Sida Evaluation 01/22

Expanded Support to the International Sciences Programme (ISP) in Uppsala University

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Department for Research Cooperation

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Table of Contents

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Executive Summary

1 The International Science Programme (ISP) at Uppsala University has presented a proposal to Sida-SAREC to expand its activities significantly, particularly to broaden support from existing physics and chemistry programmes to encompass three new subject programmes – in Biology, Mathematics and Geo-sciences (section 1.1).

2 The ISP has received long-term support from Sida, SAREC and Sida-SAREC for its activities that aim to assist developing countries in strengthening their research capabilities in the natural sciences through the support of long-term research collaboration between leading Swedish institutions and institutions in developing countries. In 1999, ISP supported 45 projects and 14 networks in the basic sciences in 16 developing countries (sections 1 and 2).

3 The evaluation was to assess the proposal for expanded support of the ISP, in particular to provide an expert opinion on the advantages and disadvantages of the the expanded programme (EP). The assessment covered the following aspects: general quality of the proposal; whether it is demand- or supply-driven; the systems proposed to choose and develop project; the ownership and sustainability of the programme; the merits and de-merits of centralised/decentralised programmes; the willingness of Swedish partners to be involved; the current level of support for Biology, Mathematics and Geosciences; and cost comparisons between different models of ownership (appendix A).

4 The assessment was conducted by: reviewing the proposal itself; reviewing related documentation including previous evaluations; visiting ISP, Sida-SAREC, Swedish university partners; visiting the Universities of Dar Es Salaam and Zimbabwe and interviewing senior scientists (14 in all), conducting telephone interviews in four other African universities (Addis Ababa, Asmara, Eduardo Mondlane and Makerere), a total of 11 interviews; and telephone interviews with other Swedish scientists. The assessment attempts to get opinions of these senior scientists about the EP as articulated in the terms of reference of the assessment (section 1.2).

5 The EP, in brief, proposed an expansion of the physics and chemistry programmes, and a major expansion into three further programmes: Biology, taking some projects from the existing Chemistry programme, and linking with that programme; Geoscience, taking some projects from Physics and Chemistry and building links with the physics programme; and Mathematics. The new subject areas would focus solely on African universities and on building research capacity, including the training of new cohorts of young scientists (sections 1 and 2).

6 The general quality of the proposal was assessed using routine programme assessment techniques. The eight volume proposal contained a large amount of relevant information, particularly about the existing programmes, but also giving evidence of needs in the basic sciences in African universities. The proposal for the expansion into three new subject areas was not so clearly set out. The EP did not, except in one subject area, clearly articulate aims and objectives for the new subject areas. The actions planned to establish new projects and networks were not clearly laid out – rather there was an assumption that the existing ISP programme areas would be the model used. However, the ISP chemistry and physics programmes are significantly different in some respects. The evidence for each new subject area was coherent but not complete, with much stronger information from eastern and southern Africa than from other regions (section 4).

7 The ISP model has certain key characteristics, developed over more than 25 years, that are important to assessing future support. The focus is on basic sciences, it is project and network based, rather small funding per project/network but over a very long time frame, it involves sandwich research training, strong hands-on monitoring and evaluation by the programme directors, emphasis on local capacity building of labs and local degree registration, hosts for supervision in Swedish other developed and in developing countries. Most links are north-south Swedish/developing country, but with an increasing south-south dimension (section 3).

8 Trends during the 1990s include: the expansion of networks, in Chemistry; a move to the most needy universities, and thus a shift towards African universities; a trend towards more interdisciplinary projects and networks; and some stronger developing country teams asking to be more involved in regional capacity building (sections 2 and 3).

9 For its partners, the ISP model and system has major strengths. For example, it gives long-term support, links sandwich training based in students own country with support for local laboratory establishment, and has a reputation for effective and efficient hands-on direction and administration. However, the resources per project are relatively small, ISP tends to take on the procurement and administration of research, and fund management remains in ISP (section 3.2).

10 To the extent that the EP was proposed by ISP and senior scientists did not know formally about the proposal to broaden into three extra subjects, it was supply-driven. However, ISP could also have been responding to a series of signals. First, the SAREC evaluation of 1992/93 recommended disciplinary tidying and boundarying, narrowing physics and chemistry and adding other subjects. Other signals have come from ISP projects leaders, calling for increased interdisciplinary research, especially between chemistry and biology. Finally, there are signals, included in the ISP EP evidence, that: a new generation of natural scientists needs training in Africa; there is a need to support the rebuilding of some African universities after two decades of difficult circumstances; and applied research in ecology, environmental sciences, and so on, needs underpinning with some more fundamental research (section 4.2).

11 The criteria in the EP for selection of new projects and networks in the new subject areas are not made clear. However, ISP has said that the ISP model will be used. This involves a verbal invitation to a limited number of countries and limited number of institutions by the Programme Directors. A recent IPICS meeting in Chile (1997) recommended a broadening of this approach to include a call every five years as well as the targeted approached used by ISP (section 4.3).

12 There is no question that more support is needed for the subjects biology, mathematics and the geo-sciences. All six universities where interviews were conducted had major needs in those subjects. Mathematics had the most serious needs that were not, at present, being met. There are signs that mathematics communities in some African universities are prioritising and activating new research groupings, both inside and between universities. Biology and geo-sciences also had needs, for example in staff development of young academics, for upgrading laboratories, and for research into local species and ecology. Research is uneven but strengthening in these subject areas (section 5.1).

13 Universities have significantly improved their capacity to organize and conduct research in recent years, albeit from a fragile state. There is real potential, if positive trends continue, for institutions to take on more of the research management activities normally done within each

university, providing they receive good support. ISP has the skills to assist with such capacity building (section 5.2).

14 There are arguments in favour of some decentralisation of some functions currently performed centrally by ISP, including administrative functions, financial management, and research management, internal and external such as proposal evaluation and monitoring of ISP projects (section 6.1).

15 On ownership, ISP is owned by Uppsala University, but its organizational design is more complex than that. First, it is set up as a national centre and thus has a role in the Swedish university system. Second, it has a large group of developing country universities where projects and networks are located; and third, Sida-SAREC is a 90% funder of the ISP. There is a need for more clarity on four key stakeholder relationships, between ISP and Uppsala University, Swedish universities, developing country universities, and Sida-SAREC (section 6.2).

16 Key recommendations are:

- To continue and slowly expand the present programme in physics and chemistry, including areas which interface with biology and geo-sciences
- To begin planning for a programme in mathematics, to include stronger stakeholder ownership, particularly of developing country universities in Africa
- Not to begin separate programmes in biology and the geo-sciences, but to continue support through physics and chemistry
- ISP to respond to the gradual strengthening of African universities by decentralizing and building capacity to enable decentralization
- ISP to build stronger formal decision-making relations with developing country universities and scientists by adding to the Board, setting up north-south proposal evaluation and monitoring panels, and to consider other recommendations in sections 6 and 7 (sections 6 and 7).

1 The International Science Programme (ISP) – the proposal for an expanded program

1.1 The proposal

The International Science Programme (ISP) at Uppsala University comprises two units – the International Programme in the Physical Sciences (IPPS), which had its origins, under a different name in 1961, and the International Program in the Chemical Sciences (IPICS), which originated in 1970. The basic aim of ISP is 'to assist developing countries in strengthening their research capacities in the natural sciences' through the initiation and support of long-term research collaboration between leading Swedish institutions and institutions in the developing countries.

ISP cooperation has several key features: it is project-oriented, long-term (15–20 years is not uncommon); training is of the sandwich type, if possible based on degree registration at home universities; and it involves the equipping of local labs and the development of local research environments; multiple use of scarce and expensive equipment; and ISP uses Swedish universities, universities in other industrialized countries, and southern universities, to provide the expertise necessary to build capabilities. Over the years it has moved support to the countries and universities that most require basic capacity-building in research.

Unlike the other three organizations that SAREC supports with aim to strengthen research capacity in the basic sciences, The International Centre for Theoretical Physics (ICTP), the Third World Academy of Sciences (TWAS) and the Third World Organization of Women Scientists (TWOWS), ISP has become totally dependent on SAREC support.

The most recent proposal from ISP is for a large expansion (more or less to double) the programme from 56m SEK in 1997–99 to 111m SEK in 2000–2002. ISP proposes an expansion of the programme to include support in the subjects of Biology, Mathematics and Geology as well as the ongoing Physics and Chemistry programmes. SAREC extended support in 2000 to preserve continuity whilst the present evaluation could take place (see TOR, appendix A for details).

The terms of reference requests a wide-ranging assessment with the following main elements:

- A review of the general quality of the proposal (see section 4.1 for findings)
- An analysis of whether the expanded programme (EP) is demand- (developing country) led or supply- (an ISP initiative) driven (see section 4.2)
- Analyze the criteria that would be used to search for and select proposals (section 4.3)
- Assess the conceptualization of 'ownership and sustainability' of the EP (section 6.2)
- Assess the merits and de-merits of centralised and decentralised programmes (section 6.1)
- Assess the willingness of other Swedish institutions to participate in the EP (section 3.2)
- Analyze the extent to which geology, mathematics and biology receive support in some selected countries (section 5.1)

- Compare costs of alternative arrangements of comparable quality in scientifically more advanced developing countries (section 6.3)

1.2 Organization of the assessment (evaluation methodology)

The assessment was conducted as follows:

(i) the proposal itself (including enclosures and appendices) was read and analyzed. The proposal was an eight volume document (see Bibliography) which was read and analyzed and used in various parts of this report

(ii) a series of related documents was collected, mainly from ISP and SAREC, and analyzed. These included further project and programme documents from ISP, a previous evaluation of ISP, and some country evaluations of science programmes

(iii) Visits were made to Swedish institutions and to individuals in institutions: Sida-SAREC; ISP and Uppsala University; Swedish Agricultural University; Karolinska Institute; KTH)

(iv) Telephone interviews were made with other individuals from Swedish universities

(v) Visits were made to the University of Dar Es Salaam in Tanzania and University of Zimbabwe, for discussions with research directors, Deans of Science, Heads of Science Departments and other scientists – a total of 14 interviews – see Appendix B

(vi) Telephone and e-mail interviews were conducted with research directors, Deans and Heads of Science Departments in the University of Addis Ababa, Ethiopia, University of Asmara, Eritrea, Makerere University, Uganda, and Eduardo Mondlane University, Mozambique – a total of 11 interviews – see Appendix B

(vii) Some limited data was collected on costings

(viii) The interviews (iii)-(vi) used semi-structured schedules to cover the issues set out in the Terms of Reference, Terms of Reference were sent in advance so that staff could reflect on the issues before the interviews. The interviews were with senior scientists from southern and eastern Africa and Sweden, around half of whom had close relations with ISP and around half had not.

It should be emphasized that one key requirement of the evaluation is to obtain a wide range of ideas and opinions on support for research in the Basic Sciences. The report uses quotes from those interviewed as much as possible. Sometimes senior scientists gave opinions on generic issues, not directly relevant to the assessment, but important for basic sciences support more generally. One example is the opinions on network support. I have taken the liberty of including this material if it feels important for those responsible for such support in Sida-SAREC.

Overall, the assessment is based around a key argument. The coming decade, hopefully, will see a major advance in he strengthening of African universities – that is the key goal of many universities. ISP already works to improve institutional capacity to manage and conduct research through its support of projects and networks. How should it respond to the possibilities of significant strengthening? The assessment attempts to give some perspectives on this question.

2 ISP – context

2.1 Essential background

ISP supports the establishment of research activities in physics and chemistry in a range of developing countries in Asia, Latin America and Africa. IPS has set itself the task of 'initiating and supporting long-term collaboration in research, of foremost Swedish institutions with institutions in the developing countries. The purpose is to increase the research capacity of universities and research institutes of the Third World. ISP also encourages regional collaboration amongst countries of the Third World in their respective fields of the program' (IPPS Supported Research Groups, 1998, p1). The overall purpose of IPS is to: develop independent research teams to an international level, generating useful research results to be disseminated and implemented for the development of the country or region; to select problem-oriented projects, of high relevance to the country or region concerned, for long-term support; and, to assist in the process of building up sustainable research environments.

At the beginning, ISP was a seminar system for physicists from developing countries. In 1970 a similar seminar in Chemistry began, using physics as a model. ISP had a scholarship programme to bring developing country scientists to Sweden for a year (SAREC, 1994). Activities have gradually evolved so that today the aim is to provide long-term support to selected research groups and to research projects that develop indigenous research capacity and generate good quality scientific results.

The support towards developing sustainable research environments normally involves north-south and increasingly north-south-south and south-south relationships. The approach involves a mixture of training, laboratory or field equipment build-up, workshops and conferences.

ISP operates with a number of key characteristics. For example, training is normally of the 'sandwich' variety, where researchers are encouraged to remain in their home institution as much as possible, to set up a home research environment; the developing country researcher is normally registered for degree at home research establishment, with external advisors/supervisors from Swedish (or other host) institution.

Institutionally, ISP is a unit within the Faculty of Science and Technology at Uppsala University. It is not, however, a teaching and research unit of the Faculty, acting solely as an international links unit through its ISP activities. Thus, it is not a part of the Uppsala University International Office. It has a Board, appointed by University of Uppsala, which meets twice a year, and an Executive Committee, which meets four times a year.

In 1999, ISP was supporting a total of 45 projects and 14 networks, the majority in 'low-income countries'. The projects were located in 16 countries (Ethiopia, Kenya, Nigeria, Tanzania, Uganda, Zambia, Zimbabwe and Cameroon in Africa, Bangladesh, Sri Lanka and Thailand in Asia, and Colombia, Ecuador, Chile, Peru and Urguay in Latin America. Of these, 26 projects and two networks were supported through the Physics program (IPPS) and 19 projects and 12 networks through the chemistry program (IPICS).

