that payments are made in advance such that the group has a budget available that it can access from the start. Financial management of the grants was considered very efficient. On the contrary, the annual narrative report was considered too expensive and time-consuming to prepare.

The second advantage is the relative long-term nature of the ISP support, whose three-year grants are substantially longer than the usual one-year grants of other funders.

4. *Collaborations and their importance*

The main collaboration outside Burkina Faso with the group of Prof Pascal Gerbaux at Mons Univ. in Belgium, which the group uses for conducting advanced analytical work and for student exchanges.

The group also collaborates with other groups in Burkina Faso and the West African region working on biopesticides. Again these collaborations serve primarily for student exchanges and for learning about or carrying out specific techniques or applications.

In recent years the group has also been trying to establish collaborations with non-governmental organisations for conducting more applied research and for linking to the social sciences, but so far no such research has received funding.

While ISP has not been the initiator of any of these collaborations, some of the contacts have been established at ISP-sponsored events.

5. *Future development and role of ISP*

In terms of the direction of the research, the plan is to continue working on a mix of topic related to bio-fuels, bio-fertiliser and bio-pesticides, expanding into natural products used in different contexts and for different applications. In view of strengthening the applied dimension of the research, the plan is also to incorporate aspects of social sciences into the research and working directly with farmers and other relevant stakeholders.

ISP is expected to continue play a role in funding the group, but the group is mindful of the need to diversify further the funding basis, in particular by applying to larger grants from the African Union and the European Union together with European partners. In this regard the group is looking into strengthening and diversifying the research network.

In order to increase the chances of accessing those larger grants, the group would welcome support from ISP in reviewing and improving research applications. The group leader is convinced that this would enable the group to move to another level of funding.

Finally, with respect to staffing, because the current leader is approaching the age of retirement, the group has started planning for her succession.

IPICS BUF:02

Water and Clays Burkina Faso

Overview

The ISP support to this group started as a common pilot grant with the designation IPICS BUF:01 to two groups, which after 2009 have been identified as BUF:01 and BUF:02, both at the Dep. of Chemistry of the University of Ouagadougou. BUF:02 is led by Dr Boubié Guel, and budded off from one of the research topics of the original BUF:01 application of 2007. It collaborates with the group of Prof Ingmar Persson at

the Dep. of Chemistry at SLU, and groups in Burkina Faso, Mali, France, Belgium and Italy.

The overall objectives of the group is to contribute to the development of simple, low-cost and high-performance water purification processes using natural clay minerals, laterite soils and oxide materials from Burkina Faso for the removal of heavy metals cations and arsenic compounds in contaminated groundwater in rural villages in Burkina Faso.

After the initial common grant in 2008 – which was exclusively used for participation in conferences, exchange visits and student support - the group was invited to apply for 3-year funding 2009-2011. The same happened in 2011 relative to support in the period 2012-2014. The latest application was submitted in 2014, covering the period under evaluation. The proposals have been assessed very positively since the first year; the last assessment praised in particular the project's educational possibilities – notably the output of PhD graduates and scientific papers – and the international cooperation with groups in Africa working on similar purification techniques. Funding for the period 2014-2016 is summarised in Table 13. The level of funding in the previous period was similar. Other funders include the Belgian cooperation under the framework of the PIC Project (for student fellowships, equipment and consumables) and the Burkina Faso National Fund for Research, Innovation and Development.

Table 13 - ISP funding to IPICS BUF:02 2014-2016

	2014	2015	2016
ISP funding (10³ SEK)	450	450	426
ISP funding % of total	83	63	51

Assessment

1. Capacities developed

The support from ISP has contributed to developing capacity in the following five areas:

- Development of a *research competence in the field of water and clays investigations*. Knowledge about some natural adsorbents (clays, laterite soils, manganese dioxide) of Burkina Faso regarding their structural characterization and their adsorption or ion exchange properties has been strengthened.
- Development of *teaching capacity in the field of water and clays investigations*: new basic courses have been introduced at the University of Ouagadougou. These new courses are related to electro-analytical methods, water chemistry, waste water treatment, design operations (concepts and numerical applications, thermodynamic and complements) and materials investigations. Research results from the group are being used in education at the Chemistry Department. The bachelor programme at the Chemistry Department offers a specialization in the field of water analysis and the group provides support to this specialisation.

- PhD and MSc studies have been strengthened with the training of several students in both degrees.
- Research results have been published in international academic peer-reviewed journals.
- Scientific exchange and interactions with government and society are well developed. The groups has been able to extend scientific collaboration with several research groups in Europe.

2. *Mentoring and other support*

Although the group leader considered this elements “very important”, the only example given was the training of local technicians and MSc students in analytical tools following the acquisition of these tools with ISP funds. Mentoring or other types of advisory support do not seem therefore to have had a very influential role otherwise.

3. *ISP support vs. other funders*

The ISP support has had three main components: acquisition of equipment and consumables; North-South scientific exchanges with groups in Sweden, France and Belgium; and training of graduate students and group staff. In the view of the group leader, ISP does not only support the acquisition of equipment, like other funders do, but instead accompanies the group throughout its development, and helps guide the design of the research in a way that is tailored to the interests of the group.

4. *Collaborations and their importance*

The group leader mentioned that the director of ISP has facilitated contacts between the group and other groups, helping in identifying these and reaching out to them. The main current collaborations include:

- 1) *Ingmar Persson at SLU in Sweden*, whose collaboration was to help the group have access to modern equipment for the clays studies, to plan adsorption and ion exchange properties measurements of the clays samples.
- 2) *Philippe Blanchart at Univ. Limoges in France*, whose collaboration was to help the group have access to some modern equipment for the mechanical properties of the clays.
- 3) *Paul-Louis Fabre at Univ. Toulouse in France*, whose collaboration was in the field of Electrochemistry by helping the group develop electrochemical sensors.
- 4) *Anne-Lise Hantson at the Univ. Mons in Belgium*, whose collaboration was in the field of laterite samples investigation and to plan adsorption and ion exchange properties measurements of laterites samples.

5. *Future development and role of ISP*

With respect to the direction of the research, the aim is to continue working for the transfer of research results to the field, namely in terms of improving access to safe water through the development of low cost alternatives for the treatment of ground water in rural environments.

With respect to the capacity of the group, the aim is to proceed with training/capacity building efforts, in order to strengthen the group and thereby attract more international funding. In this regard, the group leader would welcome more support from ISP in the field of research management and how to apply for international research grants.

Finally the group expects to acquire more advanced equipment and establish more international collaborations, enabling it to conduct more advanced research.

ISP is regarded as an important partner in all of these components.

IPICS ANEC

African Network of Electroanalytical Chemists

Overview

ANEC was formally established in 2013, following scientific contacts in Sweden in 2008-2009 facilitated by ISP, as well as exchange visits and workshops in Africa involving network members in the two years that followed. ISP supported several of these preparatory exchanges through its support to some of the groups involved, and granted the first funding to the network in 2013 with a pilot one-year grant, followed by grants for the periods 2015-2016 and 2017-2019. The membership of the network includes groups in Burkina Faso, Cameroon, Ethiopia, Kenya, Senegal, South Africa and Tunisia, and collaborations are found with groups in Canada, France, Gabon, Germany, Jordan, Lebanon, Morocco, South Africa, Spain and Sweden, in this latter case at Lund and Uppsala Universities. The network is hosted at the Dept. of Chemistry of the University of Ouagadougou.

Within the broad aim of consolidating the ANEC, the ISP support is to be used for developing electrochemical methods and efficient sensors for on-site analysis of environmental pollution, producing reactors for treatment of waste water from local industries, training of MSc and PhD students, and improving of the gender balance among the students and staff. The key component of the ISP support is short-term fellowships and mobility grants to MSc and PhD students from network countries, for research stays in other groups in Africa and Europe. ISP funds are also used to sponsor research exchanges and network coordination meetings by senior staff associated with the network, as well as participation by students and senior researchers in scientific meetings.

Women are still poorly represented among both senior staff and students in the network organisations – at the end of 2016, of the 33 individual network members, nine were women, and out of 39 MSc and PhD students, seven were women. The network is trying to correct this imbalance by giving preference to female applicants, but finds itself limited by their much lower number compared to that of male applicants.

The network has collaborative research projects with the industry, in particular in waste water treatment and gold mining. It also has a large proportion of non-ISP funding, as depicted in Table 14.

Table 14 - ISP funding to IPICS ANEC 2014-2016

	2014	2015	2016
ISP funding (10³ SEK)	0	200	208
ISP funding % of total	0	25	13

Assessment

1. Capacities developed

ISP was instrumental in helping design the network at the very beginning, bringing scientists together from Africa with the purpose of establishing a regional network. Prior to the creation of ANEC African scientists would reach out to researchers in Europe for exchanges and support, hence ISP suggested to the current network coordinator (Dr Issa Tapsoba) the establishment of a regional network through which scientists could assist one another. ISP has therefore provided a key support to the development of regional scientific collaboration.

In terms of capacity building of human resources, ISP has since 2010 contributed to the mobility of graduate students, with mobility grants to spend up to three months in other countries. Student mobility is a key element of the regional collaboration.

The regional collaboration has in turn created an opportunity for groups to pool resources, which has given groups access to knowledge and equipment they did not have on their own. Knowledge pooling and exchanges are equally important in this context, and the network has strengthened the groups' capacity to prepare proposals for funding – notably through scientific proposal writing workshops for students and staff – which has helped groups and the network attract new funding.

2. Mentoring and other support

In addition to the guidance during the establishment of the network, the network coordinator mentioned that technicians associated with the network had received training in Sweden supported by ISP. Other than this no other mentoring support was mentioned.

ISP is not involved in the management of the network, which is the exclusive responsibility of its members.

There is not really any dialogue in connection with the grant application process. Such process starts with the network consulting internally to design a proposal for ISP. ISP then invites applicants to an international review meeting, which the network attends to defend the proposal. The review group then sends it report to ISP, which forwards it to the group. It is up to the network to integrate recommendations or make any adjustments, but without any involvement of ISP.

3. ISP support vs. other funders

ISP is regarded as a more flexible donor compared to others, and communication is very good. The support to student mobility is particularly appreciated, which other donors do not fund.

Another distinctive feature of ISP is the attention given to gender balance issues - ISP always has a recommendation on this subject, and the network has had the chance of having a scholarship exclusively for women

In terms of duration, other donors typically provide one-year grants, with relatively little support students. So far only one PhD has received funding from non-ISP sources, but no MSc student. According to the network coordinator, “ISP is really different in that it allows combining different types of expenses, and lays focus on students mobility.” Similarly, ISP also supports the mobility of senior staff, e.g. for PhD defences, which is very rare in other projects or funders.

4. *Collaborations and their importance*

There are several collaborations with groups outside the network, namely in Sweden, France, Belgium, and Brazil, which are used for student exchanges. Such exchanges also happen among members of the network.

Collaborations are also used for collaborative research projects. There is currently one project supported by the International Foundation for Science with the Ivory Coast and Gabon. Through different projects involving network members there are collaborations with non-network countries, which sometimes are used for student and staff exchanges, thus benefitting members in the network.

Finally, as alluded to under 1., collaborations within network also enable members to become aware of other sources of funding, which extends opportunities for support to all network members.

5. *Future development and role of ISP*

The network coordinator expects being able to sustain intake and graduation of MSc and PhD students, with emphasis on the latter, so as to have a growing number of graduates in the region.

He also expects the network to grow in number of members, to respond to existing demand from non-member groups in Africa. Sources of funding for that expansion include projects that support the network or partners’ networking elements, and engagement with the private sector, in particular waste water treatment, who has requested ANEC to engage in collaborative development projects. In such projects the contract is signed with ANEC, which then distributes the work among its members. There are also expectations that the support of some governments in West Africa – notably Burkina Faso and Senegal – will increase support to PhD students, which could benefit mobility and networking. Finally, still with regards to student support, it is expected that there will be greater recognition of the importance of supporting student mobility, in particular of MSc students, which again could benefit the network.

With regards to the role of ISP in these developments, it is hope that it will continue supporting the network along similar lines as up to now.

IPICS RAFPE

Research Network in Africa on Pollution of the Environment

Overview

Support was started in 2013 and concluded in 2015 because the activities ended up more policy-related than chemistry-related. The assessment of the 2014 application was critical of the poor science in the proposal and recommended that funding be discontinued, and that the network be invited to apply the year after with an improved proposal. The network received a total of SEK 300,000 for the period Jan-Dec 2013, which was intended for the establishment of the network dealing with regulations for pesticide use and methods for monitoring and reducing such use. The network has therefore not been included in the assessment.

IPICS RABioTech

West African Biotechnology Network

Overview

This network was created in 2002 by 10 universities and institutes in West Africa, with financial support from the World Bank and the overarching aim of improving MSc- and PhD-level training in biotechnology and food sciences by pooling financial and human resources. The network is hosted by the Research Centre in Biological, Food and Nutrition Sciences at the University of Ouagadougou, and has members in Burkina Faso (other than Univ. Ouagadougou), Benin, Cameroon, Central African Republic, Chad, Congo-Brazzaville, Gabon, Guinea Conakry, Ivory Coast, Mali, Niger, Senegal and Togo, and collaborations in Belgium, France, Italy and USA. It does not have any collaboration with a Swedish group. The strategy for 2016-2018 involves the network expanding to other countries in the Central African region. The ISP support started in 2008, and has been channelled primarily to supporting MSc and PhD students conduct parts of their research. The number of students supported in recent years has been high – in 2016 the network reported 21 PhD students enrolled and 12 graduated, and 33 MSc graduated student. The percentage of women graduates varies between MSc and PhD, and between the different MSc themes, ranging between 25 and 65% (2016). The number of publications produced with the support of ISP is equally large, although that support has not always been acknowledged.

ISP funding is also used for research and lecturing visits by scientists in the network, to lecture and do research at other universities, as well as for North-South exchanges. ISP also supports public outreach activities with government and industry on issues of human nutrition and food technologies.

Funding from ISP is given in Table 15. Other funding sources for the same period include the West African Economic and Monetary Union, fees paid by students or governments in the different countries, and service fees paid by partners and industry.

Table 15 - ISP funding to IPICS RABiotech 2014-2016

	2014	2015	2016
ISP funding (10³ SEK)	450	450	379
ISP funding % of total	47	76	72

Assessment

1. Capacities developed

The ISP support has since its inception contributed to strengthening the following capacities:

- Development of an inter-university regional cooperation on sets of themes common to several countries, and to participating to execution of activities of international organizations (UNICEF, WHO, ACF; NGOs, NESTLE). It also allowed RABiotech to have exchange with other networks like FOSNNA (continental network in human nutrition), Plant Biotechnology network (a network on the behalf of AUF)
- Equipment of laboratories at the host centre, the Research Centre in Biological, Food and Nutrition Sciences, for the training and the research. This equipment is available for all members of RABiotech
- Development of curricula in biotechnology and foods sciences, which have since been in use by most universities members of RABiotech in their home countries.
- Human resources development, notably through the graduation of 160-180 MSc and 30 PhD students, of which approximately one third were women. This is, according to the network coordinator, the greatest contribution of the ISP support, which otherwise would not have been possible.
- Made possible the publication of approx. 140 papers in international journals from the research supported by ISP.
- Strengthened networking and scientific exchanges through two large international conferences held in 2012 and 2017.

2. Mentoring and other support

There have not been many mentoring or advisory services provided by ISP; instead, activities tend to concentrate around the network, and only involve staff from network members, without much involvement from people in Sweden.

3. ISP support vs. other funders

The ISP support has been granted to equipment purchases, research exchanges and student mobility grants predominantly in two areas of research: 1) food sciences and human nutrition: contribution to the improvement of nutritional quality of food products devoted to the vulnerable persons; and 2) microbial biotechnologies applied to environmental studies and natural resources valorisation.

Compared to other funders, the ISP support is very well programmed, and is of sufficient duration to allow results to become visible. Other funders generally provide 1-2 year grants, and results are seldom noticeable after such short time.

The management of the ISP grants is considered very good and efficient. Communication is open and timely. On a less positive note, the annual narrative reports are considered excessively detailed and somewhat complicated, and should therefore be made simpler

4. *Collaborations and their importance*

The main financial collaborations include

- The World Bank, which supported the creation of the network
- The French University Agency (AUF), which took responsibility for the support to part of the mobility exchange between the universities members
- West Africa Economic and Monetary Union, which supported a part of MSc and PhD student scholarships

Scientific collaborations outside the network include:

- Universities from France, which received some of RABiotech PhD students for short training periods
- Universities from Belgium that have participated in teaching

No collaboration has been established with groups in Sweden, but Swedish professors have been invited occasionally to be jury at PhD defences.

The main purpose of collaborations within the network is the training of students through a quality programme, given the needs of African societies. There is regular engagement with the national governments in order to understand their needs and adjust the research programmes to those needs.

5. *Future development and role of ISP*

It is expected that the network will see an expansion into other countries, incl. members from the Central African region, given the need to expand the pool of trained specialist. The fact that universities in the network now have a pool of qualified people trained through the network is a good for the usefulness and quality of the network. It is expected that the ISP support will continue along similar lines as up to now, and thereby supports those expansion efforts.

With respect to attaining greater financial sustainability, the network coordinator recognised that it would be difficult to replace the level of funding from ISP with another source. There is the recognition that the network needs to step up its efforts to attract other international competitive grants.

UGANDA

IPICS UGA:01

Environmental Chemistry

Overview

The ISP support is being provided to the group led by Dr John Wasswa at the Dep. of Chemistry of Makerere University. It was first provided between 1999 and 2009, but was interrupted in the period 2010-2014 during which the group received support through the Sida bilateral programme with the University. Direct ISP support was resumed in 2015 so as to avoid losing the earlier investments. The current group leader has been in contact with ISP since 1999, at that time as a PhD student.

The overall aim of the ISP collaboration is to strengthen capacity for research in analytical and environmental chemistry, and to foster international collaborations. The latter include collaborations with the group led by Prof Henrik Kylin at Linköping University, and with groups in Sudan, Kenya, Tanzania, South Africa, USA, France, Germany and UK.

Focus is on training graduate students in those two areas of chemistry, to enable Uganda to establish baselines of chemical pollution in Lakes Victoria, Edward and Albert and the rivers discharging into the lakes, and to strengthen capacity (technical and human) to monitor chemical loadings in those systems. The project also has a component dedicated to the mitigation of chemical waste associated with the growing petroleum industry in Uganda.

The application was assessed as relevant and of overall "high quality", but concerns were raised about the level of detail and the suitability of the research and training plans, as well as about the fact that the team is 100% male. A large portion of the financial support requested of ISP is for equipment and consumables, and the group does not indicate any other sources of funding (although it does have other funding sources). The latter is a matter of concern for ISP and the group was encouraged to address it. Funding for the period 2015-2016 is summarised in Table 16. **Fel! Hittar inte referenskölla.**, where the large dependence on ISP is visible.

Table 16 - ISP funding to IPICS UGA:01 2015-2016

	2015	2016
ISP funding (10³ SEK)	500	379
ISP funding % of total	95	84

Assessment

1. Capacities developed

The main contribution by ISP has been at the level of equipping the research facilities, which has enabled the group to carry out its research. This in turn has been essential for staff and students to advance their academic careers.

Because the facilities are used by other groups in the region, the ISP contribution extends beyond the group's borders and has therefore been valuable at the regional level as well.

2. Mentoring and other support

There have been two main types of mentoring/advisory support provided by ISP.

Firstly, ISP has facilitated the provision of technical support in method development, mostly through visits by ISP-sponsored experts to Uganda and the region. Such type of support has been very beneficial, in the view of the group leader.

Secondly, ISP has facilitated collaborations in the region by means of the ISP-supported ANCAC scientific network (African Network for Chemical Analysis of Pesticides), as well as through partnerships established in Sweden with the support of ISP.

3. ISP support vs. other funders

About 65% of the ISP funding goes to expenses with equipment, consumables and field work for carrying out chemical analyses of environmental contaminants, the remainder being spent on graduate student grants and on scientific meetings.

Other funders of the group include the German Academic Exchange Service (DAAD), which provides financial support to graduate students; the University of Florida, which supports procurement of equipment and consumables, and provides supervision of graduate students; and the African Development Bank, which has granted research funds for the procurement of reagents. These funders also support expenses with equipment, but ISP provides the largest amount of funding for this type of expenses.

The comparative advantages of ISP vis-à-vis those other funders are the flexibility of the funding, notably that 1) it also covers expenses with equipment maintenance and not only acquisition, which is the case with most other funders; and 2) it provides support to networking activities, which has assisted the group in establishing collaborations in the region.

4. Collaborations and their importance

Collaborations with other groups have been used primarily for knowledge exchanges and student visits, for these to be able to use facilities not available at Makerere University. So far the group has not succeeded in having any joint project approved. The main collaborations are with groups in the region, but also with a group in the USA and with the group of Prof Kylin at Linköping University in Sweden.

5. Future development and role of ISP

In terms of the thematic scope of the research conducted by the group, the group leader does not envision any major shift. He anticipates continuing in the research direction set in recent years, with greater focus on petroleum pollution analysis. In this contexts, he anticipates working more closely with NGOs and government; recently the group has submitted a proposal for joint research with an NGO that is still awaiting award decision

With respect to the involvement of ISP, the group leader would mostly welcome technical assistance in finding potential partners to develop joint projects for that could attract other funding. There is also need for continued assistance in developing further the networking for the purpose of placing graduate students – usually this has taken place by means of ISP facilitating contacts with other ISP supported groups, and facilitating meetings where groups are brought together. Finally, he anticipates continued need for technical support along the lines ISP has provided so far, including equipment maintenance and support to research exchanges.

IPICS UGA:02

Overview

The support of ISP to the “Green Chemistry Project” by the group led by Dr Emmanuel Tebandeke at the Dep. of Chemistry of Makerere University was provided in a first phase between 2003 and 2008, and following a period of Sida bilateral support to the University, was reinstated in 2016. The purpose of this second period of funding was to “not lose the investments”. The group collaborates with the Centre for Analysis and Synthesis at Lund University, led by Prof Ola Wendt, with whom Dr Tebandeke did part of his PhD.

ISP supports a study to develop catalytic systems for the conversion of CO₂ into chemical products that can be used for different applications. The first part of the study is focused on developing systems for the coupling of CO₂ and epoxides; the second part is focused on the direct oxidative carboxylation of olefins using a green oxidant in the presence of CO₂; and the last part is focused on the copolymerization of epoxides and CO₂ to produce biodegradable polymers.

The proposal also involves the training of graduate researchers within the research project, specifically two PhD and one MSc student in the 2016-2018 period. The intention is to enrol other students after 2018. So far the group has only had male PhD graduates, and earlier female candidate having received funding from another group. The reason given for the gender imbalance is the low number of female MSc students where PhD candidates are recruited from. With funding from ISP it is expected that one female PhD candidate will be able to enrol.

The funding requested for the 2016-2018 period is for equipment (acquisition, maintenance and repair; approx. 50%), laboratory consumables (approx. 25%), participation in conferences (approx. 5%), exchange visits (approx. 3%), and fellowships for and other support to graduate students (approx. 15%). Funding during the bilateral support era was of 450-500,000 SEK per annum. In the current phase approved funding is slightly lower, at 350-400,000 SEK per annum (approximately one third of what was requested). The volume of ISP funding for the period 2014-2016 is given in Table 17.

Table 17 - ISP funding to IPICS UGA:02 2014-2016

	2014	2015	2016
ISP funding (10³ SEK)	0	0	379
ISP funding % of total	0	0	68

The assessment of the application praised the 'good research ideas', but considered the specific description of the work and the training plan for graduate students insufficient, including a strategy for achieving greater gender balance in the group. It was recommended that the group improved the description of the research and produced an education plan.

Assessment

1. Capacities developed

ISP has contributed to developing the group's capacity mostly at three levels:

- human resources – including the period since 2003, ISP funds have supported two PhD graduates, and six MSc graduates, of which two women. All of these graduates are working at Makerere University or in other organisations in Uganda.
- equipping the research facilities, namely with a spectrometer, autoclaves, smaller equipment and consumables
- establishing collaborations, including the links to Lund University in Sweden, which have enabled research exchanges and student mobility, namely for group members to be able to use equipment not available in Uganda.

The ISP support, as well as the Sida bilateral support, have been important for leveraging other sources of funding, which have enabled the group and its members to progress in their work and careers.

2. Mentoring and other support

The group leader revealed that ISP has provided guidance on how to address the comments by the reference group during the application review process, in particular the detailed description of the research and the gender and education plan. ISP has occasionally also provided advice on potential funding sources.

The group has also received support from ISP reference group members during a visit to Linköping to draft their funding application, specifically for how to formulate the research and identify collaborators.

Finally, ISP has assisted the group in establishing links to other ISP-supported groups and networks, namely the collaboration with Nairobi University. Collaborations facilitated by ISP have also helped the group access advanced research equipment in other laboratories.

3. ISP support vs. other funders

The breakdown of the ISP funds is given in the overview above, and covers equipment (acquisition, maintenance and repair, laboratory consumables, participation in conferences, exchange visits, and fellowships for and other support to

graduate students. Because ISP could not cover all budgetary needs the group was encouraged by ISP to seek other funders. Local sources, including the State House Kampala provide fellowships to graduate students, and the Organisations for the Prohibition of Chemical Weapons supports *inter alia* the acquisition of consumables. In comparison with these two sources, the ISP support is not only much larger but also much more diversified.

In comparison to the Sida bilateral support received by the group in the period 2003-2008, the ISP support is considered to be more flexible in terms of the management of student grants: whereas the bilateral support only allowed for support to one PhD student, ISP enables support to several PhD and MSc students. However, the total level of funding during the Sida bilateral support period was larger, amounting to an annual maximum of SEK 1 million.

The group leader values the closeness and the personal support from ISP, and the ability to discuss needs and challenges. ISP is flexible in addressing problems and needs; he has been able to interact with ISP staff at all levels, and all have been available to provide advice and support, and shown interest in the growth of the group.

4. *Collaborations and their importance*

The group leader referred to the collaboration with the group of Prof Ola Wendt at Lund University. This collaboration has been useful for the development of the group in general, and in particular for the supervision of group staff and students. The group has also produced several publications jointly with Lund, and Lund has hosted Ugandan graduate students and donated idle equipment to Makerere. The transportation of this equipment to Uganda was supported by ISP, including sending a technician to help install the equipment.

5. *Future development and role of ISP*

In terms of the direction of the research, for the coming years the group leader anticipates concentrating on industrial applications of the synthesis of certain products, coupled to Uganda's policy for cutting down CO₂ emissions.

For the staff, the priority for the near future is consolidating the career of group members, including the group leader attain the level of professor.

In terms of funding, the plan involves pursuing attempts to attract funding from other sources. The group will continue applying to ISP funds, and is hopeful of receiving more support for expanding the scope of work. The group would welcome funding for periods longer than three years, as well as support to two-way exchanges with Lund University (i.e. that would enable Swedish researchers' and students' stays in Uganda). On the whole, the expectation is for continued funding from ISP at higher levels and for a longer period.