2.2 The model and system (strengths and weaknesses)

This brief sub-section reviews (in table 2.1) the ISP approach and model – its strengths, and also its potential weaknesses. The short review allows later assessments, opinions and reflections to be put into context. We take each key characteristic and rehearse the arguments for and against it

Table 2.1 The ISP model

Strengths	Weaknesses
• Basic sciences-physics and chemistry • There is much less support for basic sciences than applied sciences in developing countries; • ISP adds to the major Sida-SAREC support to basic sciences, with commitment to institutional strengthening as well as the strengthening of 'good' science • Disciplines can build research areas without pressures to become applied, interdisciplinary, and short term	• Some basic physics and chemistry might need to be done in function of its strategic relevant to application in developing countries or regions • Could become too disciplinary when many problems cross disciplinary boundaries
Long-term support • Allows capacity-building, continuity, and the ability to survive difficult periods in research project/group development • Strengthened groups can support newer groups	• Not much flexibility to support new groups in any three-year period
All round support emphasizing local capacity • Sandwich training allows home laboratory environments to grow, and whole research groups to be developed • Investment at home keeps researchers in home bases • There is strong procurement support and technical support for equipment maintenance • Technicians and administrators are trained as well as academics	• Hands-on support could be too intense after an initial period, lowering local development of procurement, maintenance, local equipment purchase and local production • Research management capacity building could be constrained. Overall institutional, fund-evaluation and selection of projects, laboratory management at national level could be held back if there is a 'fall-back' to an efficient system in Sweden – could be 'too cosy' • Could overlap with IFS
Networks • Can give a role to stronger institutions as they become independent of ISP support • Can bring in more groups than can be funded through project and group support system	• Stronger local institutions could compete with ISP • Less funds for projects and groups • Are networks more effective for the strong or the weak – danger of using networks before researchers are ready to make best use of them
Strong Sida-SAREC support • Gives good long-term support to ISP with little need to look for alternative funding **Focus on quality of research** • Gives incentives to gradually increase quality of outputs with long-term commitment	• Could become 'too cosy' with little pressure to innovate

2.3 Previous evaluations and responses

There have been three previous reviews of the ISP by SAREC, according to ISP: in 1977/78 before funding was transferred from Sida; in 1985/86; and in 1992/93. This section focuses on the most recent evaluation (SAREC, 1994), but also notes some internal reflections from ISP scientists. The SAREC recommendations can be divided into those which emphasized continuation of existing policies and practices, and recommendations for changes. A set of key recommendations were made in the 1992/93 evaluation. We list recommendations below and for each provide (in italics)

comments from ISP on how they responded to the recommendations which were discussed at the ISP Board, and also some comments by myself (evaluator) arising from ISP documentation and interviews.

Those recommendations that emphasized continuation of previously existing practices included the following:

(i) support university institutions within developing countries, that is, avoid diluting support away from universities towards other research institutions

ISP (written response to evaluator) comments: 'ISP is mainly engaged in capacity building and thus engaged with university departments. This is now the case for close to 100% for the projects, and is also part of the activity of some networks'.

(ii) continue with workshops and seminars to encourage researchers to continue involvement after project completion and to build new relationships, focusing on south-led initiatives

ISP comment: 'Such scientific activities in the developing countries are constantly supported through the project supports and on request by the projects. They form one important activity by most networks.'

(iii) continue with the sandwich approach to training so that southern scientists build up laboratories and institutional support within and around their home universities

ISP comment: 'Definitely a key priority'

(iv) stay with the long-term style of partnership and support.

ISP comment: 'Yes, since this is a must to build up a local research environment'.

Overall on recommendations (i) to (iv), there is no sign of significant change away from practices praised by the SAREC evaluation.

Another set of recommendations made suggestions for change and improvement, as follows:

(v) increase south-south-north links so that south-south research group links increase

ISP comments: 'S-S-N links were already a part of our activity and a part that we wanted to strengthen even further, since we judge this to be a very efficient way of supporting science in developing countries. We had for some years also wanted (and still want) to introduce triangular co-operation i.e. S-S-N which would include not only S-S and S-N co-operation but also a co-operation between the regional resource group and the group in the North. Regrettably, we have not got the funds for such co-operation.'

Evaluator comments: south-south-north links have increased, especially in the chemistry programme (IPICS), and in Africa and Latin America in both programmes.

(vi) involve Nordic countries more in ISP's activities and funding

ISP comment: 'Physics had for many years funds from the Norwegian government. Regrettably, these funds were withdrawn in connection with a re-organization of the Norwegian aid programme. It was not possible for the Norwegian Government to support a programme at Uppsala University any longer. The same arguments had already been given by the Danish Government and the Finnish Government has never been interested. We still judge it not possible to get such funding. However, we still make use of research teams in Denmark, Norway and Finland in cases when such teams fit better to the requests on support.

Evaluator comment: no evidence of funding from other Nordic countries

(vii) broaden the funding base

ISP comment: 'A "memorandum of understanding" exists with the IAEA as well as with Thailand. In the latter case this means that the ISP administrates activities completely financed by the Thai Government. Further, we steadily encourage and facilitate for the groups to get additional funding elsewhere in order to increase their budgets. It is not judged possible to presently broaden the direct funding base any further.

Evaluator comment: No further evidence of broadened funding in ISP reports. The Thai Government contract is a positive means of continuing sustained support after ISP's normal support finishes. It is a useful model.

Some ISP work involves it acting as sub-contractor to the developing country universities with respect to their SAREC funds. If this is at the initiative of the developing country, then it amounts to a client relationship with the developing country university, not Sida-SAREC, and is another source of funding.

(viii) give increased support to instrument construction, adaptation and development, perhaps in relationship with IFS

ISP comment: 'This is and has always been an important policy of the activities, since, many times a locally constructed piece of equipment is easier to maintain than a purchased one. In this connection we should not forget that the project support can also include training of technicians.'

Evaluator comment: No evidence of increased activity since 1993, except in the specific case of the NITUB network in Bangladesh (Network of Instrument Technical Personnel and User scientists of Bangladesh) that ran four training workshops on particular types of technique, between 1994 and 1997, and has an instrument repair programme. No clear evidence of a change from procurement advice (which ISP continues to give) towards the development of regional initiatives in instrumentation.

(ix) phase out gradually the more advanced countries, moving resources to countries most in need

ISP comment: 'exactly what happens.'

Evaluator comment: mixed evidence here. On the one hand, of movement from more advanced to less advanced countries. But not obvious from the funding …It might be that the advanced countries receive funding for south-south initiatives

(x) transfer administrative tasks to receiving institutions, where planning should be based

ISP comment: 'This has been part of our policy for many years. However, many groups do not prefer this possibility due to bureaucratic reasons as for example different fees, custom duties etc. Still, the planning is with the receiving groups.'

(xi) change board composition to avoid that funders are on the board (ISP, IAEA, UNESCO, etc)

ISP comment: 'This was done, but later SAREC wanted a representative once again. This is presently under discussions. UNESCO does not have a representative any longer but on the other hand, no funds are received from UNESCO either.'

Evaluator comment: Annual Report 1999 gives representation on the eleven member Board as six from Uppsala University, two from other Swedish universities, one from IAEA, one from Sida, and one from developing countries (from TWAS, Trieste).

(xii) programme reviewers for each programme from developing countries

ISP comment: 'Discussed by the board but not found feasible. Too costly.'

Evaluator comment: Lack of response by ISP is not a good indicator of movement towards southern ownership since the costs of a reviewer are not that great.'

(xiii) produce joint program catalogue

ISP comment: 'This could be made of course but has not been done so far due to practical reasons.'

Evaluator comment: no joint program catalogue but joint Annual Report, latest being 1999 (published in 2000)..

(xiv) keep admin costs to 20%

ISP comment: 'Now at 14.6% (see annual reports)'

(xv) lower staff travelling costs

ISP comment: 'It is viewed essential that the programme directors can regularly visit the projects supported. This includes visits to the projects as such as well as visits to resource groups both in the North and the South. The budget for this has been about SEK 600,000 for the last years, and is included in the administrative costs for ISP.'

(xvi) broaden the programme, by narrowing physics and chemistry, separating out geosciences and biology, and supporting maths and theoretical physics through ICTP or TWAS

ISP has responded to this recommendation with the proposal for an Expanded Program.

Evaluator comments: From the ISP information it is possible to see two key aspects. First, within the present programmes there is very significant research related to the biological and earth sciences. In IPPS, six (out of 26 projects) and 1 (out of two) networks, in IPICS 12 (out of 17) projects and 6 or 7 (of 12) networks. See also the section that follows this, for reflections from IPICS scientists.

Internal reflections among IPS scientists

Another interesting source of review and reflection is the occasional meetings within the IPS programmes, in particular from a large meeting of IPICS held in Chile in 1997 (Neimeyer, 1998) and a IPICS programme review (Liminga, 1996).

Liminga (1996) in the section 'strategy for the next decade' proposed a three-fold strategy:

- selection of projects should bear in mind that boundaries between disciplines are more diffuse and require multidisciplinary approach
- concentrate support on a limited number of projects, to build node points and well functioning research laboratories that can be used regionally
- increase support to regional networking.

Later, in 1997, a series of round tables was held at the Chile meeting, where a number of suggestions was made for the ISP, including:

- chemistry is broad and evolving and includes biology, and physics, geology and maths. It is important to be interdisciplinary
- successful IPICS projects could become partners in development. They might take responsibility for research capacity building in countries/universities with less capacity (and thus become partners of IPICS for national and regional research and training
- developed regional nuclei should continue to be funded as regional capacity builders
- selection of new projects could be by scouts, by invitation, by limited targeting, and a call once every five years

- workshop in science management for new young leaders.

To summarise, the ISP model and system has major strengths. It focuses on basic sciences, gives long-term support, allows sandwich training based on local postgraduate registration and laboratories where possible, and has a reputation for its effective hands-on direction and administration. The other side of the latter is that it has not succeeded in increasing local administration and management, fund-keeping or in appointing programme reviewers from developing countries. Neither has it succeeded in lowering its funding dependence, directly and indirectly, on Sida-SAREC.

3 The ISP system – as presently constituted

Section 3 looks at the present ISP programmes from two parallel perspectives – first from the perspective of the ISP centre in Uppsala University and then from the perspectives of the developing country and Swedish university partner scientists.

3.1 ISP from its reports

This sub-section uses information from the Annual Reports of ISP and elsewhere to give a panorama of the present programmes in Physics and Chemistry. It looks at continental distribution, the balance project/network, project and network funding levels, time-scale of support and the training dimension of ISP.

Number, Sectoral and Regional Distribution of ISP Projects and Networks

In 1999 ISP was supporting a total of 45 projects and 14 networks (one of which was a summer school). Of these totals 26 projects and two networks were supported through the IPPS, whilst IPICS supported 19 projects and 12 networks (see Table 3.1). IPICS networks are in all three what IPS calls 'regions' meaning continents (ie Africa, Asia and Latin America). The two physics networks were in Africa.

Table 3.1: Number, Sectoral and Regional Distribution of ISP Projects and Networks in 1999

Continent	IPPS		IPICS		Total	
	project	network	project	network	project	network
Africa	12	2	7	6	19	8
Asia	8	-	6	3	14	3
Latin America	6	-	6	3	12	3
Total	26	2	19	12	45	14

Sources: ISP, 1999, IPPS, 1997 and IPICS, 1997.

ISP total number of projects and networks show some changes (up and down) over time. For example in 1995/96 the number of IPICS projects was 23, this number dropped to 17 in 1997/98, and then rose to 19 in 1999. The details of changes are not clearly documented.

The list of all ISP supported projects and networks for 1998 is given in Appendix D3 below, together with some information collated from reports, particularly on length of project, fellowships, continuity of support, attachment of researchers to projects over time, and host laboratory distribution. From this list it is clear that many IPPS projects are in the area of condensed matter physics and material science. Many IPICS projects are in interfaces between biology and chemistry.

The Composition of Project and Network Funding

ISP's objective is to build and sustain the capacity for doing research and to create 'independent research teams to an international level'. Through ISP support the research units should develop the required number and quality of personnel (PhDs and masters), equipment, etc. and produce research results that can be published at internationally competitive levels. Project/network funding, therefore, reflects this long term objective of the ISP. Secondly, ISP fund allocation also reflects the economic base and status of physics and chemistry in the supported regions/countries. The drive

behind supporting networks seem to be based on (i) economising on resources through saving from economies of scale, and (ii) promoting regional cooperation. To this end resource centres are set up to serve as a focal point for a network (and avoid duplication of effort in establishing centres in each country).

Table 3.2 shows the volume and share of IPPS fund allocation for African projects and networks for 1999. Table 3.2 refers to Africa only because both IPPS networks (Eastern and Southern Africa Regional Seismological Working Group, set up in 1989, and African Laser, Molecular and Optical Sciences Network, set up in 1996) were in Africa.

Table 3.2: IPPS/Africa, 1999 expenditure

project/network	ISP Funding k SEK, 1999	shares
projects (12)	1845	82
networks (2)	417	18

Source: IPS, 1999, p.39

There are more networks in chemistry than in physics hence in IPICS the distribution of funds, between projects and networks, is more important. Looking at the distribution of IPICS in different continents (Table 3.1) it can be seen that in 1998 6 of the 12 networks were in Africa. In the same year Asia and Latin America each had three IPICS networks. Table 3.3 shows that in 1999 53% of IPICS funding in Africa went to networks (the average funding for all networks was 39%).

Table 3.3: Composition of IPICS supported project and network funding for 1999 (kSEK)

Continent	project	network	total	% of Total
Africa	1570 (47%)	1747 (53%)	3317	45
Asia	1401 (79%)	381 (21%)	1782	24
Latin America	1522 (67%)	765 (33%)	2287	31
Total	4493 (61%)	2893 (39%)	7386	100

Source: ISP, 1999, p.79-81.

Table 3.4 shows the ratio of allocated funds into projects and networks in Chemistry (ie the amount of project funds per 1 SEK that went to a network).

Table 3.4: The Ratio of Allocated Project Funds to Networks, 1997–99

Continent	1997	1998	1999	Actual, 1999
Africa	1.35:1	1.15:1	1.05:1	0.90:1
Asia	4.23:1	4.36:1	4.67:1	3.68:1
L America	1.85:1	1.83:1	2.10:1	1.99:1
Total	1.88:1	1.74:1	1.72:1	1.55:1

Source: IPICS, 1997, p.11

The observed trend (Table 3.4) is that more funding is going to networks – and increasingly so in Africa where, in 1999, the ratio of project to network funding was nearly 1:1. In Asia over 75 per cent of ISP allocated funding still goes to projects.

There may be competing explanations for these differences. First, networks are growing as a proportion of IPICS activity at a time when African activity is also growing – thus it may be 'natural' that networks are more important in African IPICS than in Latin America and particularly Asia.

However, it is often argued that successful networking depends on relative strength in research, and that networks are not so effective among weaker research units which need to be built up before networking can begin.

Table 3.5: Distribution of ISP funds by use and regions, 1998, kSEK

Region	IPPS				IPICS			
	training	Development	reg. network	total	training	development	reg. network	total
Africa	805.8	2888.7	198.5	3993.0	939	883	911	2732
Asia	928.1	1743.0	132.5	2803.6	492	612	276	1380
L America	335.9	1022.8	300.6	1559.3	373	1079	728	2180
Miscel.	135.5	242.4	0	407.9	146	213	85	444
Total	2205.3	5927.9	631.6	8763.8	1949	2787	2000	6736

Source: ISP, 1998 P.36 and 79

Distribution of funds can also be looked at in terms of uses of funds (training, development, and regional networks) and Table 3.5 shows the distribution of funds by use. The 'development' component (that is spending on items like the purchase of equipment and periodicals) accounts for a large part of the allocations, especially in Physics

Funding level of projects

The expenditure by project/network is rather low, the vast majority of projects/networks having expenditure below 200,000 SEK in 1999 (see Table 3.6). The average expenditure on chemistry projects/network is around 200, 000 SEK and on physics projects around 300, 000 SEK. Expenditure on networks does not seem to be that different to project expenditure.

Table 3.6 expenditure by project/network, 1999 SEK

Expenditure, 000 SEK	No of IPPS projects/networks	No of IPICS projects	TOTAL
0-99	13	9	22
100-199	7	7	14
200-299	2	5	7
300-399	2	5	7
400-499	1	3	4
500-599	2	1	3
600-699			
700-799			
800-899	1		1
900-999		1	1

Duration of Projects

As the Appendix D shows, the average length of support for IPPS and IPICS projects, is 13.4 and 15 years respectively, suggesting indeed that ISP projects are long term in nature. Appendix D1 and D2 give the duration of ISP support for each project (also of networks if data permits). Below is a summary of relevant information on the duration of project support organised from Appendix D1.

Table 3.7: Temporal Trend in IPPS Supported Projects by Region (1976–98)

Period project began	Africa	Asia	Latin America	Total
1976-79	2	1	1	4
1980-89	5	7	4	16
1990-98	5	-	1	6
Total	12	8	6	26

Source: Organized from Appendix D1

As Table 3.7 shows, most physics projects were accepted for support in the 1980s. 20 out of 26 IPPS projects have received 10 or more years of support. Four projects in particular (TAN:01/2, NIG: 02, COL:01 and SRI:01/1) have enjoyed 20 or more years of IPPS support. The average annual number of projects accepted for IPPS support is barely more than one (about 5-6 projects every five years).

In chemistry (Table 3.8) the rate at which projects were accepted for support was more evenly distributed over the decades. Most IPICS supported projects too have enjoyed 10 or more years of support. At least five of the 17 projects received 20 or more years of support. The youngest IPICS projects were BAN: 03 and SRI: 07 both set-up in 1995.

Table 3.8 Temporal Trend in IPICS Supported Projects by Region (1974–98)

Period project began	Africa	Asia	Latin America	Total
1974-79	1	2	3	6
1980-89	2	2	2	6
1990-98	2	2	1	5
Total	5	6	6	17

Source: Organized from Appendix D2

The average number of projects accepted for IPICS support per year is below one – that is about four projects for every five years. This low rate of project acceptance for support suggests that (a) resources available for project support are limited, and (b) given limited resources the ISP focuses on continuous commitment to project/network support.

Location of host laboratories

Table 3.9 gives the location of host laboratories within Sweden. Data over two years does not give a complete picture by any means, but suggest perhaps that the physics programme has a smaller more focused group of local host institutions, and uses Uppsala University rather more. The chemistry programme perhaps has a broader range of host laboratories, and uses Uppsala rather less.

Table 3.9 location of host laboratories

Location	Physics		Chemistry	
	1999	1998	1999	1998
CTH	4	6	4	5
KTH	2	1	1	3
Linkoping	2	3		
Lulea	2	2		
Uppsala	12	17	2	8
Swedish State Power Board	1			
Astra-Zeneca			1	
Lund			2	5
Karolinska			4	5
Huddinge Hospital			1	
SLU			4	3
National Food Admin.			1	
Mid-Swedish U. College			1	

Source: IPS, 1998, 1999

Table 3.10 gives a summary of the overall distribution of fellows in 1998 and 1999. There is a sense that institutions outside Sweden are used rather more in the Chemistry Programme. It also shows the relative strength of Latin American institutions as hosts for fellowships.

Table 3.10 International distribution of host institutions

Location	Physics		Chemistry	
	1999	1998	1999	1998
Uppsala	10	17	2	8
Rest of Sweden	10	12	19	21
Rest of Europe	3	1	4	6
US				1
Latin America	6	9	7	10
Asia	4	4	6	2
Africa	6	8	8	5

Source: 1998, 1999.

Continuity of Training

Overall more than 25 per cent of all ISP funds goes to training (Table 3.5). Often records on ISP supported training outputs are given in terms of number of PhD, MSc/MPhil and/or participants with fellowships periods of more than one month. Table 3.11 shows total IPPS and IPICS fellowships of one or more months. Accordingly over the years 1075 fellowships were given to ISP participants[1].

[1] IPICS fellowships for Africa and Latin America include 25 and 51 fellowships via networks, respectively.

Documents show that, as of 1998, there were 160 PhDs and 250 MSc that had received ISP support (ISP, 1998: 4). In IPPS and IPICS average project fellowship months are 77.6 and 91, respectively. Appendix D also shows that training is an essential aspect of each project and network. Reading figures, however, requires some level of caution.

Table 3.11: ISP Fellowships, 1997

Region	IPPS fellowships	IPICS fellowships
Africa	320	141
Asia	193	179
Latin America	124	118
Total	637	438

Sources: IPPS, 1997, p. 3 and IPICS, 1997, p. 18, 47 and 74.

The total number of fellowships does not add up to the total number of PhDs and MSc produced. 17 IPICS projects had 272 fellowships that were given to 133 persons. Average number of fellowships and fellows per project were 16 and 7.8 respectively. This means that on average there were two fellowships per person. Examples from individual projects show that CAM: 01, SRI: 02 and ECU: 01 each had 12, 16 and 24 fellowships, respectively. But under each project the number of people that received long term training were, respectively, 7, 10 and 11. The unique case was IPICS ECU: 01 that had 24 fellowships for 11 people. Of the 105 total fellowship months 53 % (i.e. 56 months) went to one person. Again these examples suggest that some individuals were getting more than one fellowship within a project and/or network.

Thus it is possible to imagine that many fellowships lead to sandwich programmes towards Masters and PhDs but many do not seem to. The data do not make clear the relative proportions of support given to a PhD candidate from ISP, from home institution, host laboratory and other sources.

The use of some indicators or data are not precisely defined. For example, records on 'persons trained', PhDs/MSc 'registered' and 'examined' and 'personnel engaged in projects and networks'. Whether the ISP has contributed to these outputs is not always clear. When ISP contributions are made clear it is also the case that the level of ISP contribution is not always obvious. It is mentioned that the cost per ISP supported PhD thesis is 25 per cent of the cost in Sweden (IPPS, 1997: 8). But contributions of participating countries and other institutions are not clearly accounted for. Also, there are less adequate data on terminated projects. For some indicators (eg, PhDs and MSc in physics) there are no historical data to trace continuity.

We asked ISP to clarify its information on continuity of training. The data on fellowships is by person for a single visit. Some fellows receive several fellowships but it is not clear which of those multiple fellowships are for postgraduate training. We wanted to find out if it is possible to say for each postgraduate student, especially PhD student, how many visits, with total number of months fellowship, it required to obtain a PhD? The reply reproduced in italics below shows that this was not possible:

'This is not possible since we always want every person to spend as much as possible of his/her time doing the research work in his/her home laboratory. It is the local environment for research we want to strengthen with the aim that every project should be able to conduct its MSc/PhD projects without the need to send students outside. This means that the time required for research work outside the own laboratory could be as much as 70% for projects that start more or less from scratch to 10% where more or less only complementary measurements are needed. The latter being projects that have been supported over a longer period of time. We also emphasize that students should not spend longer consecutive periods outside their home laboratories and that the student should be well aware of his/her role in the building up of the

local research capacity and take an active part in strengthen the local research environment. Most of the presently supported projects now manage the MSc programmes without any need for outside support.'

In terms of the continuity of projects/networks, an interesting indicator is the proportion of trained personnel who are still attached to the project. It was found that in the IPICS projects out of 136 staff (115 of them trained in Europe with ISP support) 100 of them were still involved in the ISP projects and/or in regular contact with ISP and affiliated institutions. This shows that at least 3 out 4 trained people were still in their home countries. However, numbers of ISP trained personnel that are still working for ISP-supported projects/networks vary from country to country. For example, in IPICS URU: 01 5 of the 8 staff were no longer related to the project.

Appendix D3 shows ongoing and completed research projects for 17 IPICS projects. As of 1998 there were 116 PhD and 243 MSc (sandwich and local) research activities that were carried out within 17 IPICS projects.

To summarise this sub-section, the 59 projects and networks are spread around 16 countries. There are some significant differences between the physics and chemistry programmes. For example the chemistry programme has many more networks, especially in Africa, with over one-half of spending on networks compared with less than one-third in Asia and Latin America. Physics has just two networks to chemistry's 12. Funding per project is relatively low, the vast majority of active projects receiving below 300,000 SEK per annum. Support is indeed long-term. 20 out of 26 physics projects and 12 out of 17 chemistry projects have received funding for more than ten years. There is a strong retention rate of scientists within their home university and research project teams. The other side of such long-term support is that less than one new project per year is funded. The data is not clear on continuity of training – the extent to which fellowships are more than one-off. First, the number of fellowships is less than the number of masters and PhDs attributed to ISP support. But in IPICS the average number of fellowships per fellow is two.

3.2 ISP from its partners

This sub-section reports the results of interviews with a wide range of partners and related scientists, particularly from six universities in Eastern and Southern Africa, and from Swedish partner institutions. Of the many interviews made, around two-thirds of the scientists interviews had direct or close indirect knowledge if ISP and we restrict this sections information to this group. The interview comments are summarised in bullet point form. Interviews asked first for the strengths and positive aspects of the ISP, then for the limitations and weaknesses. The bullet points below take the same structure. Quotes are chosen to reflect responses from several senior scientists. We have clustered the opinions by theme:

On ISP strengths:

Management and administration

- ISP acts as an 'active motor in the system', a 'spider in the web' activating and pushing hosts and fellows. Keeps an eye on people. ISP expects a lot from hosts
- 'ISP has a very simple reporting system, which makes life easier for the scientists'
- It is very flexible, for example, giving multi-fellowships to successful projects
- ISP is 'very, very efficient'

- ISP is good on procurement
- The ISP administrative staff are 'excellent and very committed'
- They take good responsibility for housing, etc compared to SAREC who expect host university to do everything
- 'ISP budget holding in Uppsala helps us because otherwise funds can get lost in the system'

Quality issues

- 'ISP activities are impressive and I have high regard for the programmes. The seismology research team, that now covers east and southern Africa, is largely a credit to ISP funding'
- ISP spend time on quality assessment and keep scientists up to scratch. 'There is a good balance between scientific quality and overall capacity building.' ISP tries to keep up the scientific level as well as institutional support. 'There is more emphasis on this in ISP than in bilateral'
- 'The research Project leader is given good responsibility. ISP hand picks good project leaders and sticks with them'

Overall

- 'Through short visits to universities like Uppsala I understand that our senior staff get the opportunity to refresh themselves'
- 'Support is long-term which helps to build up friendship and real collegiality'
- 'Allows good scientists to operate in difficult circumstances'
- ISP is good at 'beginning projects' which can later be supported in bilateral and thematic programmes
- Registration for higher degree is in home country which helps capacity building

On constraints side of the ISP:

Management and administration

- 'Funds are with ISP, not the institution so they don't get to build up financial management capability. This will become more of a problem as university systems are strengthened in the next years'
- 'Sometimes feel pressurised to take a student – when there is not much in it for me it is important that the student is committed to research'

Related to Swedish university relationship

- Most Swedish universities have International Departments. We could be using and pushing them to improve support to foreign students rather than expecting ISP to fill gaps. ISP would then be there for advice the International Secretariats of Swedish universities
- Desk fees do not cover costs of space. This is an increasing issue as the Swedish institutions begin to become more cost-conscious. It is not a good business proposition for the receiving institution
- There is a danger of ISP expanding to become another SAREC

Fellowships

- In the past lack of continuity was a problem. The 10 months fellowship was too short. But recently ISP started offering grants to former fellows to continue doing research
- Some students are not good. They are unaccustomed to work in the labs and some won't work with women, won't accept women's advice
- For such a long-term sandwich there needs to be a good rapport with supervisor before research begins. Supervisor needs to choose the student, to see and talk to the student and not just receive them

North-South relationships

- ISP needs to work harder to get senior scientists to come to developing countries instead of the other way round
- ISP need to get more involvement of those who work on the ground. It needs a proper forum for developing country input. ISP is not good on involving developing countries in its decisions. More developing country scientists are needed in its funding decisions

Regional collaboration

- Individual projects can build in only a small regional component

Institutional development

- On an individual basis I would say the programme is successful. However I do not know the broader impact of ISP on an institution. There is a need also to strengthen institutions and not just projects
- ISP resources are small compared to what we would have liked them to be. ISP funds are small
- It is limited to few subject areas, earmarked to individual projects
- 'PhD sandwich programmes are different to simple one-off fellowships since there are strong institutional issues. There are strong institutional issues here, they cannot just be individual or project related issues'
- The projects are good but it is difficult to get departments in the same university to work together in my experience – they might just as well be in different countries

Overall

- There is no salary component making it hard to keep going in home countries. Postgrads are given a little monthly stipend by ISP which is better than SAREC
- It's unrealistic to give lots of funds to bring people to Sweden, but little or nothing in home countries. It means that people spend too much time in Sweden
- There is no real follow-up after PhDs, for example, it is hard to get publications after students return. The 'diploma' thing can take precedence over scientific output in publications.

One part of the assessment involves finding out the extent to which Swedish partners would be prepared to be involved in an expanded programme. From the interviews made (with those already

involved, and therefore in Physics and Chemistry, it is hard to be categorical on this point. The relevant issues arising from the interviews are:

(i) overall goodwill towards trainees from ISP

(ii) a clear feeling that Swedish partners will be found, though it may get harder to get the best

(iii) strong positive feedback on the practical support given

(iv) a sense that the funding changes in Sweden were making it harder to 'give' lab space and resources without full cost-covering

(v) a sense that Swedish university International Offices – including that of Uppsala University itself could be better integrated into the ISP system.

To summarise, the partners perceived strengths of ISP cluster around management and administration and research quality. The perceived constraints within the programme cluster around institutional development issues, including decentralisation possibilities, the balance between north and south for responsibility and ownership, and on the changing situation in Swedish universities affecting ISP relationships.

4 General review of expanded programme proposal

This section first assesses, in section 4.1, the proposal regarding the new subject areas, particularly using explicit or implicit aims and objectives to assess the plans and models for each subject area, using evidence from the proposal and elsewhere. It then, in later sections, summarises where the initiatives arose, and the criteria that are proposed for choosing new projects.

4.1 Quality of proposal

The proposal from ISP contains a large amount of background material as well as the core sections of the proposal itself (see Bibliography). This information was analyzed with respect to the terms of reference. Background information has already been used in earlier sections, particularly section 3.1.