IPPS EAARN

East African Astrophysical Research Network

Overview

EAARN was created in 2014 on the initiative of astrophysics scientists from Ethiopia, Rwanda and Uganda supported by the IPPS director Ernst van Groningen. ISP has supported the network since inception. The current network membership includes researchers in Mbarara Univ. of Science and Technology (UG), Muni Univ (UG), National Univ Rwanda (RW), Makerere Univ. (UG), Addis Ababa Univ (ET), and collaborations with institutions in Hungary, Spain and South Africa.

Within the overall aim of training human resources in astrophysics and astronomy in the East African region to improve overall research capacity, the network carries out the following activities with the support of ISP:

- offering MSc and PhD research degrees to students from the region, with supervisors from within and outside the region.
- supporting academic staff attend short training courses and international scientific meetings, as well as research visits to other groups
- organising scientific meetings in the region
- establishing regional research libraries

As per the 2017 activity report, the network is falling somewhat short of its targets in terms of the number of graduates, with a number of MSc students not completing their degrees in time due to “logistical reasons”, and more importantly to the fact that support could not be provided for the work they conducted in their home countries. The number of female staff and students supported by the network is still relatively small (no female staff, and around 25% female students, higher among MSc students), which is attributed to the low number of women taking science degrees in the region.

The size of ISP funding is indicated in Table 18. No additional funding has been secured other than in-kind contributions from the participating universities.

Table 18 - ISP funding to IPPS EAARN 2014-2016

	2014	2015	2016
ISP funding (10³ SEK)	530	420	430
ISP funding % of total	100	100	100

Assessment

1. Capacities developed

The key benefit of the ISP support so far has been the rise in the interest for graduate studies in astrophysics in the region. Interest among undergraduates has been very low, as have the alternatives for funding, and although the number of students is still low, it is on the rise. According to the network coordinator, there is an interest for astrophysics studies today that was not there a few years ago.

2. *Mentoring and other support*

ISP has so far not provided any mentoring or advisory support to the network. All mentorship of students has been received from elsewhere.

3. *ISP support vs. other funders*

The ISP funds have been used primarily for scholarships for graduate students. These are full scholarships for students outside their home country, but until 2016 were only partial scholarships (covering tuition costs) for students in their home country. This placed students enrolled in universities in their home countries at a disadvantage, as they often had to have part time jobs to cover their subsistence costs (in the latest ISP programme full scholarships are awarded to all students).

A smaller fraction of the ISP grant is used for acquiring literature for a regional library, but the budget line for this was very small.

The network itself does not receive funding from any other source than ISP, but the participating universities all contribute in-kind to the students' work, including covering part of transport costs for field work.

The network coordinator considers the management of the ISP grant excellent, in particular the process for transferring funds and administering disbursements. ISP is always there to help and guide, and communication is open, transparent, frequent and problem-free. He describes the collaboration with ISP as collegial and based on mutual respect.

4. *Collaborations and their importance*

The collaboration with Lund University is used primarily for knowledge exchanges, with professors from Lund coming to the region once a year to lecture. ISP provides the possibility for the network to invite lecturers from abroad whenever there is none available from the region.

The collaboration with the South Africa National Astrophysics Institute dates back to 2001, and the Institute has since received Ugandan students for training on a regular basis, including several of Uganda's senior astrophysics researchers. The Institute is also involved in co-supervising PhD students from universities in the network.

5. *Future development and role of ISP*

In the African political context, the leaders want investments in things that are tangible and can transform society – little they know astrophysics has so many benefits to society, even if not direct. Government has been slow in recognising such benefits, and is only now putting astrophysics into secondary school science curricula. In Ugandan universities astrophysics has to be taught in all physics courses. Still, at least in Uganda the presidency is still reluctant to invest in astrophysics; according to the network coordinator, government wants “downwards astrophysics” (remote sensing) rather than “upwards astrophysics” (space science).

The number of students in astrophysics is growing, and has not been dependent on government support, rather on partners and funders, which attests to the continued importance of the ISP support in the near future. The network cannot walk alone yet;

the target is to realise a critical mass that can design and drive an own agenda in the country, in the hope that government will join along the way.

In this context Ethiopia is far ahead, with groups much better equipped, and government exhibiting greater interest and goodwill. The number of astrophysicists in Ethiopia is also larger than in any of the two other countries. Rwanda on the contrary is not in a better position than Uganda, having recently had the first researchers trained in South Africa and being in the process of establishing its research programme. In comparison Uganda could actually be more advance in terms of higher education, given the existence of the MSc programme in astrophysics at the Mbarara Univ. of Science and Technology.

On the whole, continued ISP support is regarded as essential if the network is to pursue its activities.

IPPS MSSEESA

Materials Science and Solar Energy for Eastern and Southern Africa

Overview

MSSEESA was established in 2002 following an ISP reference group meeting with research group leaders in Uppsala. Following a workshop in East Africa involving materials science and solar energy scientists, the network was created by representatives from the University of Nairobi, Kenya; University of Zambia, Zambia; University of Dar es Salaam, Tanzania; Moi University (now University of Eldoret), Kenya and Makerere University, Uganda. It is currently coordinated by Prof Otiti at Makerere University. Support from ISP to the network started formally in 2009, although it had received ISP funding before that date through the TAN:01/2 group.

The overarching aim of the network is to develop human and infrastructure capacity in advanced research in materials science and solar energy, through inter-university collaboration in research, teaching and training. The current funding period emphasizes three areas of activity: 1) strengthening graduate training for advanced research; 2) strengthening research capacity through sharing of facilities and equipment; and 3) facilitating the dissemination of research findings, through publications and other forms of information exchange, mostly scientific conferences. Interaction with broader society is expected to happen at these conferences.

The latest assessments by the reference group (2013, 2014 and 2017) all point to several weaknesses, most notably the lack of details about the results of the network, the planning of activities, and the specific work of the network vis-à-vis that of the ISP-supported groups that are part of it. According to the 2016 application, the group is supporting two PhD students, who initiated their studies in 2014. Despite the repeated weaknesses, and little evidence in the activity reports of very significant improvements at the level of the regional network, recommendations have been to continue the support. The level of ISP funding for the period 2014-2016 is given in Table 19; the network is not known to receive funding from any other source.

Table 19 - ISP funding to IPPS MSSEESA 2014-2016

	2014	2015	2016
ISP funding (10³ SEK)	310	230	208
ISP funding % of total	100	100	100

Assessment

1. Capacities developed

The main contribution of ISP to the network has been in terms of training of technicians and knowledge exchange in the region. No other capacity gains were mentioned.

2. Mentoring and other support

ISP will be part of the advisory committee of the network once this is established, and until that date it is playing a similar role in terms of providing information about conferences relevant for the network, and engaging in discussions about the funding to the network.

3. ISP support vs. other funders

The network does not receive funding from any other source than ISP. In terms of the administration of the ISP grant, the view of the network coordinator is that it is very transparent, and that ISP monitors the grant at different levels. He has regular contact with ISP when there is a need to use funds, which are transferred to administered by Makerere University. No further features of the ISP grant were mentioned.

4. Collaborations and their importance

Most of the collaborations are held among network members, and these are used primarily for student exchanges, in particular for sharing facilities and equipment that are not available everywhere. Collaborations within the network are also used for organising regional events.

The latest application to ISP (2017) notes that the network has not established any collaboration with external groups. However, network members do collaborate with non-network groups mostly for student exchanges and for conducting specific analyses.

5. Future development and role of ISP

There are no clear plans regarding the development of the network in the near future. Other universities have shown interest in joining the network – most recently the University of Rwanda, which was considered to lack the capacity to do so though, and therefore was rejected.

Given the uncertain development, there is no clear expectation regarding the ISP support either. It is hoped that the support will continue along similar lines as until now. While there is understanding for the impossibility of ISP to fund the network indefinitely, there is no clear plan for diversifying funding other than to continue

submitting applications for funding, which have not been successful so far. ISP has not set any deadline or targets regarding other funding. Because the network is fully dependent on ISP, a reduction in ISP funding would entail a reduction in network activities.

IPPS ESARSWG

Eastern and Southern Africa Regional Seismological Working Group

Overview

The network was established in 1993 by organisations from seven countries: Uganda, Kenya, Tanzania, Zambia, Zimbabwe, Malawi and Ethiopia, later joined by Mozambique and Eritrea. It is dedicated to establishing, operating and maintaining a seismic monitoring network in the East African Rift Valley. Chairmanship of the network rotates among its member organisations; it is currently held by Dr Fred Tugume at the Uganda Geological Survey in Entebbe. Members of the network are state agencies and research organisations, depending on how seismological monitoring is organised in the nine member countries. Collaborations outside the region exist with groups in USA and Italy.

The main activities of the network include:

1. providing training to seismogram analysts and technicians at the national level
2. conducting analyses for seismic hazard calculations
3. compiling a regional earthquake catalogue as input to regional seismic hazard calculations, and performing analyses of seismic hazard for the region
4. operating and maintaining seismographic equipment across the region

Analyses are made publicly available, and occasionally published in scientific papers if part of a research project. In this regard, the network also provides funds to researchers from the region to do (parts of) graduate training. The network also organises regional scientific exchange events for network members.

ISP has supported the network from its inception, starting with a grant in 1995, and has since supported efforts at strengthening regional cooperation and capacity building. Several of the founding members of the network had received research training at Uppsala University and were familiar with ISP. The financial contribution from ISP in the period 2014-2016 is given in Table 20. The network does not receive any other support for its regional activities, but activities and equipment in the countries are often supported by the respective governments. Such support is not equal across the nine members, and therefore does not always contribute to greater regional harmonisation.

Table 20 - ISP funding to IPPS ESARSWG 2014-2016

	2014	2015	2016
ISP funding (10³ SEK)	404	372	250
ISP funding % of total	100	100	100

The network differs somewhat from the majority of the other ISP grantees, in the sense that it does not engage in fundamental science, but instead is fully dedicated to applied science and the provision of monitoring services to governments and society. It does apply scientific methods in its activities, but its primary aim is not to conduct fundamental scientific research.

Assessment

1. *Capacities developed*

The key contribution of ISP has been at the level of developing human resources for seismological science in the region. Most of the people linked to the network have been trained through ISP funds, at both MSc and PhD levels. This has included ISP support through the network, and through research groups in the region. In both cases the network has played a very useful role in contextualising and harmonising the work of those different scientists, and by providing them additional support not available otherwise. In addition to the training of researchers, ISP has been important for making funding available to technicians to conduct hands-on training and to enhance their skills. The ISP support to human resources development has made it possible for the region to have its own experts do seismic monitoring, and not depend on external experts.

Through its support to equipment purchases, ISP has made an important contribution to putting in place monitoring equipment across the region.

Finally, by supporting seismological research and data collection, the ISP support has contributed to generating data that are currently used by students in their research.

2. *Mentoring and other support*

The current network coordinator has been appointed to that position recently and could not recall any particular mentoring support in recent years. He revealed that ISP staff have been present at regional network meetings and provided advice on different matters, but noted that ISP is not directly involved in the management of the network.

3. *ISP support vs. other funders*

The ISP grant is used primarily to purchase equipment (currently mostly spares for maintenance and upgrades), capacity building, data collection and assessment models, and for the publication and dissemination of seismic information.

Funding to network activities comes exclusively from ISP, whereas the national governments and universities provide support to different elements of their national seismic monitoring systems. In this context ISP is the only donor contributing to harmonising capacities across the region. Since there are no other donors supporting the regional dimension, it is not possible to draw any comparison.

4. *Collaborations and their importance*

The network does not have any active collaboration at the moment, despite earlier attempts. A recent attempt at establishing a collaboration with China failed due to differences in objectives.

5. *Future development and role of ISP*

The network coordinator is of the view that governments in the region have progressively acknowledged the importance of the network, hence he expects greater contribution/input from governments, and not only an interest by scientists. The network is starting to receiving support from some countries, but there are significant differences between the countries such that the network is not yet sustainable. He hopes that in 10-15 years government funding will be sufficient to keep the network running.

ISP expects that the network progresses towards financial sustainability, but has not set any targets or date for such – it is rather a rolling expectation. However, capacity building of seismic experts is a constant need, and as most of the initial members have retired, there is a need to replace and train more. Also here there are important differences between the countries in the region, with some countries more active in contributing to renewal of expert pool than others.

IPPS UGA:01/1

Materials Science and Solar Energy

Overview

The ISP support to the group led by Prof Oti at the Dep. of Physics at Makerere Univ. started in 1989, was discontinued in 2009 due to the Sida bilateral programme with the University, and reinstated in 2011. The research in the group focuses on the properties of materials, specifically the preparation and characterisation of thin films for the development of low-cost solar cells.

The research on thin films that ISP supports was initiated in 1996 and involved in the early years the sponsoring of senior staff visits to a research group at the Univ. of Dar es Salaam to learn about thin film technology. With support from ISP, the group had as of 2016 produced two MSc and one PhD graduates. The support has also been used to equip the laboratory, and to sponsor other research exchanges involving senior researchers and graduate students.

According to the 2016 activity report, this is a small four-person exclusively male group. The lack of female researchers is attributed to the low interest of women in this type of research. The overall level of activity and results of the group seems, according to that report, to be relatively low. The assessment by the reference group of the 2013 application observed that “despite the potential and the long-term support by ISP, the group has had a weak development”, with no new staff and few students. Support was declined that year and the group was invited to reapply in 2014, which led to the granting of new ISP support from 2015 onward. The latest activity report (2016) shows a relatively low level of activity and few results.