The present section focuses mostly on the materials sent regarding the expansion of the ISP with three new programs: Biology, Mathematics and Geosciences. It then looks briefly at the physical and chemical sciences programmes.

The most relevant materials are:

(i) the application letter itself

(ii) rationale

(iii) Expansion of ISP into Biology: Appendix 6 of proposal

(iv) Expansion of ISP into Mathematics: Appendix 7 of proposal

(v) Expansion of ISP into Geosciences: Appendix 8 of proposal.

Other documents, including background appendices 4 and 5 on physical and chemical sciences, and enclosures 3 to 9 were also used for this section.

For each new subject proposal an evaluation was made of the material enclosed in the proposal. Section 4.1 focuses on the quality of the proposal itself. Later parts of section 4 concentrate on how the programs are proposed to be established. Then sections 5 and 6 look at wider implications.

The following checklist was used to evaluate the proposal for each new subject area:

(i) the aims and objectives of the proposed program?

(ii) to what extent are the aims and objectives accurately turned into a set of actions for the next three years?

(iii) what model of support is envisaged? To what extent does it bring in southern decision-making?

(iv) what evidence is given for the need for a program? How good is the evidence produced? What are the strengths and weaknesses in the subjects?

(v) are there significant differences between programs in different subjects? Does the proposal take into account that biology and geosciences may have a stronger southern ownership issue – of resources, etc.

Table 4.1 gives a summary of the evaluator's assessment on these criteria. A more detailed summary is now given by subject area.

Table 4.1 Assessment of new subject areas

Criteria	Biology	Mathematics	Geosciences
Aims, objectives	Yes	Yes	No
Actions envisaged	Summarised	Weak	Weak
Model	ISP, link to Chemistry	ISP	ISP
Evidence	Summary data	Uneven data	Weak data
Differences	No		No

Biology

(i) Aims and objectives

The aims, as articulated in the proposal (appendix 6, page 4) are: to support promising groups of scientists at universities to create sustainable research programmes in biology. The aim is to start with 'green' part of biology, focusing on taxonomy, biodiversity, community ecology, conservation biology, with priority given to fundamental research that is essential for applied projects, so as to complement other sources of funding directed to more applied projects. The 'white' part of biology is proposed to begin in cooperation with the chemistry program.

The proposal makes the good point that there is significant support to a few institutes in Africa that are regarded as centres of excellence, but that there is rather less support for universities, where the fundamentals of the subject have probably deteriorated recently.

There is an assumption built into the proposal and all the other proposals that this is a program to support African universities. This was confirmed by ISP.

(ii) Actions envisaged

The areas for support are summarised above, there is no further information. The idea is to support 5–7 projects in the first three years.

The proposal is for a half-time Director plus half time assistant to share with Chemistry and a new secretary for all three new programs. The half-time director would be funded with Sida funds and the others with Uppsala funds. The Uppsala funds are not indicted in a separate budget line, only as overheads.

(iii) Model

The model implied is the ISP model as practised at present, but an added dimension is the recognition that there is a significant overlap between chemical and biological sciences, and the proposal suggests strong co-operation. The other significant difference is the concentration on Africa, with no support for Asia or Latin America.

(iv) Evidence

The summarised information on the situation in East and Southern Africa is reasonable. There is no information on West Africa. The information on university strengths was somewhat misleading, since it did not total the publications. Thus, Zimbabwe, Tanzania, Kenya and Ethiopia seem to be significantly stronger than the other seven departments cited.

The case is made that capacity strengthening is required in Biology in universities. No evidence seemed to have been gathered directly from African university departments.

(v) Biology as different

Nothing in proposal.

Overall assessment

The proposal gives a good preliminary case that fundamental biological sciences need strengthening in East and Southern African universities, and that such strengthening should focus on the fundamentals that relate to applied biology that is already supported to a greater extent. The proposal suggests that institutional strengthening in biology is required to re-build departments with older staff and where the basic bachelors, masters and doctoral training depends on more trained academic staff. The proposal suggests the need to coordinate with the chemistry programme, which is essential given the high proportion of IPICS projects with a biological orientation.

The proposal is less clear on how to capacity build beyond setting up five to seven projects. There is no mention of networks for example, so not all countries in need would get support in the first three years. There is a need for a stronger sense of how the institutional dimension is to be built-in to any new initiative.

Mathematics

(i) aims

No specific aims and objectives are articulated explicitly. From the proposal it is possible to gauge that the aims and objectives of a programme might be to build (or perhaps rebuild) research and teaching capacity in Mathematics in African universities by addressing:

- the shortage of fully qualified university staff using sandwich masters and doctoral programme;
- the relative isolation of university mathematics teachers through, financial support for connections, journals and partnership.

(ii) Actions envisaged

No information

(iii) Model

The model assumed is the present ISP model, with the appointment of a half-time mathematics program leader, assisted by a half-time assistant, shared with geosciences, and a new secretary to be shared by all three programme.

(iv) Evidence

The evidence gathered is from a study by El Tom on:

- publication in mathematics and mathematics related journals – not clear how broad the journals scanned and whether mathematicians are publishing in non-maths journals. There is some broader evidence from University of Botswana and DSM. The evidence suggest extremely weak publications records
- the research profile of African universities, which suggests that research is focused on algebra, analysis, differential equations and functional analysis
- a slowing down of research output during the nineties
- the age profile of staff is worrying given the weak staffing situation in most departments.

Overall, there is compelling evidence that the situation of mathematics in Africa is weakening and that new staff development is required urgently. See below for the responses in some universities.

Overall assessment

A strong case is made that strengthening of mathematics is required with a possible focus on staff development of a new cohort of university staff. The assumption is that the Program would run in Africa only.

Clearly, such a programme depends on a decision among African universities to emphasize the staff development and institutional developments required. Therefore, there is a need not only for research support but institutional support and clarity.

The situation of mathematics has also been discussed in African Universities (see section 5 below) and a group in southern and east Africa are beginning to build partnership relations.

The proposal however, concentrates, in the main, on setting up the programme office in Uppsala, with no information on what the Maths Program might do (in terms of subject or in terms of type of support).

There is a need to think carefully how to support emerging networks of African mathematicians, to open up the support systems and reinforce dialogue that has begun, and to develop support for re-staffing Maths and IT departments.

Geosciences

(i) aims

No specified aims and objectives, but the assumed aim is to support the development of multidisciplinary geosciences in African universities, particularly of the fundamental sciences underpinning the application of geosciences.

(iii) Actions envisaged

no information

(iii) model

ISP present model with a half-time Program Director, share of half-time assistant and secretary. The latter two are not in the budget line for Uppsala support. The proposal suggest that present IPPS support in geophysics and atmospheric physics be transferred to the new programme. However, some of this support is outside Africa, and the new program is proposed only for Africa.

The strength and interdisciplinarity of Earth Sciences at Uppsala University and the Geological Survey of Sweden is cited as an added plus.

(iv) evidence

Publications evidence is given from 12 countries in East and Southern Africa, but nothing from West Africa. The evidence suggests that research outputs are not strong and that there is a need to strengthen university departments

(iv) Specificity of Geosciences

nothing on this issue

Overall assessment

Although the proposal gives evidence of need in Geosciences, and presents a case for the multi-disciplinary study of geoscience, there is no action program submitted. There is no evidence that local geoscientists from African universities have been involved in the proposal.

Physics

The application is strong on reporting the present situation regarding the programme, and also gives good evidence of research need in the subject area. It is weaker on plans for the future. The proposal emphasises that it will support the same number of projects as at present, with the same ISP staff level. It will make more use of the 'most promising groups as resource groups for the region'. Especially in Eastern and Southern Africa. It proposes an expansion of funding from 10 m SEK to 12 m SEK in 2000 and 14m SEK in 2002. For comparison, the physics budget was 11.19 m SEK in 1999 and actual expenditure was 8.27 m SEK.

Chemistry

The chemistry proposal also gives a good report on the present situation, with a good overview of general subject area needs. The proposal suggests that extra funding would allow extension of funding in molecular biology and in areas like materials science and energy and storage conversion, where collaboration between the chemistry and physics would be useful, and also requests more funds for basic research equipment. The proposal, as in physics, suggests a funding expansion to 12 m SEK in 2000 going up to 14 m SEK in 2002. Budget in 1999 was 11.01 and actual expenditure 9.94 m SEK.

4.2 Demand or supply-led

The ToR ask whether the EP proposal is 'supply driven', that is an initiative primarily by ISP, or a response to active initiative from developing county universities. The evidence suggests that the initiative comes from ISP.

None of the 25 African university academics interviewed had been consulted about the ISP Expanded Programme. One of the academics was President of Geological Society of Africa, and others were senior ISP project leaders. There is no evidence that there were direct attempts to gauge opinions on the ISP proposals.

Clearly however, ISP has listened both to the SAREC 1993 evaluation (which recommended disciplinary boundarying and tidying) and to those in African universities who have articulated their needs, particularly (see section 5 below) for:

- the training of a new generation of staff to work with, and gradually replace those in mid- and late-career
- the need to underpin the applied research on topics like environment, ecology, minerals, with some more fundamental research capabilities.

4.3 Criteria for selection

The ToR asks for the criteria by which projects will be selected and judged. ISP's response to this questions is:

The criteria will be based on the same principles as for the present activities i.e. mainly by invitation to a limited number of countries and a limited number of institutions where the ISP has achieved good background information about the present situation, the long-term plans for capacity building etc. This is based on active work by the programme directors in achieving as complete knowledge as possible about the situation in the region for the respective fields, as well as getting such information from other sources as for example other Swedish scientists as well as scientists from the region. However, it never excludes approaches from other universities/institutions with whom a dialog will be taken up. It must be remembered though that the number of projects will be limited and entirely based on the requests from the respective countries and how well research teams/institutions in Sweden (mainly) can meet these requests.

The scientific quality of the projects must be good, they must be according to plans by the institution/faculty/university, be realistic with respect to the financial support needed, manpower available and the possibility to maintain experimental equipment and there must be a strong project leader around whom it is possible to build a research activity up.

ISP were also asked how proposals would be evaluated and reviewed. The questions to ISP asked for any plans to open up reviewing to developing country representation. ISP response was as follows:

The physics programme has presently a "reference group" consisting of well reputed physicists with experience from physics in developing countries and coming from universities in Bergen (Norway), Gothenburg, Lund, Linköping, Uppsala and Luleå. This system functions very well. The three year proposals are also reviewed by other specialists and very frequently the regional co-operation partners are very much involved in the planning and the review. Further, the projects are more or less constantly under a review by the ISP as well as by other visiting scientists. The applications in chemistry are sent to external reviewers selected within the (mainly) Swedish scientific community, separately for each application. It must be remembered that for project of this type a good understanding of the local environment is very essential to fully judge a proposal.

How this will be organized for the new projects is dependent on the funding made available and the number of projects possible to support. The experiences from the present ISP activities will of course be made use of.

Summary

The strongest aspects of the expanded programme proposal, in the assessor's opinion, were:

(i) the reports on the present subject areas, physics and chemistry. These subject areas include significant research in the geo-sciences and biologically oriented chemistry;

(ii) the general review of subject needs in biology, mathematics and geo-sciences, in particular the case for building (and in some cases) rebuilding research capacity in those institutions with strong support for institutional strengthening.

There is a strong case for improving the quality of research in the new subject areas in African universities, through more fundamental research, by linking the strengthening of departments and postgraduate training of a new generation of scientist staff to good quality research projects.

But the proposal was not clear on plans and actions envisaged for the new subject areas. Neither was there much material on how the new programmes would give a stronger southern dimension, taking into account recent improvements in local capacities to manage research.

Overall, any significant expanded support for the basic sciences should mesh well with goals for institutional strengthening of African universities themselves. As the ISP proposal confirms, the last two decades have been hard for scientists in these universities and any extra support must link closely with the need to break the 'cycle of crisis' by helping rebuild teaching and research departments and improving the career possibilities of top scientists who commit themselves to work in local universities.

ISP has developed approaches which have assisted the survival of, and growth in some departments, of high quality research whilst anchoring academics in their local posts.

New subject area support may well require new institutional systems with closer institutional integration and ISP might consider whether it wants to be a partner in these new systems which may involve new and changed models of support. ISP's involvement would certainly be an asset.

5 Biology, Mathematics and Geo-sciences

This section pulls together the opinions of those interviewed, particularly the 25 senior scientists from six African universities, on the present situation in Biology, Mathematics and the Geo-sciences and their opinions in needs in the short and medium term. No attempt was made to make a comprehensive review of each universities present situation and needs – the idea was to give a flavour of opinions from a significant group of deans, professors and heads of department of university science departments.

5.1 Biology, Mathematics and Geology – state of play and funding in Africa

This section reports on the state of research and funding for research. The data are gathered from interviews with 25 senior academics in six universities (Addis Ababa, Asmara, Dar Es Salaam, Eduardo Mondlane Maputo, Makerere, and the University of Zimbabwe). The idea is to give a flavour of the situation, mostly in the three subjects Biology, Mathematics and Geosciences, proposed as new in the EP.

But first (Table 5.1), the research of Kivaisi on the donor funding of physics is interesting and indicative of the funding situation in the basic sciences more generally in African universities (Kivaisi, in Kivaisi, 1999). He gathered data on the number of projects each donor was funding in physics in universities in Eastern and Southern Africa. Although the data do not include non-donor funding (like universities own resources) nor some types of indirect donor support to research (postgraduate training grants, for example), they do show the key importance of Sida-SAREC in the funding of basic sciences. Sida-SAREC not only funds IPPS but supports ICPT and TWAS. Clearly any policy change within Sida, or within any of the organizations it supports, would have a major effect on basic sciences research in African universities.

Table 5.1 The donor funding of physics projects in East and Southern African Universities

Agency	No of projects funded as %age of total
IPPS	37%
SAREC	16
ICTP/TWAS	11
IAEA	9
NUFU	7
DAAD	4
British Council	4
NORAD	2
GTZ	2
CIDA	2
UNESCO	2
EU	2
World Bank	2

Source: Kivaisi,

All the six universities where we interviewed have departments with undergraduate taught courses in biology, geology and mathematics. Undergraduate degrees are given either in those specific subjects

or in combinations of subjects as major and minor. At postgraduate level the six universities are at different stages. Asmara and Eduardo Mondlane do not have Masters or PhD programmes. The other four have postgraduate studies in the three subjects, though these are uneven, by subject and by level. For example, Addis Ababa has a doctoral programme in biology whilst the others can manage doctoral programmes in all three subjects. Masters programmes are taught in all four, though some intermittently, constrained by lack of student fellowships. It is worth noting that some universities, like Asmara, Dar Es Salaam and Eduardo Mondlane have increasing numbers of young scientists being recruited who need PhD training.

Overall, the picture is uneven but suggests gradually increasing research, though from a very low base.

One potentially important initiative, in Mathematics, is that the University of Zimbabwe has run since 1996, a regional masters programme in Mathematical Modelling funded by NUFU, with students from Botswana, Swaziland, Malawi, Tanzania, Zambia and Zimbabwe, which has acted to increase regional collaboration. UZ presently has several new proposals, including one to continue this programme, another to establish The Mathematical Sciences Training Institute of Southern Africa (MSISA) to build PhD level collaboration among regional mathematicians. NUFU and the International Mathematics Union have pledged some support but more is needed.

Research in biology, maths and geology at six universities

Relatively more research areas were identified in biology than in geology and maths (Table 5.2). Research in Maths is altogether more limited, focusing on the pedagogical needs of developing teaching materials, except in Makerere, Dar Es Salaam and Zimbabwe. There, research is done on mathematics applied to epidemology, biomathematics and on fluids and modelling.

Table 5.1: Main Research Areas in Biology, Geology and Maths

Addis Ababa, Ethiopia

Biology	Geology	Maths
Major research units include: Botanical science, vertebrates ecology, aquatics, fisheries, bio-diversity, genetics and microbiology. Some areas of research are: Study of Ethiopian flora, Medical biology (eg. on HIV/AIDS and other diseases) Crop sciences (eg. teff genetics research), Biotechnology, Fungal micro logy, Ecology based research like one in Biodiversity.	Land resources inventory, Rift geo-dynamics, Afar Depression tectonic volcanism and environmental changes, rift valley project on natural hazards like flooding	Limited research in both pure and applied mathematics (the focus is on pedagogical needs like developing teaching materials).

Asmara, Eritrea

Biology	Geology	Maths
Medicinal plants	Seismology	Theoretical maths (Numerical analysis)
Species classification	Mineralogy	Text book development
Micro-biology and micro Chemistry	Structural geology	
Coral reefs protection	Geo-physics	
Fish diversity		

Dar Es Salaam, Tanzania

Biology	Geology	Maths
Applied microbiology	Mineral resources of Tanzania: Geology, geophysics and geochemistry	Mathematical modelling
Propagation of endangered species	Environmental problems associated with mining in Tanzania	Fluid dynamics
Ecology, eg ecological monitoring in semi-arid areas; mangrove ecology	Seismology and geotectonics	Differential equations
Biodiversity		Operational research
Local variety breeding		Functional analysis
Marine biology		
Wildlife		
Pollution		

Eduardo Mondlane, Mozambique

Biology	Geology	Maths
Improvements in plants species (breeding),	Ground water (geophysics),	Limited research in information technology and modelling.
Fresh and shallow waters studies,	Hydrogeology	Maths is at formative stage
Marine ecology and coastal management	Coal geology and oil deposits	
Marine biology	Environmental geology, artisan mining,	
	Water pollution	

Makerere, Uganda

Biology	Geology	Maths
Entomology,	Petroleum Exploration,	Bio-mathematics that includes mathematical epidemiology, statistical modelling and numerical analysis with applications in HIV, malaria and control of other diseases
Parasitology,	Study of volcanic rocks	
Fishery,		
Vertebrates		
Ecology		
Study of sediments/Lake Victoria,		
Pollen grains		
Ethnobotany and botany		
Waste material handling		

University of Zimbabwe

Biology (incomplete)	Geology	Maths
Biotechnology	Structural geology	Maths modelling
Plant biochemistry	Igneous geomorphic geology	Fluid mechanics
Mammalian biochemistry	Rock dating	Epidemiology
Nutrition	Environmental geology	Number theory
Natural products		Abstract algebra
		Complex analysis
		Graph theory

Main funding sources for research in biology, maths and geology

Asmara and Eduardo Mondlane depend heavily on bilateral Sida/SAREC funding (table 5.3). The other four universities have relatively more sources of external funding. But Sida-SAREC funding is very important in all institutions, except as yet Makerere. Addis Ababa and UZ appear to have relatively more internal/local resources than the others.

The interviews did not capture the overall situation. For example, in Dar Es Salaam the Institute of Marine Biology was not included in Biology, and in UZ the biology department could not be included. Resources for environmental research are often spread around several departments.

Overall, the situation in biology and geo-sciences seemed significantly better than in Mathematics.

Table 5.3 Main funding Sources for Research in Biology, Geology and Maths

Addis Ababa

Sida-, NUFU, GTZ (Biology)
Italy and France (Geology)
No external funding (Maths)
AAU and ESTC (Domestic funding, for all subjects)[2]

Asmara

Sida-SAREC
Sida-SAREC and UNESCO

Dar Es Salaam

Sida-SAREC (Botany, Geology, maths modelling)
Netherlands (microbiology), Danida (scholarships)
Macauthur (biodiversity)
Belgium
Norad (geology)

[2] AAU Research and Publication Office and Ethiopian Science and Technology Commission (ESTC).

Eduardo Mondlane

SIDA-SAREC, Rockefeller Foundation and Holland

Sida/SAREC supports at least 80 per cent of research funds in science and technology at UEM.

Makerere

NUFU
Different bilateral sources (eg. Lake Victoria Research Organisation),
Grants generated by individual members of staff, limited Sida/SAREC funding and domestic funding

Zimbabwe

Sida-SAREC (geology, biochemistry,
Netherlands (geology scholarships)
ISP (biochemistry)
International Geology Programme (Geology)
NUFU (maths masters in maths modelling)
Austria (masters in graph theory)
IDRC (geology)

5.2 Subject area needs

This section reports on questions asked about key needs for subject development in universities. The questions were asked to the 25 senior scientists from the six universities in East and Southern Africa, although much more time was given in Dar Es Salaam and Zimbabwe universities. Those interviewed were not asked to give a complete formal answer for their department and the section is not meant to be a definitive list. It is meant rather to give a flavour of the situation. Most responses are reported in Table 5.4. Overall, The following issues arose:

- there is a tension between strengthening established sub-areas of subjects, or developing very weak areas required for undergraduate and graduate teaching. As an example, in the University of Zimbabwe Chemistry Department organic chemistry is the strongest sub-area, and physical and inorganic are less developed. Also, many Maths departments in the region are stronger in applied than in pure maths. Given that no sub-areas are well enough funded, decisions are not easy

- The universities would like to open up and expand postgraduate studies. In Eduardo Mondlane, Maputo and the University of Asmara, for example, there are, as yet, no Masters programmes, and funds are needed to begin teaching at postgraduate level. In the other universities, where masters and doctoral programmes exist, there is a need to obtain fellowships for students

- In one case, UZ, the mathematics department has a regional based masters degree, and is actively seeking funding to expand such programmes. That department, with some other maths departments mentioned the possibility of north-south-south links and networks having promise for masters and doctoral training

Table 5.4 Subject area needs

Addis Ababa

PhD training in maths and geology and research in all subject areas may be contenders for new funds.

'I hope that in two to three years time we will be able to start PhD programme in maths and geology'.

'In geology we have an MSc programme but not PhDs. We are at a preparatory stage (staff and laboratory) to start a PhD programme.'

Asmara

No specific subject needs mentioned, only the need to begin postgraduate programme, where the Science College was already more advanced, and where Biology might be ready first.

'The College of Science will be in a better position to start masters (and probably PhD) levels programmes.'

Dar Es Salaam

Pure maths is a big gap, but applied maths research could be expanded more quickly

Basic biology, biotechnology, local species including endangered species,

Core zoology, physiology, neurological, rehabilitate herbarium

In geology, to go beyond mapping of resources to understanding

In physics, electronics, and weather prediction, solar energy – the latter both related to geo-sciences

Makerere

'future funds will be used to expand and strengthen research in all subject areas.'

Zimbabwe

Big gaps in physical and inorganic chemistry

Synthetic chemistry (molecule manufacture)

Biochemistry of natural products

Economic geology

Rock dating, evolutionary geology, understanding Zimbabwe's rock formations

Hydro-geology

Pure maths

Epidemiology

5.3 Infrastructure/institutional needs

Table 5.5 gives the responses from the scientists about the infrastructural (non-subject) aspects of needs. Some key issues arising are:

- The need to support projects that give wider than project outcomes. That is, the need for a close relationship between support for good quality projects and other objectives, such as postgraduate training facilities for department and faculties, and the integration of staff into research groups of more senior and junior staff
- In maths, there seems to be somewhat different emphasis. Certainly one priority was postgraduate programmes, but there was more emphasis on the need for space and time away from routine teaching, but also the need for funds for linking, meeting and joining up with other mathematicians.
- Overall, there was a strong view that research projects needed to link closely to overall institutional needs, especially for postgraduate training and new staff development. This is a major opportunity for agencies planning to expand research support

Table 5.5 Infrastructure/institutional needs in basic sciences

Addis Ababa

Receives SAREC support for its masters programme and hopes soon to obtain funding to begin new PhD programmes. This is a major priority in the sciences.

Asmara

Masters programmes expected to commence within 5 years.

MSc and PhD programmes are required because, first, there is an increasing demand in the country for trained personnel. Second, it has become difficult for the university to conduct research without its own masters and PhD students.

The approach to the PhD programme is 'cautious, gradual and selective with emphasis on quality

Dar Es Salaam

Funds to organise meetings, conferences, including international conferences (from maths)

Resources that give time and space to think (maths)

Research computers and software (maths)

Project grants that link staff and postgrad students (geology)

Scholarships and lab Equipment for PhD students (geology)

Project funding to activate non-active researchers among staff (biology)

Basic equipment for molecular biology (biology)

Staff training (academic and technician)

Wide band spectrophotometer

Specialised equipment and technician training

Project funding within institutional objectives and lowered bureaucracy of PMU (University Unit)

Eduardo Mondlane

Except for a few people training abroad for masters and PhD degrees, so far UEM does not have its own graduate level studies. UEM expects graduate level studies in some subject areas to start in

about one year. New funds are likely to be used for developing postgraduate studies and research at UEM.

Zimbabwe

Fellowships, equipment and maintenance, for in-house PhD training (chemistry)

Already has a significant number of masters programmes, problem is more bursaries for students

Sandwich training resources (geology)

Projects that 'encompass as many staff as possible' (geology)

Equipment for hard rock geology research (geology)

Functioning labs with postgraduate facilities (biology)

Collaborations to learn research management systems (biology)

Masters programmes, which require only fellowships and small resources in-house (biology)

Support that strengthens institutions and projects at the same time (chemistry)

Support for networks, fellowships and north-south-south links (maths)

Support for regional maths masters and PhD programmes (maths)

Summary

The 25 interviews in six universities give a sense, in most cases, of expanding research in the basic sciences. Also, there is evidence of new staff recruitment in some universities, and of increasing regional cooperation. In mathematics, where the research base is weak, there is some evidence of plans to improve the situation. In this subject, interviews in academic IT and computer departments might have improved our evidence. Evidence is clear on the key importance of Sida-SAREC in supporting basic sciences research in East and Southern Africa.

Funding needs seem strongest in mathematics, and for the development of postgraduate programmes, including the equipping of postgraduate and research laboratories. There are also needs, not only for technician training and equipment maintenance, but also for advanced programmes in the use of equipment for research, and in research management techniques and strategy.

Overall, the evidence suggests that mathematics should have some priority in any new subject programme, and that it and other programmes need to re-double their efforts to integrate with institutional goals regarding staff development through postgraduate research training. In mathematics, the regional organizations, like SAMSA should be involved in any support processes.

Overall, the last few years have seen a 'sea-change' in approaches to research support in the six universities studied, as in other universities in the region. The crises of the 1980s and 1990s, where universities became less able to plan for research development as an integral part of their activities, has given way to stronger strategic leadership. Institutional development strategies have allowed better planning of donor and local resources. Progress has been slow but steady.

The implications for research support are extremely important. New research support programmes need to be structured according to the needs of developing country universities. The 25 senior scientists interviewed, though criticising their own university administrative systems at times for lack

of detailed attention to their research project needs, also articulated a strong consensus in favour of projects needed to fit closely to departmental, faculty and university plans.

For agencies planning to expand research support, this presents a major challenge and also a major opportunity. ISP's present programmes have evolved to be more integrated into university needs for long-term support based on building multi-member research groups, sandwich training and shared institutional use of scarce equipment, at the same time as building an enviable reputation for quality and efficiency.

The recent improvement in some key university's will to pull together resources towards priority needs, suggests that all agencies, including ISP, will need to evolve and work closer through university authorities, and with other agencies. Development of new subject areas presents an ideal opportunity to construct new models for collaboration. ISP's reputation and experience, including as sub-contractor to African universities, suggests that they should be involved in any initiatives.

6 Ownership and sustainability

The terms of reference requested that the assessment address:

- the advantages of centralisation and decentralisation of the EP, whether decentralisation to other Swedish universities or to selected universities in developing countries
- ownership and sustainability of the ISP and of the EP
- the costing of alternatives in developing countries.

This section reports on responses from Swedish and developing country senior scientists to these questions.

By decentralisation we mean, in this study, the decentralisation of responsibility from ISP to other universities or units of certain aspects of the ISP, such as financial, procurement, administrative, monitoring and peer review, networks, or regional nodes.

Ownership means increasing stakeholder involvement, particularly from developing country and Swedish universities in parts of, or the whole, programme, including any programme relocations.

The interview data, gathered from developing country and Swedish universities, were of various types. For example, direct questions on ownership produced fairly uneven responses. Some respondents had not thought of the issue of ownership, some did not know ISP, others had received past support from the ISP programme. So apart from direct questions, a range of other, indirectly useful, information was gathered. This was:

- Views on networks and regional collaborations and their management
- Views on the nature of local versus global approaches to research (would local or regional approaches yield different types of scientific results
- Views on funding preferences, as between project support, PhD support, department support, faculty support, and so on.

Some of the material gathered is only indirectly relevant for the questions raised in the terms of reference but since the opinions of senior scientists are not often obtained on issues like networking and the nature of developing country science, sometimes data have been included even when not directly relevant to ownership and decentralisation issues.

Perspective on ownership

At present the ownership situation can be simply described as follows. ISP is located within the University of Uppsala, as a part of the Faculty of Science. However, as stated in the ISP Annual Report (1999) 'ISP functions as a national programme'. ISP conducts some activities as an integral part of Uppsala University (for example, administering activities around memoranda of understanding with IAEA, University of Dar Es Salaam, Chang Mai and the University of Asmara), at the same time as being a national programme. It is not clear that ISP is responsible for teaching and research activities within Uppsala University. The ISP Board (of 11 members in 1999) has a majority of members from Uppsala University (6).