The level of ISP funding is given in Table 21. The group received a USD 25,000 grant from the US Air Force Office of Scientific Research and Makerere University

in 2012, but has not reported any other financial contribution, other than in-kind from the university.

Table 21 - ISP funding to IPPS UGA:01/1 2014-2016

	2014	2015	2016
ISP funding (10³ SEK)	0	230	208
ISP funding % of total	0	100	100

The group collaborates with groups in the universities of Dar es Salaam and Nairobi, and with the group of Prof Granqvist at Uppsala University, where PhD students conduct part of their sandwich programme. The group is part of the regional network MSSEESA.

Assessment

1. Capacities developed

With support from ISP running for almost three decades, ISP has played a very important role in establishing the infrastructure and the equipment of the group, and in the training of researchers. ISP has therefore been a key partner in the development of the group.

2. Mentoring and other support

Mentoring and other types of advisory support to the group seem to have been rather limited, according to the group leader. ISP has occasionally provided assistance in finding host institutions for student exchanges in Europe, and earlier assisted the current group leader find a supervisor at Uppsala University. The exchanges during the grant application and review processes are mostly in writing, and there is little if any dialogue with the ISP reference group.

3. ISP support vs. other funders

The group received funding from the US Air Force in the past, but that is no longer the case. At present the group does not receive funding from other sources than ISP. In terms of the administration of the ISP grant, the view of the network coordinator is that it is very transparent, and that ISP monitors the grant at different levels. He has regular contact with ISP when there is a need to use funds, which are transferred to administered by Makerere University. No further features of the ISP grant were mentioned.

4. Collaborations and their importance

The group does not seem to have any very strong collaborations. It collaborates with Nairobi University, mostly for student exchanges and for conducting analyses that are not possible at Makerere University. Mention was made to a collaboration with the Jean Lamour Institute in France, but according to the 2016 activity report this has only involved an exchange visit by a group member in the period May-July 2016.

5. Future development and role of ISP

NB: Same as MSSEESA, see above

IPPS UGA:02

Astrophysics and Space Science

Overview

Support by ISP started in 2013 to the group led by Dr Edward Jurua at Mbarara University of Science and Technology, to develop the scientific capacity in astrophysics and space science. The research itself concentrates on the dynamics of the ionosphere within the low-latitude regions of the African sector, partly through the application of asteroseismological techniques.

The assessment of the latest proposal (period 2016-2018) differs markedly between the two Reference Group members. An assumedly non-specialist member gave generally very low marks, yet recommended that ISP continues funding the group with the aim of helping it establish itself and develop further. While that assessment is far from robust, it draws attention to the fact that astrophysics and space science are a new and underdeveloped domain in Uganda which needs to be supported if it is to develop. Overall though both the first and the second application have been evaluation positively, both on their scientific content, training component – including the gender dimension, with half of the graduate students being female, publication and dissemination plan, and networking with other groups in Africa and elsewhere. In this regard, the group collaborates with groups at Lund University and Uppsala University, the South African National Space Agency, the Thüringer Observatory in Germany, and universities in South Africa and Uganda (Makerere).

Funding for the period 2014-2016 is summarised in Table 22. **Fel! Hittar inte referenskälla..** Non-ISP support includes an in-kind contribution and small funds for travel from the University.

Table 22 - ISP funding to IPPS UGA:02 2014-2016

	2014	2015	2016
ISP funding (10³ SEK)	400	400	360
ISP funding % of total	100	95	94

Assessment

1. Capacities developed

The ISP support to this group is relatively recent, and so far has mainly contributed to strengthening human resources in astrophysics, which is a relatively new discipline in Uganda. The first batch of graduates will be completing their degrees this year. This has resulted in an increase in research staff in the group.

2. *Mentoring and other support*

While no particular examples of mentoring were given, the group leader revealed that he is regularly in touch with ISP, whenever needed. The proposal for funding is usually discussed during the grant application process, in order for the group to incorporate comments and suggestions in the most adequate manner.

3. *ISP support vs. other funders*

The group does not really receive any funding from other sources (other than small in-kind and travel support from MUST), hence a comparison is not meaningful.

4. *Collaborations and their importance*

The main collaboration the group has today is with South Africa, namely the South Africa Astronomical Observatory and the South Africa National Space Agency. The group uses this collaboration to send students for parts of the graduate studies. Similar, but less extensive collaborations exist with the Thüringer observatory in Germany, Uppsala University and Lund University, which all receive graduate students from the group.

The group also collaborates with groups in the region, again mostly for student exchanges, but occasionally also for faculty members.

Contacts for several of these collaborations have been established at scientific meetings, but there was no direct mention of ISP's role in facilitating those.

5. *Future development and role of ISP*

As the Ministry of Education is introducing space and astrophysics in curricula, there is the need to continue training scientists in these areas. The group leader's aim is to try to have a full-fledged department to support that development. For this it is necessary to continue developing human resources – with particular focus on PhD training, a library, and computer labs. He hopes to be able to establish a centre of excellence to service other research centres in the country and the region.

The greatest challenges at this point is to provide subsistence grants to graduate students – the current ISP grant only covers travel, equipment and tuition costs, hence most students need to work part time in order to cover their subsistence costs. This point is particularly important to solve if the group is to strengthen the recruitment of PhD students, which require greater support than MSc students.

No particular mention was made of the role played by ISP in these developments.

IPMS EAUMP

East African Universities Mathematics Programme

Overview

ISP support to the network started in 2002, initially to the mathematics departments at the University of Nairobi, University of Dar es Salaam and Makerere University, and since 2009 also to the University of Rwanda and the University of Zambia. There is

one coordinator at each node/member organisation, and an overall network coordinator that rotates between the members every third year. From July 2017 the network is coordinated by Dr David Sseviiri at Makerere University. In the latest IPMS reference group assessment (2013) it was recommended that Juba National University join the network, but only after further strengthening supported by an ISP grant.

The objectives of the network consist in:

- Building capacity through PhD, Postdocs and MSc, mainly in Pure Mathematics and new areas of mathematics.
- Introducing new areas of mathematics in the region, by calling for graduate programmes/curriculum reviews.
- Hosting regional schools, workshops and conferences for graduate students and researchers.
- Conducting joint research projects and producing joint publications.
- Improving research facilities in the region.
- Acquiring graduate text books and journals.
- Building international cooperation and links in various areas of mathematics. Collaborations include with European universities in Uppsala, Mälardalen, KTH, Stockholm, Bath, Chalmers, Reading, Linköping, Lappeenranta, and Tampere, as well as in Southern Africa countries through SAMSA and other ISP supported networks in South East Asia.
- Promoting staff exchange in the region.
- Collaborating with Sida bilateral activities in the region through holding joint events.

The assessment of the latest application available (2013) raised concerns about the costs and the use of network funds by the different nodes. It was also suggested that funding to the three older nodes could be phased out and instead channelled to the two younger ones, assuming the older ones do not need as much capacity support. EAUMP receives the largest annual funding of all ISP grantees. The funding for the period 2014-2016 is shown in Table 23.

Table 23 - ISP funding to IPMS EAUMP 2014-2016

	2014	2015	2016
ISP funding (10³ SEK)	3,000	3,000	2,711
ISP funding % of total	49	57	49

Assessment

1. Capacities developed

Capacity strengthening resulting from the ISP support has been observed mainly at two levels, according to the current network coordinator:

- research capacity: 15 years ago one could hardly get any active researchers/academics in mathematics in the region. With ISP support PhD students have been trained and have been publishing, and upon graduation

have continued working, teaching, researching. Some areas of mathematics and some organisations need further strengthening, though.

- teaching capacity: PhD training have been able to establish training at MSc level in node universities, which did not exist before. In comparison to earlier periods, teachers in summer schools were previously only from Europe, but recent years see more and more lecturers from the region. Part of that development is due to the ISP support.

2. *Mentoring and other support*

Mentoring and advisory services have been provided in three main forms:

- several institutions linked to ISP have been very supportive of the network, in terms of training students and providing supervisors, as well as contributing to regional summer schools and other events;
- ISP has provided guidance on the strategic direction of network, through annual advisory meetings that ISP attends and provides input to; and
- reference group engagement: always a dialogue on the application with the reference group, to review and improve the application for ISP funding.

3. *ISP support vs. other funders*

Most of the ISP support goes to the training of PhD students, but also some goes to annual summer schools, which receive funding from other sources. The main contributor overall is still ISP. The PhD training is a sandwich format, whereby students complete their MLic in Sweden and then proceed to completing the degree in their home institution. The PhD scholarships are awarded based on the research and training needs of each network node.

In comparison to other funding sources, ISP is the main provider of support to PhD students. Other funders are usually only involved in funding specific activities or events at the regional level. The network coordinator did not compare the ISP funding with those other sources, mostly because they target different things.

4. *Collaborations and their importance*

The collaborations with Swedish groups have been used primarily for the sandwich PhD programme. Those groups provide research facilities, supervisors and lecturers. The regional events are generally done in partnership with universities elsewhere. Lectures and participants from other countries usually attend.

In research collaboration within the region, departments typically share resources, conduct teaching visits and external examinations, and use the strengths of one another within the region. Such exchanges happen mainly among the EAUMP nodes, which is facilitated by the regular contacts within the network. This is not exclusive though, in case experts outside the network are considered more relevant for a given matter.

5. *Future development and role of ISP*

Plans for future of EAUMP include developing research that have not been emphasised yet, by means of competitive funding for groups to work together on

common topics. The network would need to operate as a kind of research council for collaborative research, emphasising joint proposals/research among node departments. The current ISP budget is said to already cover this component. ISP support will remain necessary in the near future, but is expected to become less and less so as the number of PhD graduates in the region increases. However, currently the research groups are still small and researchers are young, but there is an expectation that in 10-15 years the groups will have matured and there will be reduced need for ISP support, if any.

Expanding the number of graduate is more needed at the younger/smaller groups, and it is to those that the ISP support is to be channelled in the near future. The current agreement with ISP is that the support to the universities of Nairobi, Dar es Salaam and Zambia will increase, to make up for lower number of PhDs in their staff.

Annex 5 – Analysis of monitoring data

INTRODUCTION

This annex describes the analyses of the numerical data on the research groups and scientific networks receiving support from ISP, and summarises the results of those analyses. The aims with the analyses were to review the data and explore whether the variability in them could reveal any new aspects and results of the ISP support that the document analysis and the interviews have not made visible.

DESCRIPTION OF THE DATA

The following data sets have been provided by ISP.

- A1. ISP and other funding per group/network and year, 2014-2016, incl. start year of ISP support
- A.2. Staff numbers per group/network and year, 2011-2016, disaggregated by sex (M, F, Total)
- A.3a. Number of PhD students and drop-outs by programme and year, 2014-2016, disaggregated by sex
- A.3b. Names of PhD graduates who graduated in 2014-2016 by group/network, incl. duration of the PhD studies, disaggregated by type of programme (Local and Sandwich)
- A.4. *(word document with brief summary of each group/network)*
- A.5. Number of publications per group/network and year, 2014-2016
- A.6. *(folder with documentation about phased out groups and networks)*
- A.7. *(word document with the names of ISP Board members)*
- A.8. *(word document with the names of ISP Reference group members)*
- A.9a. File with multiple sheets containing
 - c) Combined reference group ratings per group/network and year, 2008-2017
 - m) Number of environmental impact minimisation recommendations implemented per group/network and year, 2009-2016
 - p) Number of MSc graduates per group/network and year, 2014-2016, incl. type of programme (Local, Sandwich, Full time abroad) and number of female graduates
 - q) Number of PhD graduates per group/network and year, 2008-2016, incl. type of programme (Local, Sandwich, Full time abroad) and number of female graduates

- A.9b. (word document with the questions about the degree of implementation of environmental impact reduction measures)
- A.9c. (word document containing the EIA framework for ISP)
- A.10. (folder with documents about 'Programme learning' for each ISP country)
- A.11. Tracer study data for ISP PhD graduates who have graduated 2008-2013
- B.4-5. Tracer study data for ISP MSc and PhD students and graduates who started their degree between 2005 and 2014, incl. present affiliation (as of when?)
- B.6. (word document with groups' and networks' rating of satisfaction with equipment provided by ISP)
- B.7. ISP and other funding per group/network and year, 2014-2016, incl. actual expenditure and balance brought or carried forward between years
- B.12. List with examples of outreach activities per group/network and year, 2008-2016

CONSIDERATIONS ABOUT THE RELEVANCE AND FEASIBILITY OF DIFFERENT ANALYSES

One way of investigating patterns in the data that could reveal any possible new features of the ISP support would be to try and relate **ISP inputs** - which in the data correspond to the level and, to some extent, the duration of the funding – to the **results of ISP support** – which in the data correspond primarily to number of publications, and of MSc and PhD graduates, but also to the degree to which groups/network attract other funding; the gender balance among group and network staff; and the quality of the applications as assessed by the ISP reference groups. The result of these analyses is described below.

The analysis of PhD drop-out rates (A.3a.) is not relevant given the fact that the data is aggregated by programme (IPICS, IPMS, IPPS), within which there is enormous contextual variability. The data does not show any discernible patterns.

The analysis of lists of individual graduates (A.3b, A.11. and B.4-5.) is not relevant either as it does not contain any information about the justification for the longer or shorter duration of the studies. Moreover – and more importantly – the different groups and network support MSc and PhD students differently: while a few provide full scholarships, the majority provide mobility grants of different durations, which in some cases vary depending on the nationality of the student (e.g. whether s/he is studying at home or abroad). Although students receiving short-term ISP grants are included in the ISP statistics, the actual capacity of the groups/networks and ISP to influence the duration of the studies and the outcomes in terms e.g. of grantee future placement is much reduced, at best. For these reasons those data have not be used in the analyses.

The data on the implementation of environmental impact mitigation measures (A.9a.m) was not analysed per group or network, because the data are not complete (i.e. not available for all groups/networks and year) and are organised in a way that does not enable inter-year comparison for each group or network (annual data in rows and not in columns, for each group/network). The reorganisation of the data to enable group- and network-based analyses would have required an excessive amount of time. The average level of implementation of environmental management measures as reported by groups and networks has generally improved in the period 2009-2016 (cf. Table 24). Although a generally positive trend can be observed, the significant inter-annual variation in the number of groups and networks reporting renders a finer, more disaggregated analysis difficult.

Table 24 - Average level of implementation of environmental management measures, all groups and networks reported in the period 2009-2016.

Year	Avg. percentage of measures implemented	Number of groups and networks reporting
2009	41%	40
2010	44%	44
2011	55%	35
2012	48%	42
2013	58%	50
2014	64%	55
2015	70%	57
2016	70%	56

Finally, no analysis was conducted of the outreach activities by groups and networks, as those are only examples and do not represent the full results of the groups' or networks' engagements. Moreover, because the data is qualitative/narrative, any comparison would need to be preceded by some type of content analysis, and would therefore be excessively time consuming given the time allocated to these analyses.

ANALYSIS OF RESULTS

Effects of length of support on level of dependency

Assuming that one of the objectives of the ISP support would be to strengthen groups and networks to the point where those become (more) autonomous and able to attract research funding from non-ISP sources, an analysis was done of the relationship between the length of ISP support and the degree to which groups and network remain dependent on ISP for funding.

Such an analysis would ideally be done using time series of ISP support over time for each group/network. However, because we only had data for the period 2014-2016,

all we can do is provide a snapshot using the average value for that period. The variation within that period for each of the groups and networks is not indicative of any longer-term capacity to attract funding, and instead is mostly affected by the year-to-year variations in the starting or termination of non-ISP grants. Figures 1 to 6 show the plots of average degree of ISP funding (in percentage of total group/network funding) against the length of ISP support (in years), first for the entire population of groups and networks, and then for each of the programmes (IPICS, IPMS and IPPS) and finally for groups and networks separately. Note the differences between plots in the scale of the X-axis, which are due to the different relative lengths of the ISP support to each of the programmes, and to scientific networks vs. research groups.

Figure 1 - ISP support as percentage of total group/network funding for the period 2014-2016, and total length of ISP support, for all research groups and scientific networks

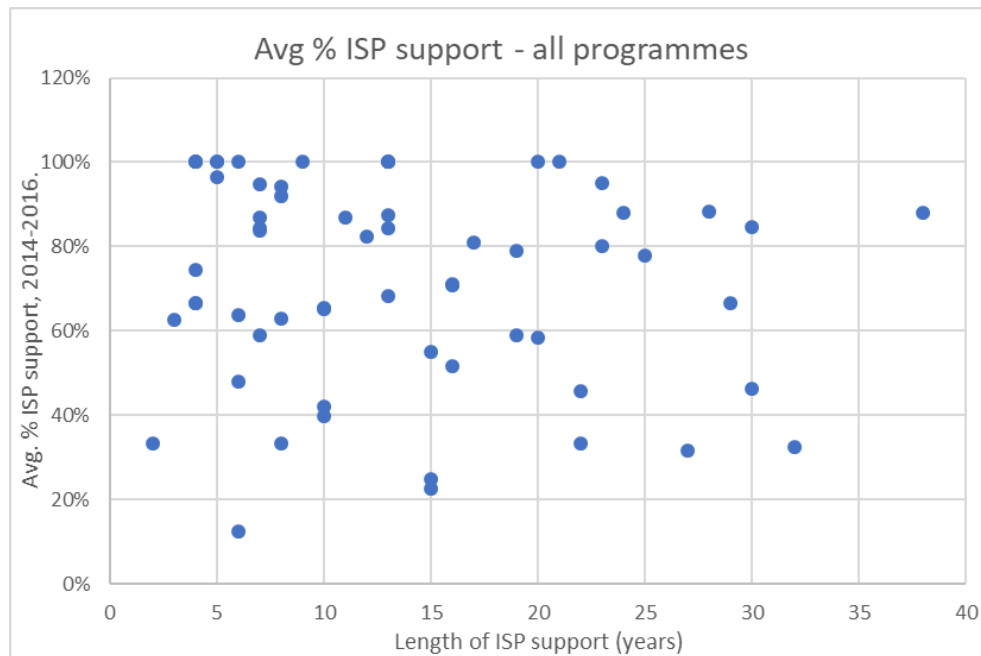


Figure 2 - ISP support as percentage of total group/network funding for the period 2014-2016, and total length of ISP support, for IPICS research groups and scientific networks

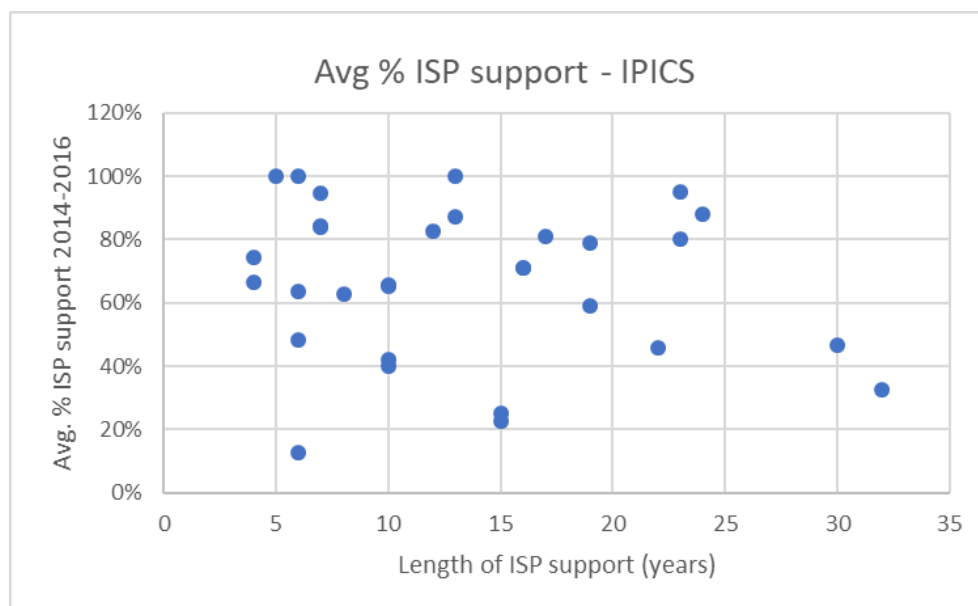


Figure 3 - ISP support as percentage of total group/network funding for the period 2014-2016, and total length of ISP support, for IPMS research groups and scientific networks

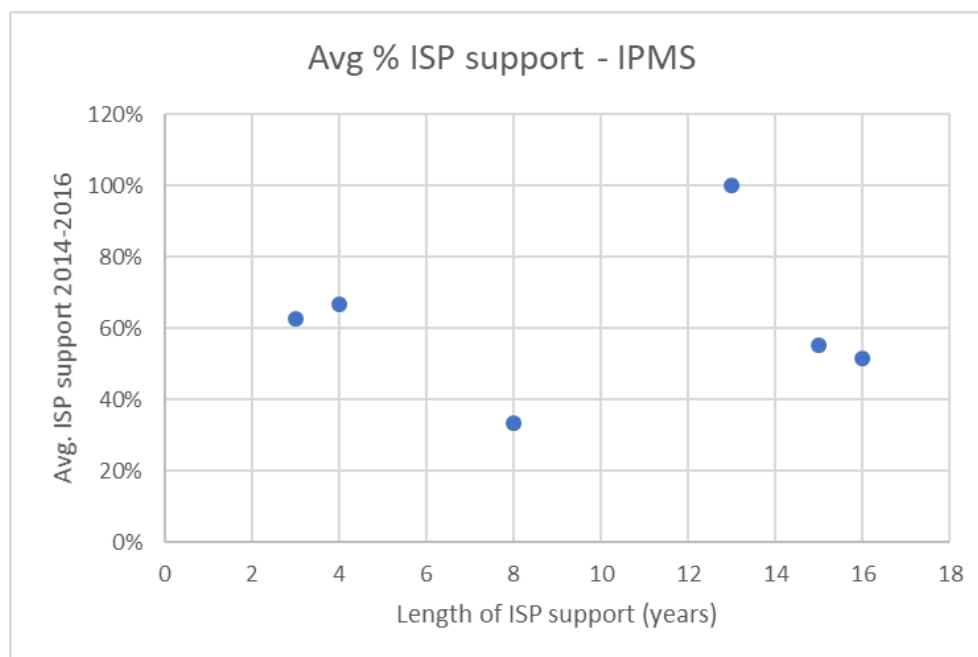


Figure 4 - ISP support as percentage of total group/network funding for the period 2014-2016, and total length of ISP support, for IPPS research groups and scientific networks

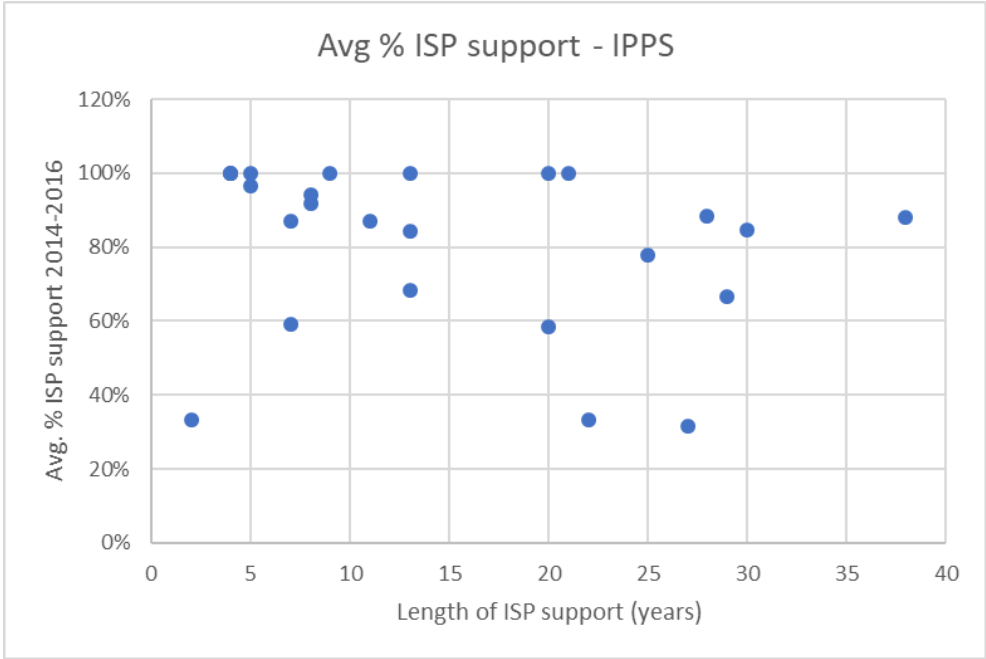


Figure 5 - ISP support as percentage of total group/network funding for the period 2014-2016, and total length of ISP support, for all scientific networks

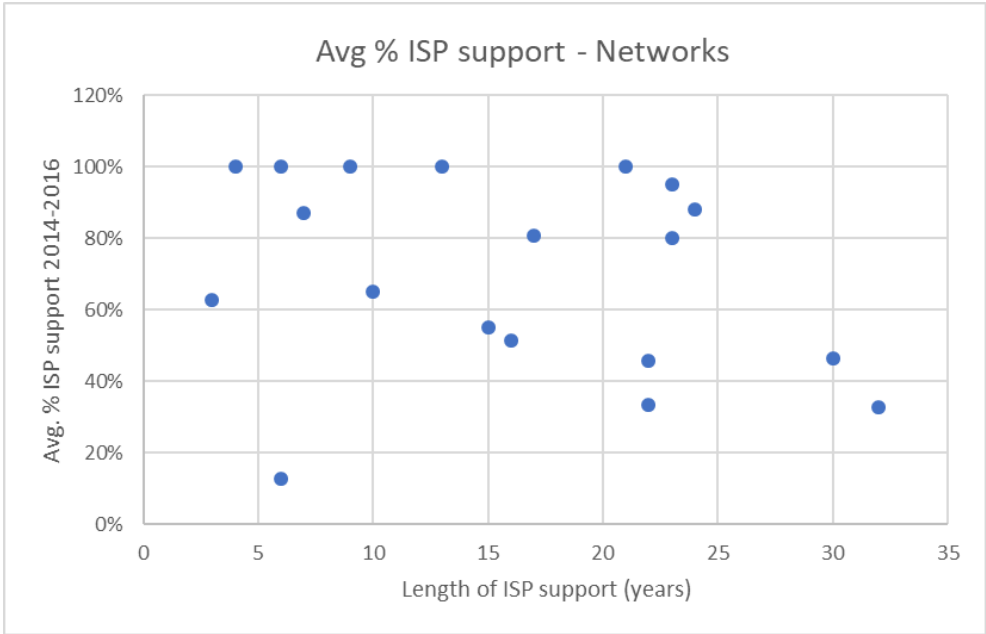
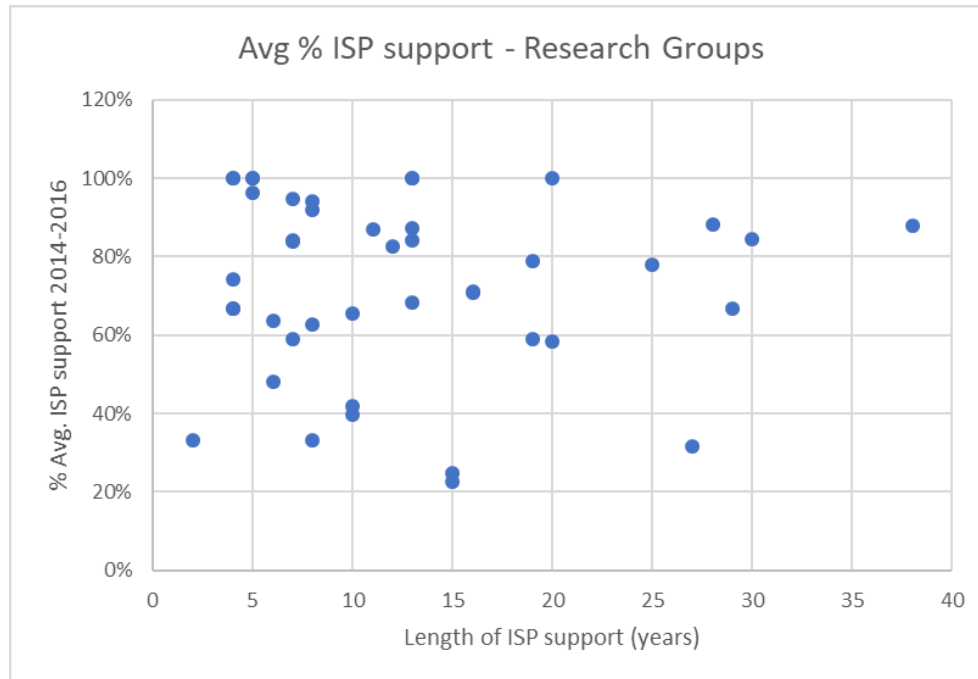