But in the case of ISP, ownership should be seen in a broader context than Board membership, since it plays a major brokering role in pulling together north-south research collaboration in physics and chemistry in Sweden. ISP has a number of key stakeholders other than the University of Uppsala and other Swedish Universities. One such key stakeholder is developing country universities and their scientists – that is, those institutions where support is used to develop research capacity in basic sciences. Another is Sida-SAREC, who fund 90% of the two main ISP programmes. Sida is represented on the Board, but not the developing country universities. However, there is a developing country representative, Professor M Hassan from the Third World Academy of Sciences in Trieste. Finally, there is a representative of IAEA.

The concept ownership is about more than board membership, thought the lack of developing country universities on the Board is an obvious gap. The concept ownership is also about more than institutional ownership, since ownership of knowledge is an issue with research collaborations. But the key aspect for this assessment, in my opinion, are four *relationships.* The relationships:

(i) ISP-Uppsala University

(ii) ISP-Swedish universities

(iii) ISP-Developing country universities and scientists

(iv) ISP Sida-SAREC.

It is these relationships that I will be assessing, in the main, in the remainder of this section. The key issue is the extent to which the ISP programme's long-term effectiveness can be improved by changed relationships. In particular, should there be more involvement of stakeholders, or not. The view of the assessor is that some opening up would benefit the overall effectiveness of the existing programme, and that new ownership relationships would be needed for new subject area programmes.

The section includes a wide range of opinions from senior scientists, which will be detailed below, but they can be summarised relatively simply:

(i) the relationship ISP-Uppsala University

This relationship is clearly formalised. At present the relationship is formally via the Science Faculty. Alternatives suggested were to link more closely to the International Secretariat and put ISP directly under the Rector. This is an internal issue with pros and cons, based on aspects like whether ISP is a basic science initiative closely linked to the internal mission of the science faculty, or is it a key arm of Uppsala's international mission or both.

(ii) the relationship ISP-Swedish universities

At present the Swedish universities are represented on the ISP Board by senior scientists. Also the physics programme has an advisory group of five Swedish and one Norwegian scientist which meets once a year. No-one broached the issue of Board representation, though it is not clear how the 'national nature' of the ISP is institutionalised in practice.

The opinions voiced were not about representation but mostly about ISP's administrative support system, its relationship with local university support systems and about the choice of students.

The opinions focused on the relationship between ISP and the international secretariats of Swedish universities. At present the key relationship of ISP is with practising scientists in Swedish universities. These scientists do not want to be bothered with administrative arrangements for fellows travelling to

Sweden, see ISP as efficient in this work. Some contrast this hands-on work with Sida-SAREC's approach which gives more responsibility to the northern partner universities for organising the time in Sweden. If indeed ISP is needed to do this type of administrative work it does suggest some deficiencies in the Swedish university system. ISP could consider decentralising and delegating this type of administrative work to local universities, whilst acting as advisors on developing country visitors. Another issue raised was that scientists felt they needed to know much more about developing country partners before committing themselves to supervision and partnership, in particular they wanted to physically meet candidates before major research initiatives begin. This is usually important for PhD supervision.

(iii) the relationship ISP-developing country university and university scientists

At present this feels least satisfactory in that there is no formal system to obtain perspectives, experiences and priorities. Clearly, ISP has huge experience of work in the three continents of the 'south' but at present there is no forum, centrally, regionally, or nationally to link this stakeholder to ISP.

In a system established to support research in developing country universities, this is a key, if not the key, relationship. Changes are needed to build fora for north-south collaboration.

At the same time, new and existing programms need to respond to the positive changing circumstances of some key national universities. The next ten years will likely see significant institutional strengthening of African universities. Ownership relationships will need to take account of university institutional development programmes, particularly regarding staff development, laboratory development and research group development in the basic sciences.

(iv) the relationship ISP-Sida SAREC

This relationship feels clear on the surface but less so in detail. Formally ISP has a three year grant system, allowing regular assessment of the programme. Also Sida has a representative on the ISP Board.

But the two ISP programmes physics and chemistry are clearly different to the sub-contracted work that ISP does for developing country universities, like the University of Asmara and the University of Dar Es Salaam among others. The University of Asmara has a formal body to reflect its relationship with ISP. Such sub-contracted work for developing country universities is 'owned' by those countries and is not a relationship with Sida-SAREC. ISP has a formal reporting relationship with the relevant developing country universities for these activities.

The data and opinions gathered were about the two ISP programmes, not the other aspects of ISP work.

Although ISP and Sida-SAREC have very different aims, at times scientists were confused about the differences, assuming that they would work in the same way. More clarity is needed here.

The remainder of this section focuses first on decentralisation issues, then on ownership issues and finally gives some preliminary perspectives on alternative costings.

6.1 Centralisation/Decentralization

Overall, there was a sense that some decentralisation would be beneficial to the ISP programme and a range of opinions were presented on administration; finance; monitoring; and network organization. The Asmara University experience is also briefly summarised.

Administration of projects

Overall, comments given were almost always linked with positive feedback on ISP's expertise in the area of managing multi-project programmes in the basic sciences and recognition that, until now, there has not been a need or push for sharing of this responsibility. The recent administrative transformation of a number of universities means that they are now in a better position to develop their research management systems.

One interviewee said: 'should IPS be administrating all projects?'. Another said: 'the time has come when more administration should be done in the south. Given the recent advances in many … universities, centralised research admin may hold back the re-generation of southern universities.'

Others focused on different aspects of ISP with suggestions on how decentralisation to the south might build research capabilities in various areas. For example, on equipment and laboratory organisation: 'ISP supports many types of equipment maintenance and technician training with very positive results. It also funds workshops on advanced laboratory research techniques. Could it build on that with more holistic equipment maintenance systems so that procurement, maintenance and associated training are built on an institutional level.' Procurement is a specialised skill that requires years of training and experience and ISP is one institution that could help build it up.

The need was mentioned by various scientists for more formal and informal capacity building in research administration and management, from grant getting to budget holding and monitoring, to visits to research groups to find out how they are run. One suggestion was that staff could be seconded to ISP for short and medium periods to find out how the system works, and that ISP staff could also visit developing countries to advise on systems.

Finance

Finance is an important sub-area of administration. There were various types of opinion here; on the key role of project leaders; and on decentralisation of funds to participating universities;

One comment was that practical decisions on spending, at present, lie with the project leader of projects even though the funds stay in Uppsala. Thus, project leaders do get good experience of managing budgets and requesting ISP to make purchases on their behalf.

Another was that the systems where funds remain in ISP could not last forever, and that eventually universities, whether in Sweden or in developing countries, would wish to take responsibility for finance and budget control. Some developing country scientists made the point that in the 1980s and much of the 1990s their university lost internal competence in these areas, but also made the point that their institution was rebuilding competences and wanted to have greater ability to control overall budgets.

On the contrary, some developing country scientists were afraid that in their particular institution, they and their research would lose out if finance was decentralised to their university finance offices. Issues raised included that inexperienced finance offices have exchanged foreign exchange into local

currency on receipt, so that later devaluations dramatically lower purchasing capabilities and thus the ability to buy items as projects progressed. This is clearly unacceptable.

Still, many scientists recognised that in their particular institution things were 'good enough' for them to have reasonable control.

Clearly, any decentralisation of budget systems would depend on the training and experience build-up of procurement specialist finance officers.

ISP's experience in this area was recognised by all those who knew of its work and several interviewees mentioned that ISP should be advisors and could be sub-contracted to hold finance budgets if partners wished.

Any decentralisation of funds management would depend on assurances concerning the overall purchasing power of funds, and the currency in which funds are held, issues on which agencies like Sida-SAREC have some experience.

Monitoring and peer review

In this area, there was a strong feeling that southern scientists could do much more to assist with project selection, monitoring and review and that this would improve the ISP programme. There was a related feeling that capacity building was required – partly by being involved in decision-making and partly via workshops/meetings. There was a sense also, that change should be gradual building on the strengths of ISP in Uppsala, the rest of Sweden but also of project leaders and previous project leaders.

Before summarising the opinions from this assessment, it is relevant to reiterate previous perspectives. The previous SAREC evaluation (1994) suggested that ISP appoint two Programme Reviewers, one each for Physics and Chemistry for six-year periods who would be senior scientists from developing countries. They would report directly to the Board. This recommendation was seen as not feasible by ISP on cost grounds, I was told. However, the costs of such a proposal would be relatively little, I submit, as a proportion of total administrative costs.

In the period 1995–98 the Chemistry programme produced two 'stocktaking' documents (Liminga 1996 and Niemeyer, 1998). Those also touched on the need better to use the experience of experienced laboratories and project leaders as regional nodes and networks. Ideas like use of regional scouts for possible new projects, improving southern inputs to project and fellow proposal evaluation, and the possibility of a course/workshop in science management were also discussed.

Opinions from the present assessment can be summarised as follows:

- There is a need for senior developing country scientists to be involved in peer review
- There is a need for local scientific priorities to set the agenda, not global ones. It is clear that ISP have operated according to such local agendas
- Developing country project leaders could be used more formally on programme review panels.
- Build on 'what is there and do not try to impose another system'. But the present system 'can be improved in its southern involvement'
- There could be regional review of fellowship proposals
- Peer review should be a north-south process

- How can the process begin to build a southern decision-making dimension? Perhaps by building a group of southern scientists respected by their peers and also by ISP as a part of the decision panel for research proposals, fellowships
- The capacity to judge proposals can be improved by actually drafting them and also via workshops.

Networks and partnerships as nodes for decentralization

This sub-section is rather different to the others since the issue of network management is broader than centralisation/decentralisation. But good south-south and south-south-north network management could presage new regional systems to manage bigger programmes. Opinions on networks were varied, as shown below:

The broad problems of regional partnerships were raised. There was a view that regional partnerships can often be dependent on the research agendas of the north and consequently research in the south plays a smaller role in development. It was suggested that the south should define its own research paradigm and organisation and seek partners, from north and south. It was not usually articulated as a north versus south issue, more that the 'global' priorities of the more advanced countries often drowns out the local priorities of those establishing a research culture. Some options follow:

'The validity of south-south cooperation requires little emphasis. My view is S-S partnerships should be based on a mature approach. Today we seem to mimic research activities as experienced in the north. When we do that research never becomes a vital instrument of development. Here in the south we have got to look at research as a complex tool for answering vital problems. This entails defining our own research paradigm and organisation and then seeking partners in the north and south. It is only when we do this that S-S cooperation becomes meaningful.'

'At the moment it is the north that is encouraging us to get into partnership. I feel that S-S partnerships are simply creations of the northern research teams. In other words the north, in a systematic way, is extending its territorial influence over the south. In the south we are not yet independent to determine our own research paradigm. It is only when we decide on our research paradigm, define our problems, that N-S and/or S-S partnership become meaningful and address pertinent problems of the region. Otherwise we end up as being extensions of research based in the north.'

'I think that more encouragement to south-south (S-S) partnership is a good idea. However, there is a major constraint to S-S partnership and that is funding. We tend to have more of S-N partnership and the reasons are that (i) lack of resources here in Africa. (ii) when resources are made available by the north there is still control over the use of funds.'

'Networks can be very effective or a complete waste of time'

'I must say that south-south networks/partnerships are always helpful. Africa needs assistance starting with popularising the idea and benefits of networking. I have personal experience of some of these networks. My experience however is disappointing. Some of our colleagues in the region do not even bother to respond to e-mail messages. Instead of seeking answers to our problems by ourselves my African colleagues tend to look for cooperation outside Africa. I think making networks work within Africa is very relevant.'

'Networks obviously are important because they bring expertise and resources together. In the regions we do not have all the expertise in one place. We can pool these dispersed resources in

networks and use them, for example, for assessing postgraduate students. Networks are important for exchange of ideas. I personally do not believe in all our postgraduate students studying in one place. I believe in what I call academic diversity not academic inbreeding. Networks are means of promoting academic diversity.'

'Some networks are owned by the host country and that can be very counter productive. There needs to be a clear division of labour and responsibility that is in contracts'.

Overall, networks are seen as an important part of research collaboration, but that they are not the solution by themselves to problems of building research capabilities and management. Overall, it does not seem that they can substitute for ISPs present role or be the sole part of any decentralised model. However, networks are a growing part of the ISP programme and experiences of the implications for decentralisation should be studied for the next three year period.

Other models – The University of Asmara

The University of Asmara-ISP model was mentioned a few times both in Sweden and in Asmara as an interesting and positive one. Two key observations were made. First, that the ownership relations were different since there are key coordinating committees with formal counterpart communication both in Asmara and ISP. Second, the scientist-to-scientist relationships involve senior scientists from Uppsala University making regular semester-long visits to Asmara, when it has proved harder to get northern scientists to visit some other ISP projects, according to project leaders.

Summary

There is a strong case for some decentralisation of administration, funds management (in appropriate situations) and of proposal evaluation and monitoring. The earlier SAREC proposal for Programme Reviewers should be considered once more, though integrated in a review of decentralisation through regional reviewing, evaluation and monitoring. Overall, there might be a consideration of decentralisation through Programme Reviewers, regional scientific advisors, and peer reviewers of research proposals and fellowship applications. In parallel, workshops can be organized on issues like scientific management.

The case for a regional university to take on a central role in organizaing the Basic Sciences is rather weak at present, but this should not preclude an accelerated programme for opening up and decentralising many functions within the programme.

ISP seems to take responsibility for some activities normally the responsibility of International Secretariats and other parts of Swedish universities.

6.2 Ownership and sustainability

This sub-section is structured around the relationships between the ISP programme and each major stakeholder: Uppsala University; Swedish universities; Developing country institutions and scientists; and Sida-SAREC. The part on developing country institutions includes some interview information on more general funding and subject area issues. The focus is on increasing stakeholder involvement to increase long-term sustainability of the basic sciences programme in the context of changes within African universities.

Uppsala University

ISP is a constituent part of Uppsala University and its Board is constituted in its majority by Uppsala University. Uppsala also constitutes the biggest group of host scientists, and it seems that laboratories contribute enormously of time and enthusiasm. In terms of financial sustainability, ISP is proposing that Uppsala provide a small increase in its percentage contribution if the programme expands from around five to around seven per cent. Although the proposal suggests that Uppsala will also make a contribution of staff to the office, this is not included as a budget item.

A key question on sustainability is: what would be the reaction of Uppsala University if Sida-SAREC support dropped? Would it increase its own support for example? Would it act to integrate ISP into its mainstream international activities? Would it actively support ISP building up sub-contracted activities for developing country universities? Would ISP be held largely responsible for its own future?

That is, is ISP an integral part of Uppsala University, secure in its future under any circumstances? Is it a semi-autonomous unit with no core teaching or research function? Is it seen as a part of Uppsala's international activities? Or a more or less fully funded sub-contracted operation? Its position in the Science Faculty suggests an academic function, but it is not directly integrated into Uppsala's teaching and research function.