Figure 6 - ISP support as percentage of total group/network funding for the period 2014-2016, and total length of ISP support, for all research groups



The plots do not show any discernible effect of ISP in terms of reduced dependency over time. In fact, if one considers the 16 groups/networks that have received ISP support for 20 or more years, the degree of dependency varies between 32% and 100%, with a median of 79%. The group that has received ISP support the longest (IPICS BAN:02) still reports an average level of dependency of 88% for 2014-2016. The length of ISP support is therefore not a determinant of improved ability to attract other funding. Disaggregating the data per programme or by group/network does not reveal any additional information, other than known differences in the relative duration of the programmes: IPMS and IPICS are newer programmes than IPPS, and networks have on average received ISP support longer than research groups.

No pattern was visible in terms of specific countries or even regions exhibiting greater or lesser dependency on ISP – instead this seems to be determined by the specific context and conditions of each individual group or network.

Effects of level of support on scientific results

The fundamental purpose of ISP is to strengthen the research/scientific capacity of groups and networks. In the data provided such capacity is represented by the number of graduates (MSc and PhD) and the volume of publications. In theory groups and networks that are better resourced should produce more, both in terms of graduates and publications. In practice however this might not always be the case, for a combination of different reasons, including:

- the type of support to MSc and PhD students is not equal across all groups and networks – whereas in a few groups ISP provides full scholarships, in most it does not, instead providing short-term mobility grants. Whether students not receiving ISP full scholarships have other support varies widely between groups and networks, and is not always reflected in the volume of funding declared by groups and networks to ISP.
- scientific production is influenced by other factors than just the total level of funding – e.g. availability of supervisors, productivity of research collaborations, ability to pool resources.
- not all ISP-supported groups and networks have as their primary goal to increase scientific production. In particular networks exhibit a more diversified set of goals, including providing services to the scientific community or society, and providing training. Hence scientific production is not the sole criterion against which they should be assessed.

Notwithstanding these considerations, because of that fundamental purpose of ISP mentioned above, it is relevant to investigate whether the level of funding is related to the level of scientific production. The plots of number of publications and graduates (sum of MSc and PhD) against average annual total funding 2014-2016 are presented in Figure 7 and Figure 8.

Figure 7 - Total number of graduates and average annual total funding for the period 2014-2016, for all research groups and scientific networks

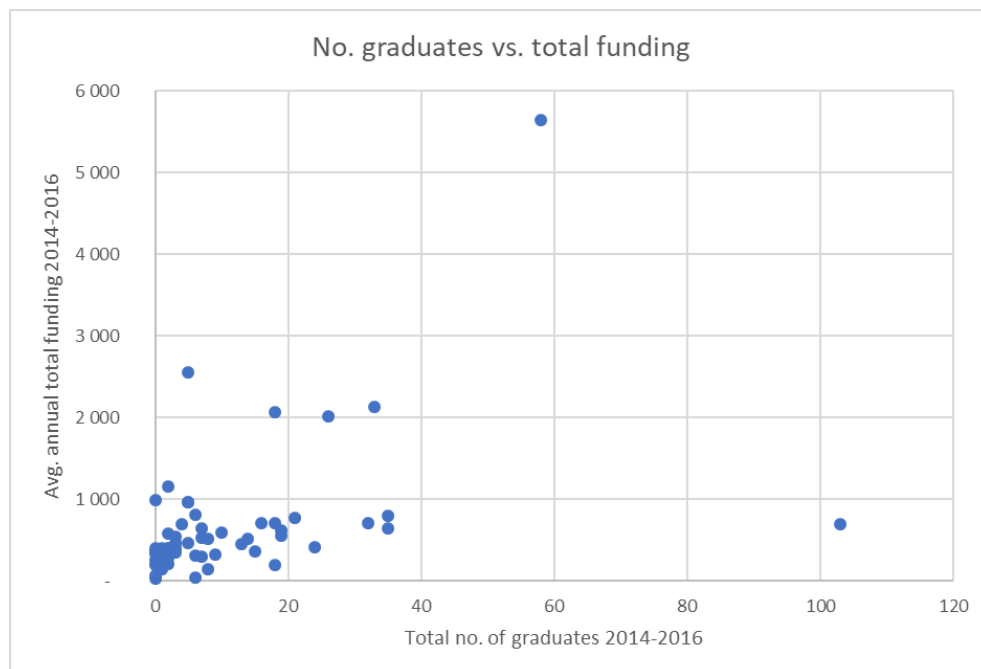
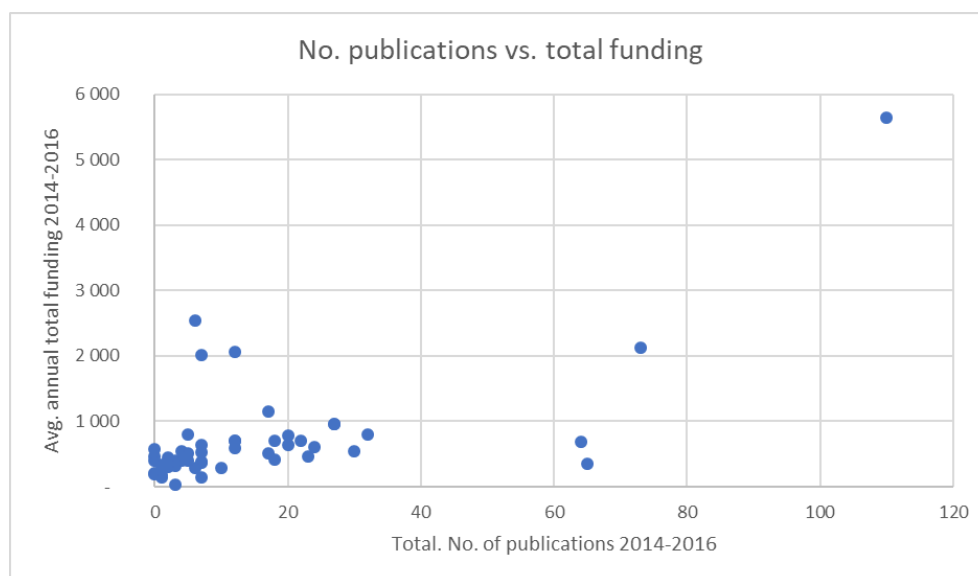


Figure 8 - Total number of publications and average annual total funding for the period 2014-2016, for all research groups and scientific networks



Similar plots are obtained if one plots against average ISP annual funding instead of average annual total funding.

A weak positive correlation is noticeable in both graphs, which becomes clearer if one removes the outlier values, as shown in Figures 9 and 10.

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Figure 9 - Total number of graduates and average annual total funding for the period 2014-2016, for all research groups and scientific networks, excluding outliers

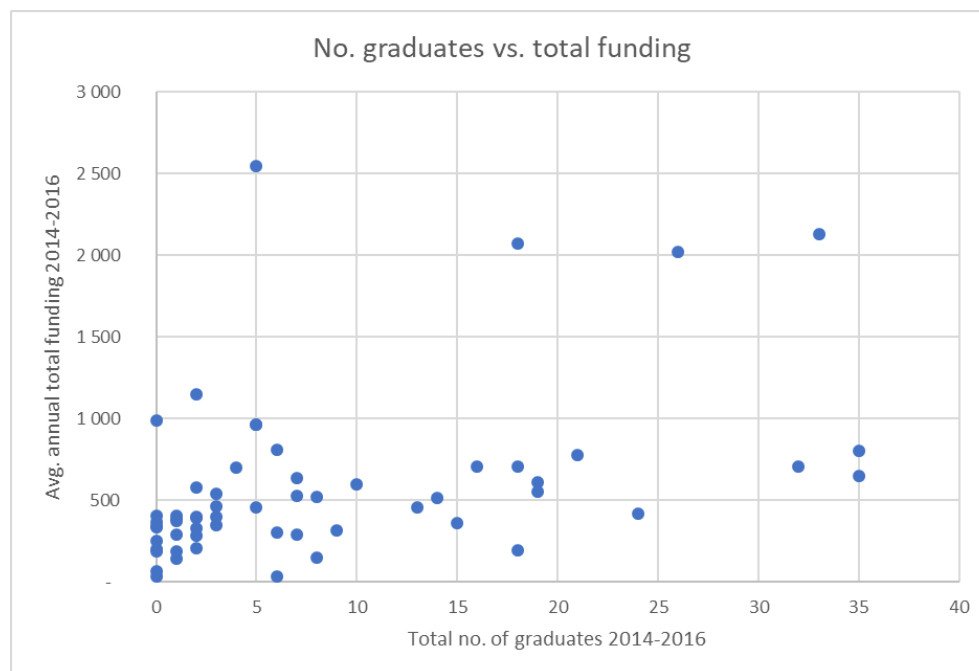
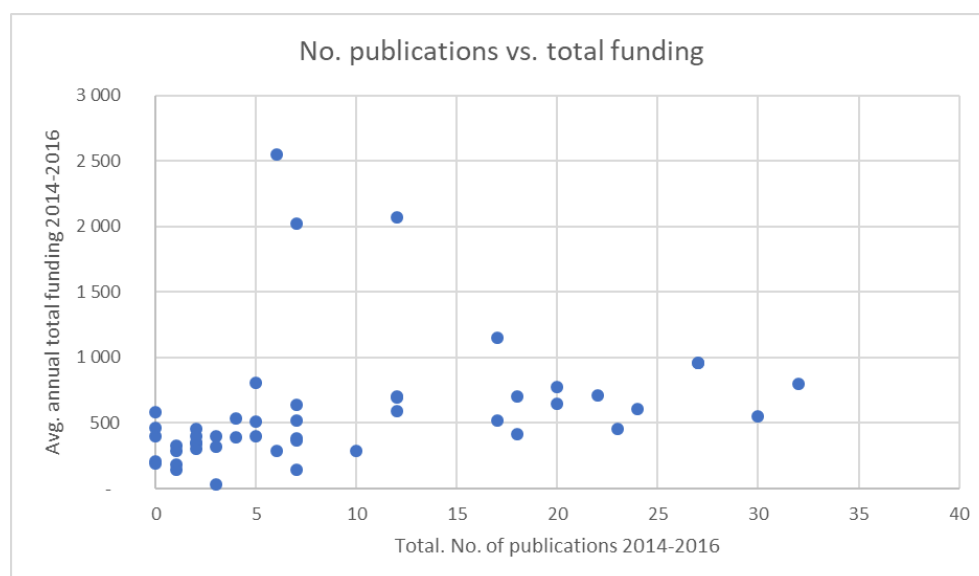


Figure 10 - Total number of publications and average annual total funding for the period 2014-2016, for all research groups and scientific networks, excluding outliers



The ranking of grantees with the highest number of graduates 2014-2016 is topped by three networks and one group: IPICS RABiotech (103), IPMS EAUMP (58), and IPICS ANEC and IPPS CAM:01 (both with 35). Their average annual total funding for that period varied between SEK 646,000 (IPPS CAM:01) and SEK 5.6 million (IPMS EAUMP). Of these four IPPS CAM:01 is the one with the highest proportion of ISP funding (approx. 87%).

At the other end, there are 24 groups and network without any graduate in the period 2014-2016. Levels of funding among those vary between zero (for 14 of those 24) and SEK 987,000 per year on average. Again, there is no discernible pattern in terms of the countries or regions of origin of the grantees, not any meaningful distinction between groups and networks.

With respect to the number of publications, the top ten is made up of the grantees included in Table 25. This table also shows that there is no discernible relationship between the number of publications and that of graduates in the period under study, based on the data available. There is no discernible pattern relative to the origin or type of the grantee either.