What is clear is that Uppsala is committed to ISP and proud of it, and Uppsala University scientists support it strongly. There is no suggestion that Uppsala University does not wish to be a key stakeholder in the future.

There are other key stakeholders, and consideration needs to be given as to how to increase their ownership of the programme and their commitment to it, at the same time as consolidating ISP's sustainability in Uppsala University and within the Swedish university system.

Swedish Universities

The other Swedish universities, in the main, contribute of their time and effort as host laboratories. Some scientists give time for the Board and the advisory group in Physics.

The commitment seems to come, in the main, from individual Swedish scientists. They feel that they are supporting research capacity building in southern universities, are grateful for ISP's efficient administrative support of fellows, equipment, etc. They also feel increasing pressure from their institutions that expect payment for space, required increasing output from scientists, and so on.

The information on Swedish universities suggests that stronger relations might be required with International Offices of Swedish universities. There was some sentiment that these offices were more focused on northern links than southern. It may be that efforts to increase the involvement in southern links should come not only from ISP, but from Sida-SAREC and very senior academics, including Rectors who believe in increasing north-south relations.

Developing country universities and scientists

There is strong consensus that ISP runs two efficient and effective programmes, with continued long-term support for high quality research projects and networks, with increasing institutional outcomes, in terms of sandwich training, good links with bilateral support, and hands-on support and monitoring. The regular contact between programme directors and project leaders is seen as an incredibly positive aspect of ISP support and serves to keep ISP abreast of local issues and priorities.

How can these advantages be turned into a more formal forum with more southern ownership and responsibility for the programme? This is a key issue for the next few years.

The interviews produced a range of views on the relationship between project type support and institutional support (Box 6.1). It is clear from our interviews in the six universities that there is a strong emphasis on institutional goals. Several universities are investing heavily in new staff members and want clear masters and doctoral training goals. The ISP programme is very important in physics and chemistry support to some of these universities and will need to take strong account of institutional priorities in its project and network support.

Box 6.1 Project and institutional support

The choice between individual and institutional support generated many comments. Strong views were expressed that tension between individual needs and needs of institutions were to be avoided. One mechanism recommended to address tension was long term (strategic) institutional goals, for example, in staff development. But the need to avoid bureaucracy in the selection of individuals for training was also highlighted.

Some respondents refereed to the narrow range of support from ISP to a relatively small set of projects in each institution, but accepted ISP remit was clear and that ISP support was always good and long-term.

'Personally I do not favour approaches/systems that create tension between individuals, departments and faculty. Our approach is guided by a strategic plan that integrates both individual and institutional efforts. What is important is, first, to set institutional goals and work towards achieving those goals. In research we neither support individual nor a departmental approach. We emphasis a flexible inter and intra disciplinary approach to research. We want to take away research from the narrow domains of the classroom teaching environment.'

'If PhD training is left to individual interest areas there is a possible conflict with institutional interests. It is likely that some individuals receive training in areas that are not priorities to the departments/faculties. This has happened in the past and some departments were forced to open up posts to accommodate those individuals. What I think is that the university needs to have a mechanism that serves both individual and institutional objectives.'

'Applying for PhDs on an individual basis, although beneficial to the individuals, may not be compatible with our institutional goals. In some area we have already achieved a critical mass of trained personnel. And in this case we want to encourage other priority areas. Eventually we want a research policy to emerge and perhaps a department/faculty to look after research policy and funding.'

'I personally have difficulties in handling this type of problem. Our experience was that individual scientists competed for resources. The problems then were lack of continuity and institutional capacity building. However, this does not mean that individual initiatives were bad things. I believe that funding now should be more institution based. Within such a framework individual initiatives can be accommodated. For example, if we manage to get funds amounting to a million US dollars then we can best handle individually competitive allocations within the university. You see in the past, that is when support was based on individual scientists, we had problems of accountability. Even production of reports was a problem. Neither the fundmakers nor the university knew what was happening. That was a disadvantage. But if a university coordinates support to individuals then programmes/activities can be monitored and impacts [on individuals/institutions] be assessed.'

Similarly, there were a huge range of important observations on issues of ownership of knowledge and priorities for the basic sciences. These show, of course, the key input of senior scientists in developing priorities for support in the basic sciences (see Box 6.2).

Box 6.2 Nature of research priorities in basic sciences

'In my view all the sciences are, and need to be, related to local resources and conditions. Research that addresses health, forestry, environment, etc. are related to local resources and conditions. Most of our problems are not pure physics or chemistry. ... As to programme ownership, let it be clear that we are the owners and accountable to outcomes of the programmes.'

'I think that issues that are addressed in physics are international in character. Whereas in biology we tackle local problems. Of course, as in physics, in biology too we use accepted methods and approaches to tackling problems.'

'Yes I do think that biology research is different to chemistry and physics. I would say that there are plenty of opportunities to do relevant biology research. After all we are an agrarian country where biology related research like on crop science, fishery and forestry are very important. But I am not suggesting that chemistry and physics are not important. 'In our context in particular biology research is related to local ecological problems. There is also an overlap between biology and chemistry (especially in areas of molecular chemistry).

'In terms of relevance to local conditions and resources yes I do think that geology research is different. Interest in geology research has strong external dimensions, mineral exploration, for example, attracts global interest'

'I think many research activities in geology are relevant to both local and global conditions. But specific resources based geology research may be relevant to a specific location.'

'I do not think biology is different to physics and chemistry under those conditions. Both chemistry and physics are as relevant to local conditions as biology is. I will give examples. In processing natural products like oil extraction and extraction of medicinal herbs you use organic chemistry that is related to local resources.'

'Biology is of course a different science to physics and chemistry. All three subjects are important. As to links to local conditions I think you can define local conditions for all those subjects. Projects, given that they are important, have to be identified regardless of their specific subject orientation.'

'Yes research problems in biology are more related to local conditions. But we also have relevant research agenda in maths and physics. I gave the example of mathematical epidemiology earlier.'

There are a range of possibilities for increasing developing country input into decisions on basic sciences. These include:

- Senior scientists on the ISP Board. A group of three would have more impact than one, perhaps one from each of Africa, Asia, and Latin America, appointed after consultation with senior ISP project and network leaders in each continent. A balance of subject specialisms and gender would be required.
- Programme reviewers for each programme, as proposed in SAREC, 1994, though Board membership may be a good alternative to programme reviewers, providing there was more involvement in proposal and application decision-making
- Research proposals and fellowship applications could be appraised at a regional level, or joint Uppsala office/regional team could appraise and recommend to the Board
- Proposals, if they are not already, would need to be counter-signed by the developing country university that they integrated with university plans
- Senior project leaders and senior academics from developing countries could constitute 50% of research proposers and fellowship assessors and other peer reviews
- Workshops could be established on subjects like proposal review and appraisal.

Together with action on decentralisation, a combination of these, or similar, initiatives would build a strong southern dimension to decision-making, which could change the stakeholder relationship between ISP and developing country institutions. In one sense this builds on informal relations of trust which have built up over 25 years, and acts to cement them in a more open 'ownership structure'.

Given that ISP has, over recent years, built a second source of income acting as sub-contracting agent for developing country universities in basic science research support, such changes might act to increase those collaborations.

Sida-SAREC

Sida-SAREC is the 90% funder of the ISP programmes. Such a huge dependence on one funder is unusual. The fact that ISP has a second source of funding, albeit indirectly via Sida-SAREC, is perhaps a positive means of broadening the funding base a little since ISP is responsible to the southern partners for sub-contracted activities.

A number of Swedish scientists mentioned that there were tensions between Sida-SAREC and ISP. These seemed to be around:

- ISP's administrative support for fellows and procurement support was very hands-on, and many scientists saw it as relieving them of a major burden. Sida-SAREC approach was compared negatively to this approach, often without consideration of the institutional necessity to build up broken African systems. Both approaches might well be needed and certainly it does not help if one agency pits itself against the other. Certainly, Swedish university support to visiting scientists might be improved and ISP might be able to advise.
- ISP had a sense sometimes of being a kind of research council to support basic sciences and therefore as a possible national agency. There was a sense that ISP was looking for roles beyond those it had within Uppsala.

Interestingly, the developing country interviews (see Box 6.1) were clear on these issues – project and network funding was necessary and had to fit within institutional goals.

Sida already has a member of the Board, and if more developing country representatives were to go on the Board, so that all four key stakeholders were there, none dominating, the primary interest of ISP to support basic sciences in the most needy developing country universities would be formalised.

Summary

Assuming a continuation of the recent improvement in university coordination of research in some African universities, it is important that research support agencies respond to the institutional needs of universities, by making sure projects and network support fits with institutional priorities. There is a range of possibilities to open up the ISP programmes to stakeholders, particularly developing country stakeholders. Any new subject area programme should use a more open stakeholder approach where ISP would be one of several key stakeholders. The existing programme could relatively easily begin the changes, given its knowledge of project leaders and their willingness to support ISP.

6.3 Costing alternatives

One of the terms of reference, to cost alternatives arrangements of supporting subject area development, proved impossible. One reason was the difficulty of obtaining cost information of this type in any form. Few agencies could give anything but a vague estimate of their real costs. Most systems do not fully cost the good will coming from scientist links, for example, and in most examples, the cost was in direct relationship to how much good will was expected. The British Council link scheme, for example, operates on huge good will and is thus extremely cheap. The postgraduate scholarship system on the other hand, is highly costed and some British university departments are highly dependent on it. Certainly the 'Swedish sandwich' system does not look hugely more expensive than other national systems, indeed it looks quite competitive on the basis on the training part of its remit. Of course, there are other parts to its remit, like equipping local laboratories. But the most important constraint on costing alternatives is that it was impossible to give a clear remit to be costed.

7 Conclusions and recommendations

7.1 Conclusions

This assessment of a proposal from ISP to expand support for its existing programmes, and establishment of new subject areas, has reviewed the proposal itself and visited and interviewed relevant institutions and stakeholders. The key conclusions from the assessment are:

- ISP has made a significant contribution to the development of scientific research capacity in developing country universities. In the early 1990s, for example, IPPS was supporting 23 of the 64 physics and related fields research units in east and southern Africa. ISP support balances project and network support for high quality research with meeting some institutional needs of some of the neediest universities in developing countries
- ISP, and Sida-SAREC dominate research-specific support for these universities since research is not well supported by most donor agencies
- More support is needed for basic sciences in these universities. The six universities where interviews were conducted, all the prime national universities of their country, had plans for expanding courses and staff numbers. They had coherently mapped their research priorities, in most cases linked explicitly to their institutional plans
- Of the new subjects proposed, Mathematics had the most serious needs. Biology and the Geosciences also had important needs but these were being met rather more than Mathematics. Those disciplines also had more complex stakeholders, both within universities, and in terms of present support. Mathematics had very little support, is extremely important as the basis for many other subjects and in the expansion of information and computer technologies. However, the lack of present support makes building support for research particularly challenging
- The proposal from ISP gave good reviews of the present programmes in physics and chemistry, and also reviewed the needs on biology, mathematics and in geo-sciences, particularly in eastern and southern Africa. The present assessment has added materials on infrastructural and institutional needs of these universities. The proposals lacked clear aims and objectives, except in the case of biology, and there were no operational plans for the new subject areas. No formal discussions had taken place with major stakeholders though ISP had a strong sense of the situation in east and southern Africa
- Many African universities, especially those key national universities in east and southern Africa, have made serious efforts in the 1990s to combat crises of funding and organization. The coming decade, if support is forthcoming and organization and management continue to improve, will see a major strengthening of African universities. Agencies supporting research will need to respond and support university initiatives
- In this context, there are strong arguments for some decentralization of functions currently performed centrally. Such decentralization will depend on continuing capacity building in areas such as research management, laboratory management, equipment procurement and maintenance, and on Swedish universities tightening support to research students from developing countries. ISP has these skills to be involved in such capacity building programmes

- The assessment looked at four major stakeholder relationships: ISP/Uppsala University; ISP/Swedish universities; ISP/developing country universities and scientists; and ISP/Sida-SAREC. The current strengthening of African universities presents an opportunity for opening up stakeholder involvement in ISP existing and any new programmes. Senior ISP project leaders and senior scientists appear willing to be involved in such initiatives

7.2 Recommendations

1. Present programmes in physics and chemistry

The present programmes in physics and chemistry perform an extremely useful and important role as a key part of Sida-SAREC's support to research. Support to ISP has grown gradually, the programme has also evolved and obtains good quality research outputs together with meeting some of the institutional objectives of universities.

There is a case for some further resources, if the current programmes continue to support research on the interfaces with biology and the geo-sciences, and provided ISP makes changes to build developing country stakeholder involvement.

2. Proposed programme in Mathematics

Building a programme in Mathematics is both a priority and also a challenge which should be attempted. We believe that it would be possible to start a programme, given the recent increases in academic staffing in maths and IT departments, and recent moves in east and southern Africa to establish regional research initiatives and Masters programmes. We would recommend that a start is made by resourcing the development of a group, to include ISP, Swedish scientists, developing country university mathematicians, including from SAMSA, and Sida-SAREC, to develop the ISP proposal with aims and objectives, an action plan for project, network with long-term support, sandwich and local research environment characteristics. We would recommend that formal relations are built between these stakeholders, and other relevant agencies, including NUFU who are funding mathematics and the ICTP. In particular, there should be a 'two-pole plus' system, where ISP and developing country university mathematicians determine the key priorities for the programme. It feels, from the opinions given in interviews, that such programmes would focus on integrating young members of academic staff into research through postgraduate qualifications, links with more senior scientists, assisted through regular workshops and seminars in long term networks. The development of any programme would be phased and should continue to experiment with more open processes of decision-making. The experiences of Asmara-ISP might be useful in this respect.

3. Proposed programmes in Biology and the geo-sciences

At present the case does not exist for separate programmes in biology and the geo-sciences, in our opinion. Some funding already exists and there are reasonable numbers of existing research projects, albeit not enough. One key need is the development of a new generation of young scientists, but that is an institutional issue for local universities. At present, there are southern fora for researchers. There are also strong local contexts for research. Any expansion in support for these areas would need to take account of both these issues. ISP should continue to build interdisciplinary research linking biology and geo-sciences with physics and chemistry. Many projects in chemistry are on the interface with biology, there are needs for equipment to study molecular systems in both chemistry and biology, and present project leaders support this interdisciplinarity. The seismology network has

a good reputation as a model network. The present programme can give substantial support to the gradual extension of such research.

4. ISP and university institutional strengthening

ISP should continue to evolve its support within the context of institutional strengthening of developing country universities. This is not the same as mirroring the work of Sida-SAREC on institutional strengthening. ISP has its own particular strengths – long-term support to the building of coherent multi-member research teams and networks of teams, sandwich training based on long-term N-S laboratory links, laboratory capacity building and the possibility of increasing research management capacity

5. Decentralisation and ownership

Considerations of decentralisation and ownership are driven by the need to take account of recent and future local capacity to undertake and manage research. The recommendations on decentralization depend on capacity being built but also depend on ISP helping to build capacity in administration, budgets, equipment, and proposal assessment and monitoring (see section 6.1). Similarly, on ownership, it is recommended that each of four relationships (ISP with Uppsala University, Swedish universities, developing country universities and scientists, and Sida-SAREC, be re-considered in the light of possible significant strengthening of local universities (see section 6.2). The key stakeholder relationship needing attention is that between ISP and developing country universities.

6. Future evaluations

There are possible overlaps between these recommendations and the future evaluation of Sida-SAREC support to organizations like ISP, ICTP, Third World Academy of Sciences and the Third World Organization for Women in Science.

Appendix A

Terms of reference for the assessment
Assessment of the proposal for expanded support to the international sciences programme in Uppsala

1. Background

The International Science Programme (ISP) at Uppsala University comprises two units – the International Program in Physical Sciences and the International Program in Chemical Sciences. The basic activity of ISP is to provide support to research training in Physics and Chemistry at institutions in selected countries in Africa, Asia and Latin America. The aim is to strengthen domestic research capacity. ISP's co-operation is long-term, tailored to the specific organisation and may include, beside research training, support to equipment and expendables, supervision, support to literature, spare parts, conference support etc. For research training mainly different Swedish host-institutions are used.

ISP has received support from SAREC since the mid 70-ies. The organisation is today totally dependent on the support from Sida/SAREC which provides more than 90% of ISP's total budget.

The objective of SAREC's support to ISP is to support and strengthen the development of research capacity in the basic sciences in developing countries. SAREC supports basic sciences via four different organisations viz. International Centre for Theoretical Physics (ICTP), Third World Academy of Sciences (TWAS) and Third World Organisation for Women in Science (TWOWS) in Trieste, and ISP in Uppsala which together forms a programme for support to the basic sciences.

During 1997–1999 the total support to ISP amounted to 56 MSEK. The proposal for continued support amounts to 111 MSEK (32 MSEK/2000, 37 MSEK/2001 and 42 MSEK/2001). The application is proposing an expansion of ISP's programme to include support also to the fields of Biology, Mathematics and Geology built on the same working method as the already established programmes. Before SAREC can form an opinion about the future support to ISP a thorough assessment of the proposal and the need for expansion into these new fields is required. Meanwhile SAREC has extended the agreement with ISP for one year. SAREC financed an evaluation of the whole ISP programme in 1993.

2. Purpose and Scope of the assessment

The purpose of the assessment is to provide Sida/SAREC with an expert opinion on the advantages and disadvantages with the proposed expanded programme (hereinafter referred to as the EP), in the context of Sida/SAREC's commitment to the objective of creating and strengthening research capacity in the basic sciences in developing countries.

The recommendations from the assessment will form a base for Sida's decision of future support to ISP. The assessment will also contribute to SAREC's discussion on policies for support to the basic sciences and the various forms/levels of support i.e. for example support to regional research funds, national research funds, to universities, direct institutional support or individual support in the form of stipends. The assessment shall focus on ISP as an organisation, other Swedish institutions involved in the programme activities, other Swedish institutions with similar competence, receiving institutions and potentially receiving institutions.

3. The Assignment

The assessment shall address the following aspects, issues and questions:

- Review the general outline and quality of the proposal
- Analyse the demand for research training in the proposed subjects and assess whether the EP is "supply-driven", i. e. an initiative primarily by ISP, or "demand-driven", i.e. a response to active initiatives by universities in developing countries themselves.
- Analyse on what criteria potential co-operating institutions are going to be selected and invited to write proposals for support
- Assess the relevance and appropriateness of the conceptualisation and design of the EP with regard to ownership and sustainability of the EP.
- In the context of the proposed expansion, what are the advantages and disadvantages of continuing a centralised management of the programmes? Assess the merits of decentralisation of the management of the EP to other universities with same competence in Sweden or/and to selected universities in developing countries.
- Assess the preparedness of other Swedish institutions to participate in the EP
- Analyse to what extent geology, mathematics and biology receive support from other donors in some selected countries
- Compare the cost of this approach to the cost of alternative arrangements of comparable quality involving selected research institutions in the scientifically more advanced developing countries in Africa, Asia and Latin America

4. Methodology, assessment Team and Time Schedule

The assessment will be carried out by Professor David Wield, Centre for Technology Strategy, Open University, Milton, Keynes, UK during February to September, 2000 according to a time schedule agreed upon with SAREC.

The assessment will include one visit to Sweden including briefing at SAREC, interviews at ISP and at selected Swedish host institutions.

Additionally the assessment will comprise visits to selected universities in Tanzania and Zimbabwe where ISP is active.

The assessment will comprise;

- Review of the proposal for the continued and expanded programme
- Review of other relevant written documentation, plans, annual reports etc.
- Visit to a few selected universities in two countries in Africa for in-depth interviews with Deans of the Faculties of Science and Heads of Departments of Biology, Chemistry, Geology ,Mathematics and Physics

- Visit to Sweden for
  - briefing before initiation at Sida/SAREC in Stockholm
  - in-depth interviews at ISP
  - visit to some selected Swedish host-institutions for interviews

- Compilation of an assessment report

The Terms of Reference for the assessment should be sent to the intended interviewees well in advance of the interviews, so that they have enough time to reflect on the questions raised and also consult their colleagues.

Appendix B

Contacts made

Sida-SAREC

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Dr Silas Gustavsson, Goteburg
Dr Ewa Wackegard, Angstrom lab, Uppsala (with Mr Mghendi Mwanburi, from IPPS project KEN03)
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Prof. Dr. Isidro Manuel	Dean of Faculty of Science

Appendix C

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Appendix D1

List of IPPS Projects and Networks by Year of Establishment and Duration of Support and Fellowship Months, 1998

Project/network Code	Project/Network Name	Year of Establishment (1998)	No. of years of IPPS Support	fellowship months (1998)
ETH: 01	Synthesis and Characterisation of Organic Semiconductors Polymers	1990	9	62
KEN: 01/2	Use of Nuclear and Related Techniques	1991	8	19.5
KEN: 02	Nanostructural dye-sensitised thin film solar cells	1998	1	-
NIG: 01	Geophysics	1984	15	72.5
NIG: 02	Tropospheric/Atmospheric Physics	1977	22	104.5
TAN: 01/1	Seismic Network in Tanzania	1989	9	59
TAN: 01/2	Materials for Energy Efficiency and Solar Energy Applications	1976	23	68.5
TAN: 01/3	Applied Nuclear Physics	1987	12	45.3
UGA: 01/1	Material Science and Solar Energy	1989	10	7
UGA: 01/2	Seismology	1990	9	68
ZAM: 01	Materials for Solar Energy Conversion	1988	10	32
ZIM: 01	Crustal Studies with Seismic Hazards Implications in Zimbabwe	1993	6	1
AFR: 01	Eastern and Southern Africa Regional Seismological Working Group (ESARSWG)	1989	11	
AFR:02	African Laser, Molecular and Optical Sciences Network	1996	3	
BAN: 02	Dhaka Materials Science Group	1980	19	69
BAN: 03	Thin Film	1986	13	48
SRI: 01/1	Atmospheric Physics and Lightning Research	1978	21	181
SRI: 01/2	Molecular Desorption of Biomolecules: Mass Spectrometry Applications and Mechanicanstic Studies	1981	18	197.5
SRI: 02	Physical Properties of Technologically Important New Materials	1984	15	232.5
THA: 01	Semiconductors Physics	1985	14	52
THA: 03/1	Neutron and Ion Technology	1982	17	138
THA: 04	Geophysics	1987	12	71
COL: 01	Thin Film and Nanostructures	1976	23	60
COL: 02	Phase Transmissions in Ionic Solids	1985	14	60
ECU: 01	Molecular Desorption: MALDI MS	1992	7	43
ECU: 02	Radiation Technology	1981	18	88
PER: 01	Thin Film: Energy and Hard Coating Applications	1983	16	143.5
PER: 02	Materials Science	1982	17	95
Totals			**360 (inc. n/w)**	**2018**

Source: IPPS, 1997

Appendix D2

List of IPICS Projects and Networks by Year of Establishment and Duration of Support, Fellowship Months and Staff Connected to Projects (as of 1998)

Project & network Code	Project Name	Year of Establish -ment	No. of years of IPICS Support	No of fellowship /fellows	Fellow. Months (1997)	No. Trained in Europe 1997 *	still connect-ed to project, 1997
CAM: 01	Applications of Molecular Biology Techniques to Tropical Diseases	1987	12	12/7	65	7	6
CAM: 02	Natural and Synthetic Bioactive Substances with Potential Applications in Medicine and Agriculture	1991	8	12/6	64	6	4
NIG: 01	Investigation into Anti-infectives of Activities of Some Local Plant Materials used as Drugs	1977	22	15/7	97	7	5
TAN: 01	Nutritional Biochemistry and Biotechnology	1981	18	29/11	162	9	6
ZIM: 01	Biotransformation of Xenobiotics	1990	9	9/5	47	5	5
	African Laboratory for Natural Products (ALNAP)						
	Cassava Safety Network						
	Network for analytical and bioassay services in Africa (NABSA)	1992	7				
	Natural Products Research Network for Eastern and Central Africa (NAPRECA)	1984	15				
	Southern African Regional Co-operation in Biochemistry. Molecular biology and Biotechnology (SARBIO)		-				
BAN: 01	Chemical and Biological Studies of Medicinal Plants	1977	22	42/17	228	11 (+6)	14
BAN: 03	Diabetes Research	1995	4	4/4	30	3 (+6)	4
SRI: 02	Biochemistry, Molecular Biology and Gene Technology	1979	20	16/10	103	8 (+1)	6
SRI: 03	Bioactive Compounds in the Control of Plant Diseases	1981	18	20/15	162	14 (+1)	12
SRI: 04	Biotechnology of Starch and sucrose (Palmyrah) based Products	1985	14	12/6	73	6 (+1)	4
SRI: 07	Nutritional Biochemistry	1995	4	1/1	1	1	1
	Asian Network of Research on Antidiabetic Plants (ANRAP)	1995	4				
	Network of Intrument Technical Personnel and User Scientists of Bangladesh (NITUB)	1994	5				

	Regional Cooperation in Asia (Reg/Asia)	1981	18				
CHI: 01	Chemical Ecology of Plant-insect Interactions	1984	15	16/8	97	6 (+1)	3
COL: 01	Interaction between Malnutrition and Growth Hormone Action	1977	22	17/9	101	9 (+2)	10
COL: 03	Flavours and Flavour Precursor Studies on Colombian Fruits	1992	7	2/2	12	2	2
ECU: 01	Nutritional Biochemistry and Biotechnology	1984	15	24/11	105	7 (+3)	10
URU: 01	Screening and Characterisation of Naturally Occurring Neuroactive Compounds	1978	21	21/8	112	8	3
URU: 02	Solid Phase Protein Biotechnology	1974	25	20/6	94	6	5
	Latin American Network for Research in Bioactive Natural Products (LANBIO)	1991	8				
	Latin American Network for Food Research (LANFOODS)						
	Southern Summer School in Neuroscience						
Total			256	272/133	1553	115 (21)	100

Source: IPICS, 1997

- numbers in brackets show those who received training in 'regional laboratory'.

Appendix D3

Number of PhD and MSc Trainees and Fields of Research Under IPICS Projects (as of 1998)

Project Code	Number of students and awarded degrees	PhD Sandwich	PhD Local	MSc Sandwich	MSc Local	Research Field
CAM: 01	students awarded degrees	4 -	6 1	- 4	- 11	parasite biochem., peptide syntheses, screening/filaricidal activity, sequencing, molecular bio., receptors/serotonin, monoclonal antibodies
CAM: 02	students awarded degrees	4 1	1 1	2 1	4 9	medicinal plants, peptide syntheses, pharmacological screening, natural products chemistry, structure elucidation
NIG: 01	students awarded degrees	1 -	3 1	- -	2 18	medicinal plants, natural products, pharm. chem., antibiotic resistance, synth .org. chem., phytochemistry, pharm. screening
TAN: 01	students awarded degrees	3 2	- -	- 5	- 1	nutritional evaluation of germinated sorghum, nutritional evaluation of germinated millet, protein quality/iron bioavailability in sorghum, microbiology, weaning food development, provitamin A carotenoids in veg. and fruit, nutrient bioavailability/anemia, antinutritional factors, analysis of provitamin A carotenoids
ZIM: 01	students awarded degrees	2 2	- 1	- -	1 -	schistosomiasis, drug metabolism, glutatione S-transferases, anti-oxidant enzymes
BAN: 01	students awarded degrees	2 7	2 1	2 2	10 40	carbohydrate chem., carbohydrate chem./jute, bacterial polysacc., medicinal plants, straw digestibility, instrument maintenance, bioactive substances, natural products
BAN: 03	students awarded degrees	4 -	2 7	4 -	3 8	diabetes studies, molecular biology, natural products/bioactive substances, instrument maintenance, toxicology
SRI: 02	students awarded degrees	3 8	2 -	- -	10 26	neurotoxins (snake venoms), immunology, hormones, diabetes, enzyme biochem., genetic engineering
SRI: 03	students awarded degrees	4 7	- 4	- 1	4 11	carbohydrate chem., bacterial polysaccharides, natural products chem., synth org chem., insect/plant, laboratory management
SRI: 04	students awarded degrees	5 3	- -	- -	3 8	genetic engineering, biotechnology
SRI: 07	students awarded degrees	- -	- -	2 -	2 -	nutritional biochemistry
CHI: 01	students awarded degrees	5 3	1 1	3 1	3 5	organic chem., insect-plant interaction, pharm screening, plant enzymology

COL: 01	students awarded degrees	4 -	1 -	- 2	2 8	endocrinology, hormone bioichemistry, genetic engineering, growth hormons, peptide hormones, growth factors
COL: 03	students awarded degrees	- -	4 1	- -	1 6	flavour chemistry
ECU: 01	students awarded degrees	- 1	- -	3 3	- -	weaning food development, food analysis, food chem., food science, bioavailability of nutrient, enzyme immobilisation, fermentation, food technology/starch, provitamin A carotenoids
URU: 01	students awarded degrees	- 2	- 1	- -	1 9	neurotoxins, neurochemistry, attention deficiency disorders/children/, enzymology, analysis of neuropeptides
URU: 02	students awarded degrees	3 1	1 -	- -	1 1	biochemistry (enzymes), biochemical sep. tech., immobilisation of enzymes
Total		75	41	35	208	

Source: IPICS, 1997

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