One must however keep in mind that the total funding reported to ISP might not represent fully the resources available to the groups or networks, given differences in the level and type of in-kind contributions and how these are reported.

Table 25 - Top ten ranking of ISP grantees in terms of the total number of publications in the period 2014-2016, incl. total number of graduates

Grantee	No. of publications 2014-2016	No. of graduates 2014-2016
IPMS EAUMP	37	58
IPMS BURK:01	26	33
IPICS ANCAP	19	15
IPPS CAM:01	12	35
IPICS ETH:01 & IPPS KEN:02	11	5
IPICS CAB:01 & IPICS RABiotech	10	21 (CAB:01) & 103 (RABiotech)
IPICS KEN:01	9	19
IPICS AiBST, ZIM:01, KEN:01 & IPPS BAN:02	7	2 (AiBST), 5 (ZIM:01), 10 (KEN:01) & 19 (BAN:02)
IPPS KEN:04, IPMS ETH:01, IPPS BUF:01 & IPPS BAN:04	5	7 (KEN:04), 18 (ETH:01), 24 (BUF:01) & 32 (BAN:04)
IPICS NABSA	4	8

Considerations about the level of ISP support

Of the ISP grantees included in the list in Table 25, IPMS EAUMP, IPMS BURK:01 and IPMS ETH:01 (positions 1, 2 and 9, respectively) are the ones ranking highest in terms of average annual ISP support in the period 2014-2016 (SEK 2.9, 0.9 and 0.7 million, respectively). The median for the 61 grantees for which there was data for

that period is SEK 343,000.⁴¹ EAUMP in particular is in a class of funding entirely of its own, and the reasons for this disparity are not possible to discern from the nature of the support – mostly to graduate scholarships, including a few post-docs – or from the assessments by the reference group. With respect to the latter, the latest assessments for those three groups are not any more positive than those of other groups receiving much smaller amounts. In fact, the justification found in many reference group assessments that a given requested sum ‘is above the level of funding generally granted by ISP’ does not seem to apply to the grantees on the top. While no justification is given in the cases of EAUMP and BURK:01 for the relatively high amounts granted, the reference group does justify the grant to ETH:01 in the recommendations in the 2013 assessment:

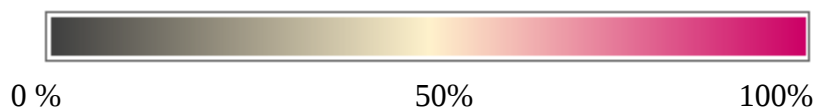
“While the project is certainly ambitious, it is clear in its objectives and requirements. Indeed, the realization of the set objectives in addition to the expected graduation of 25 PhDs by 2016 will help to significantly weaken the dependence of the department on ISP financial support. Therefore, the application should be provided by the maximum financial support possible.”

A similar justification for a higher-than-average annual contribution could arguably be presented for several of the other research groups and network. In this regard, one observes that IPMS ETH:01 was fully dependent on ISP for its funding over the period 2014-2016. In the cases of EAUMP and BURK:01 ISP support amounted to 52% and 55% of the total funding, respectively.

Changes in the gender balance of grantee staff

The data on staff of ISP groups and networks is meaningful to analyse only in terms of the gender balance, as this is the only aspect relative to which ISP has a specific objective (namely to foster gender equality among staff and students). The only other staff data provided – total staff number – is not relevant to analyse, as it largely independent of the ISP support.

Figure 11 is a colour plot of the percentage of female staff in each group or network in the period 2011-2016. The colour scale is the following:



Ideally groups should progress toward greater gender balance among its staff, but this is hardly the case for the vast majority of grantees in the period under study. Most of

⁴¹ There are an additional seven grantees with average annual ISP contributions of over SEK 0.5 million in the same period.

them exhibit small variations and only a small number progressed towards the 50% target during that period:

- IPICS: ANFEC, ANRAP, KEN:01, LAO:01, MAL:01, NITUB, SEANAC, ZIM AiBST and ZIM:01
- IPMS: SEAMaN
- IPPS: ESARSWG, KEN:02 and KEN:05

On the whole, IPICS grantees exhibit greater gender balance than the other two programmes, which is a likely reflection of the fact that there are more women in chemistry science than in mathematics or physics in the countries receiving ISP support.

Figure 11 - Changes in the percentage of female staff 2011-2016

Program	Code	2011	2012	2013	2014	2015	2016
IPICS	ALNAP	22%	17%	0%	0%	20%	n/a
IPICS	ANCAP	0%	11%	11%	11%	9%	9%
IPICS	ANEC	n/a	n/a	0%	0%	16%	0%
IPICS	ANFEC	n/a	n/a	67%	67%	67%	50%
IPICS	ANRAP	17%	17%	33%	33%	44%	44%
IPICS	BAN04	25%	18%	18%	18%	17%	22%
IPICS	BAN05	n/a	n/a	50%	50%	29%	33%
IPICS	BUF01	13%	8%	10%	10%	18%	18%
IPICS	BUF02	0%	0%	17%	17%	15%	17%
IPICS	CAB01	67%	50%	38%	38%	40%	44%
IPICS	ETH01	0%	0%	0%	0%	0%	0%
IPICS	ETH02	n/a	n/a	33%	33%	25%	25%
IPICS	ETH04	n/a	n/a	0%	18%	14%	14%
IPICS	KEN01	29%	20%	29%	29%	38%	43%
IPICS	KEN02	14%	14%	40%	40%	20%	20%
IPICS	LANBIO	67%	50%	50%	50%	33%	20%
IPICS	LAO01	57%	86%	58%	58%	58%	55%
IPICS	MAL01	17%	0%	27%	27%	14%	53%
IPICS	NABSA	n/a	33%	27%	27%	12%	18%
IPICS	NAPRECA	27%	27%	0%	0%	0%	0%
IPICS	NITUB	18%	18%	18%	18%	33%	33%
IPICS	RABioTech	0%	0%	27%	27%	20%	21%
IPICS	RWA01	n/a	n/a	n/a	40%	23%	23%
IPICS	SEANAC	36%	39%	30%	30%	48%	48%
IPICS	UGA01	n/a	n/a	n/a	n/a	38%	33%
IPICS	UGA02	n/a	n/a	n/a	n/a	n/a	20%
IPICS	ZAM01	0%	13%	13%	13%	0%	0%
IPICS	ZAM02	n/a	n/a	n/a	13%	n/a	n/a
IPICS	ZIM AiBST	43%	64%	38%	38%	40%	57%
IPICS	ZIM01	71%	75%	71%	71%	33%	40%
IPICS	ZIM02	40%	50%	50%	50%	40%	40%

Program	Code	2011	2012	2013	2014	2015	2016
IPMS	BURK01	6%	3%	2%	2%	3%	7%
IPMS	CAB01	0%	0%	0%	0%	n/a	n/a
IPMS	EAUMP	14%	19%	18%	18%	18%	20%
IPMS	ETH01	8%	8%	8%	8%	16%	16%
IPMS	LAO01	n/a	n/a	n/a	0%	n/a	n/a
IPMS	SEAMaN	n/a	n/a	n/a	n/a	22%	34%
IPPS	AFSIN	0%	n/a	8%	8%	3%	0%
IPPS	BAN02	24%	40%	36%	36%	17%	17%
IPPS	BAN04	25%	n/a	15%	15%	15%	21%
IPPS	BAN05	n/a	n/a	n/a	15%	50%	20%
IPPS	BUF01	n/a	n/a	10%	10%	0%	0%
IPPS	CAM01	50%	50%	17%	17%	23%	21%
IPPS	EAARN	n/a	n/a	n/a	15%	0%	0%
IPPS	ESARSWG	20%	22%	15%	15%	n/a	33%
IPPS	ETH01	0%	n/a	0%	0%	0%	0%
IPPS	ETH02	20%	n/a	0%	0%	33%	10%
IPPS	KEN01-2	21%	14%	21%	21%	19%	19%
IPPS	KEN02	8%	7%	8%	8%	13%	13%
IPPS	KEN03	20%	20%	20%	20%	14%	14%
IPPS	KEN04	13%	11%	10%	10%	8%	10%
IPPS	KEN05	14%	14%	14%	14%	25%	25%
IPPS	LAO01	n/a	0%	0%	0%	0%	0%
IPPS	MAL01	14%	0%	0%	0%	0%	0%
IPPS	MSSEESA	13%	8%	0%	0%	9%	10%
IPPS	MYA01	n/a	n/a	n/a	n/a	n/a	55%
IPPS	RWA01	n/a	n/a	n/a	14%	7%	0%
IPPS	UGA01-1	0%	0%	0%	0%	0%	0%
IPPS	UGA02	n/a	n/a	0%	0%	0%	0%
IPPS	ZAM01	0%	0%	0%	0%	0%	0%
IPPS	ZIM01	n/a	n/a	43%	43%	38%	38%

Changes in the quality of applications to ISP

A similar analysis to that of the groups' and networks' gender balance was performed of the changes in the quality of the grantees' applications for ISP support. The proxy for this aspect was the overall rating of the proposals given by the Reference Group, for which data was available for the period 2008-2017.

Despite the many factors affecting the content of grant applications and how they are rated – namely the composition of the review panels, which changes occasionally; and changes in the people at the grantee responsible for writing and presenting the proposal – one could assume that as groups increase their capacity, so should they

also produce better proposals that receive progressively higher grades by the reviewers.

The average ratings given by the reviewers at each periodic assessment is given in Figure 12. The numbers correspond to the average of the scores given to each assessment criterion, using the following scale: 1-Excellent; 0.75-Very good; 0.5-Good; 0.25-To be improved.⁴² The ratings of the different reviewers are given in separate rows. Note in this regard the significant differences in some of the grades given by the two reviewers to the same proposal.

To facilitate the visualisation of patterns in the evolution of the average ratings, the following colour scale was used. If ratings improved a gradient from dark on the left hand side to light on the right hand side should be easily visible.



Figure 12 - Average reviewer ratings of research group and scientific network assessments 2008-2017. For each group and network, each row corresponds to a different reviewer.

PROG	CODE	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
IPICS	AFASSA	N/A	0,33								
IPICS	AiBST	0,83			0,78			0,84			0,73
IPICS	AiBST	1,00			0,28			0,75			0,77
IPICS	ALNAP		0,40			0,25					
IPICS	ALNAP		0,58			0,68					
IPICS	ANCAP		0,55			0,70			0,75		
IPICS	ANCAP		0,68			0,70			0,80		
IPICS	ANEC				0,45			0,39		0,64	
IPICS	ANEC				0,20			0,52		0,48	
IPICS	ANEC									0,59	
IPICS	ANFEC				0,18		0,61	0,34			0,55
IPICS	ANFEC				0,43		0,57	0,61			0,48
IPICS	ANRAP					0,60			0,68		
IPICS	ANRAP		0,58			0,65			0,64		
IPICS	BAN04	0,88	0,80		0,78			0,84			1,00
IPICS	BAN04	0,54	0,78		0,53			0,57			0,68
IPICS	BAN05				0,20		0,57	0,57	0,61		
IPICS	BAN05						0,23	0,57	0,71		
IPICS	BOL01										0,52
IPICS	BOL01										0,59
IPICS	BUF01		0,50	0,63	0,63			0,66			0,48
IPICS	BUF01		0,53	0,50	.			0,93			0,77
IPICS	BUF02	0,71	0,65	.	0,55			0,93			0,93
IPICS	BUF02	0,24	0,25	.	.			0,46			0,61

⁴² In the latest set of assessments there were 11 assessment criteria, namely: Scientific quality; Justification/Strategic relevance; Clear and realistic objectives; Feasibility; Expected outcomes; Postgraduate education potential; Leader's scientific and management capacity; Sustainability; Scientific achievements previous period; Educational achievements previous period; and Outreaching activities.

ANNEX 5 – ANALYSIS OF MONITORING DATA

PROG	CODE	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
IPICS	CAB01		0,48	0,88			0,55			0,48	
IPICS	CAB01		0,63	0,28			0,64			0,59	
IPICS	ETH01			0,88			0,77			0,91	
IPICS	ETH01			0,58			0,84			0,80	
IPICS	ETH02				0,25		0,55			0,68	
IPICS	ETH02				0,23		0,77			0,41	
IPICS	ETH03					0,25		0,66			
IPICS	ETH03					0,40		0,30			
IPICS	ETH04					0,68		0,86			
IPICS	ETH04					0,60		0,59			
IPICS	FOSSNA		0,20								
IPICS	FOSSNA		0,28								
IPICS	KEN01		0,33	0,40	0,43			0,93			0,64
IPICS	KEN01		0,68	0,38	0,60			0,43			0,71
IPICS	KEN02			0,70	0,38			0,64			0,41
IPICS	KEN02			0,25	.			0,66			0,32
IPICS	LANBIO	0,46	0,73			0,35			0,86		
IPICS	LANBIO	0,71	0,53			0,55			0,61		
IPICS	LAO01					0,60			0,68		
IPICS	LAO01					0,63			0,55		
IPICS	LAO02	0,54		0,70							
IPICS	LAO02			0,60							
IPICS	LAO03	0,33		0,15							
IPICS	LAO03			0,30							
IPICS	MAL01	0,88			0,83			0,57	0,30	0,30	
IPICS	MAL01	0,54			.			0,27	0,30	0,30	
IPICS	MAW01		0,65								
IPICS	MAW01		0,80								
IPICS	NABSA		0,63			0,63		0,55			0,32
IPICS	NABSA					0,40		0,50			0,71
IPICS	NAPRECA					0,20			0,55		
IPICS	NAPRECA		0,53			0,65			0,52		
IPICS	NITUB		0,53			0,78			0,80		
IPICS	NITUB		0,83			0,65			0,55		
IPICS	RA Biotech	0,54	0,50			0,50			0,68		
IPICS	RA Biotech	0,75	1,00			0,95			0,43		
IPICS	RAFPE				0,25			0,43			
IPICS	RAFPE				.			0,39			
IPICS	RWA01						0,57		0,27		
IPICS	RWA01						0,41		0,41		
IPICS	SARBIO		0,23	0,25							
IPICS	SARBIO			0,43							
IPICS	SEANAC		0,53			0,50			0,89		
IPICS	SEANAC		0,93			0,58			0,75		
IPICS	UGA01							0,23	0,50		
IPICS	UGA01							0,75	0,46		
IPICS	UGA02								0,61		
IPICS	UGA02								0,57		
IPICS	ZAM01			0,30	0,50			0,57			0,46
IPICS	ZAM01			0,25	0,60			0,64			0,43
IPICS	ZAM01										0,75
IPICS	ZAM02						0,55				
IPICS	ZAM02						0,61				
IPICS	ZIM01			0,60			0,57			0,75	
IPICS	ZIM01			0,78			0,64			0,75	
IPICS	ZIM02		0,83			0,58		0,64		0,39	
IPICS	ZIM02		0,55			0,68		0,41		0,36	

CONCLUSIONS

This analysis set out to investigate whether any patterns in the ISP support and its results could be discerned from the numerical data provided by ISP, and whether such pattern could help unveil any nuances in that support not visible from the analysis of documentation and the interviews. Given the type, scope and level of disaggregation of the data, it is possible to draw the following conclusions:

- The length of ISP support does not seem to impact on the degree of financial dependency of the research groups and scientific networks. This is true for all programmes, and for each of them individually, and no distinction was found between the performance groups and networks.
- The volume of funding does seem to correlate with the scientific output of both groups and networks, as measured by the number of graduates and publications. The correlation is weak though, which is consistent with the fact that there are several other important factors affecting scientific output. In the case of ISP there are also differences in the type of support between groups/networks, and in how grantees report on the number of graduates that might explain some of the variability. No geographical or contextual patterns could be discerned.
- There is no discernible effect of the ISP support in terms of the gender balance among staff at the research groups and scientific networks supported. IPICS grantees exhibit greater gender balance on average than grantees in the other two programmes, which remain strongly male dominated. This is likely a consequence of the fact that there are more women in chemistry than in mathematics and physics in the countries receiving ISP support. Of the 61 grantees for which data was available, only 13 progressed towards greater gender balance in the period 2011-2016. No geographical or contextual pattern was discerned among those 13.
- Similarly, the analysis did not reveal any consistent change in the quality of the applications of groups and networks to ISP funding, using reviewers' ratings as proxy for application quality. In several cases however, we did observe significant differences in how the same group or network was assessed by the different reviewers. Occasional changes in the review panel and in the writers of the grant applications over the 10-year period for which there is data (2008-2017) are likely to explain some of the variability in the ratings, though.

Annex 6 – Analysis of the ISP logical framework

This annex briefly reviews the ISP logical framework for the programme period 2014 – 2018 to assess the programme design in relation to a results based management approach and to see what it can contribute to developing a draft Theory of Change.

We start with a brief introduction to log frame analysis. Logical frameworks (logframes or performance frameworks or results frameworks) are tools for programme management and learning. Their purpose is to set out in detail the logic that underlies the objectives of a specific intervention, project or programme in such a way that progress towards those objectives can be monitored over time and adjustments made if achievement falls short or exceeds what was planned. The logframe shows the causal links that exist between activities, outputs and outcomes i.e. if activities are implemented as planned the outputs should be delivered and if these outputs are delivered then the outcome or outcomes should be achieved. The logframe and associated monitoring should be concerned only with what an organisation can deliver or – in the case of objectives – can demonstrate that it has made a measurable contribution towards. Underlying assumptions (external factors affecting the programme) are an important element of logframes as it is only if the assumptions hold true that outputs can be delivered and outcomes achieved.

Logframes are normally time-limited (e.g. set over 5 years) meaning that the logframe should set out the activities, outputs and outcomes that an organisation can realistically expect to deliver and achieve within that period, given that organisation's capacities and resources.

An outline example of this for just one aspect of capacity development is shown below:

Objective: To contribute to an increase in the number of PhD students trained in home universities in universities where the ISP is supporting RGs and SNs.				
Activity	Outputs	Intermediate Outcomes	Outcome (December 2023)	Assumptions
Provision of: - equipment and resources - short-term overseas fellowships for PhD students	Improved facilities for training PhDs Quality of PhD training in home	X% decrease in number of PhD students on sandwich training	X% increase in number of PhD graduates in ISP-supported RGs and SNs who have been	- That home universities actively support this development - That funding for activities is sufficient

- support to upgrade teaching and supervision skills of RG leaders - courses run by overseas lecturer - (where relevant) coordination with bilateral programme to improve university environment etc.	universities is strengthened	in ISP-supported RGs and SNs X% increase in number of PhD students being trained in home universities in ISP-supported RGs and SNs	trained in home universities	- (Where relevant) that coordination with bilateral programme takes place and is effective
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A Theory of Change operates in a similar manner to show the causal logic underlying an intervention. However, it is typically more schematic than a logframe and does not set out activities and outputs to the same level of detail. The Theory of Change and the logframe for any programme go hand in hand – the Theory of Change expresses the logic of an intervention and the logframe then sets out in greater detail how this logic will be implemented in practice, over a given period and with a given set of resources and capacities.

The origins of the log frame structure used by the ISP may be traced back to the programme application document for the period 2014-2018 (ISP, 2013b). This was the first time a log frame approach to the programme had been used by ISP and followed a recommendation from the evaluation of the previous period (GDH, 2011) that this should be done. The application form used by the programme in Annex 1 (ISP, 2013b p48-50) lays out the key logic hierarchy (activities, outputs, outcomes and objectives) that Sida had established drawing on the OECD/DAC definitions. To some extent the application follows this structure stating an overall goal and two expected higher-level outcomes (ibid: p14) but then shifts its terminology and talks of a general objective (which could be interpreted as the goal) and three subordinate specific objectives (a terminology and structure common to scientific research proposals).

It then goes on to state (p14) that ‘the objectives link to expected outcomes in a logistic framework (Tables 1, 2, and 3)’. These tables which are the central thread in the ISP programme RBM framework and subsequent monitoring identify the outcomes that will lead to the specific objectives but they do not explicitly link the achievement of these specific objectives to higher level outcomes and it is confusing to have outcomes both below and above objectives. In other words the logical framework is not there in its entirety, only elements of it. Indeed the second of the higher-level outcomes (which relates to effects on Uppsala University and ISP partner universities) is not specifically addressed by any of the specific objectives.

This approach to the logical framework appears again in the ISP 2013-2017 Strategic Plan (ISP, 2013a) which clearly states ‘that the three specific objectives provide the base for the RBM approach’ (ibid, p3) and the final iteration of which appears as Appendix 1 of the 2013 ISP Annual Report, published in 2014 and referred to in subsequent annual reports as the authorised source. Figure 13 lays out in outline the hierarchy of the ISP aims as presented in the 2013 ISP annual report. The ordering of the hierarchy follows the structure of the narrative account presented by ISP.

Figure 13 - The logical framework of ISP

		Vision	
	To efficiently contribute to a significant growth of scientific knowledge in low-income countries, thereby promoting social and economy wealth in those countries and by developing human resources in the world as a whole		
		Overall Goal	
	To contribute to strengthening of scientific research and postgraduate education within the basic sciences and to promote its use to address development challenges		
		General Objective	
	To strengthen the domestic capacity for scientific research and postgraduate education by long-term support to research groups and scientific networks in these fields		
		Expected outcomes	
Expected outcomes for low income countries			Expected outcomes for collaborating partners
More well-qualified postgraduates and the increased production and use of high quality scientific research results, relevant to the fight against poverty			An expanded global perspective, an enhanced awareness and knowledge of the potentials, conditions and relevant issues of research collaboration with low-income countries, and an increased collaboration with scientists in those countries
Specific Objective 1		Specific Objective 2	Specific Objective 3
Better planning of and improved conditions for carrying out scientific research and postgraduate training		Increased production of high quality research results	Increased use by society of research results and of graduates in development
13 Outcomes		5 Outcomes	4 Outcomes

A number of observations can be made about this structure.

First this five-tier level (vision, overall goal, general objective, expected outcomes and specific objective) is unduly complicated and does not reflect the nature of the ISP, in terms of the ISP’s activities, outputs and outcomes. A logical (or performance) framework serves management purposes by tracking progress in

activities, outputs and outcomes that are within the remit of the programme. One would not therefore expect to see a vision reflected in a logical framework since this is beyond the programme's scope and cannot be measured. It is also far from clear why both a General Objective and Overall Goal are needed (or what the difference is between them) or what the logic connecting specific objectives and expected outcomes or expected outcomes to the general objective is. This is reinforced by the fact that only the achievement of the bottom tier (specific objectives) has been monitored, although with limited monitoring of SO1 which is arguably the most important. There is no systematic monitoring above the level of these objectives, limiting any assessment of what the specific objectives contribute to. This structure has no operational use as a monitoring tool for an overall assessment of effects and changes supported by the ISP or as a basis for the evaluation.

Second there are several points of disconnect. The expected outcomes for collaborating partners are not explicitly connected to any specific objectives or outcomes or higher-level goals. They are also fairly abstract and therefore not easily assessed. Specific objective 3 (SO3) is more likely to be an outcome of SO 1 and 2 and therefore is not at the same hierarchy level as these first two SOs.

Third the ISP at various levels makes strong claims to developmental relevance that do not appear to be fully justified. The goal talks of research for use to address development challenges, the expected outcome for low-income countries refers to research relevant to the fight against poverty and that the development of science promotes critical thinking based on scientific evidence, necessary for democracy development. In including these higher level goals into their results framework, the ISP appears to have incorporated Sida objectives that are beyond the ISP's capacity to influence or control. Given the overall justification for the programme and its long-term nature these are claims that need robust assessment.

Fourth the phrasing of goals, objectives and outcomes also needs tightening. In the case of goals and general objective they need to be made specific in terms of the target countries and specific disciplines. SO1 essentially seeks to contain two rather different objectives, the one concerned with better planning and the other with improved working conditions, which require somewhat different activities to be delivered. SO3 in our view is beyond the reach of the ISP. The ISP can have an objective of ensuring the relevance of supported research to development problems and challenges but it has no capacity to influence whether the results of research are used to this end.

The specific objectives are where the focus of the ISP monitoring has been, structured around the outcomes that have been defined for each SO. Matching each SO table with the outputs and outcomes, is a second table of target outcomes with indicators and a base line which set the monitoring framework for each SO.

For SO1, 13 outcome measures have been identified six addressing the quality of grant applications and research funding, two gender balance issues, two graduate completion, one collaboration, one technical resources and one environmental outcomes. In the debriefing meeting in May 2018 it was learnt that ISP aims to increase local training of Masters and PhDs (leading to an associated decrease in overseas sandwich courses) and to encourage networking. The current outcome measures therefore do not track what the ISP is aiming to achieve. For SO2 there are 5 outcome measures, two addressing publications and contributions to conferences, two numbers of graduates and one publication by PhD students. SO3 has four outcome measures, three concerning outreach and use and one staff retention. All the monitoring is quantitative and 11 of these indicators provide the agreed basis of reporting to Sida (ISP, 2016 p22-26).

The construction of baselines and challenges of interpreting exactly what the metrics or performance indicators show and do not show has been an issue discussed in the annual reports and in some ways these methodological issues have become the centre of attention. But the key questions here are more what do average values taken across the full cohort of supported groups and networks tell us about processes of change given that groups and networks are at different stages of support and development (ISP, 2015: p29). Table 26 below indicates that the research groups and networks fall into distinct age cohorts and averaging this out ignores this significant variable. It is an approach to monitoring that removes country and university context out of consideration and does not provide a basis to systematically question the overall programme logic or formally learn from the process of implementation. Answers to these questions cannot be derived from working within the existing logical framework. A broader Theory of Change and logframe that corresponds more closely to what the ISP does and is trying to achieve is needed to relate programme activities to overall outcomes and goals.

Table 26 - Number Research Groups and Scientific Networks by discipline and period of establishment

	When established:			
Chemistry	Before 2000	2000-2010	2011 to present	Total
- Research Groups	1	8	9	18
- Networks	6	3	3	12
Mathematics				
- Research Groups	0	2	0	2
- Networks	0	2	0	2
Physics				
- Research Groups	7	5	6	18
- Networks	2	1	2	5



Evaluation of the Sida supported programme “International Science Programme 2014–2018”

This evaluation takes stock of the results achieved and aims to provide new thinking on the future development of the International Science Programme, a programme run by Uppsala University providing long-term funding to the development of research capacities in low income countries in Chemistry, Mathematics and Physics.

A core conclusion from the evaluation is that ISP delivers a significant public good from its support to the development of basic scientific research capacity with the Research Groups and Scientific Networks that it works with.

The evaluation recommends ISP to focus on adapting to the shifting landscape in support of science education with new actors and networks, greater levels of funding and an increased global emphasis on science and technology. ISP needs to be more strategic in leveraging its distinct contribution to capacity development in this changing landscape. ISP should define clearer horizons for support to groups and networks, informed by more systematic assessment of baseline conditions and assessment of capacity changes.

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