Report of the External Review Panel of the International Council for Science
July 8th, 2014

Preamble

The External Review Panel (ERP) was set up in mid-2013 to review the activities of ICSU which had not been reviewed since 1996. Terms of Reference (ToR) and a timetable were agreed upon and a series of meetings set in order to deliver this report in good time for the General Assembly in Auckland from 31 August to 3 September, 2014. The Materials Research Society of Singapore (MRS-S) led by B V R Chowdari provided the secretariat and hosted on behalf of International Union of Materials Research Societies (IUMRS) the ERP meetings described below.

Membership of the panel appointed by the ICSU Executive Board (EB) are: P L Knight (chair), M T K Arroyo, H Hauser, A B Holmes, A S van Jaarsveld, M Kleiner, K Lal, K Olsen, I Serageldin, K Takeuchi. All members of the ERP contributed strongly to the report.

The first ERP meeting was held from 25 to 28 October 2013 in Singapore, with most of the members in attendance, and the others contributing by E-mail and video conference. At this initial meeting ERP focused on reviewing the ToR, establishing working procedures and addressing items in the ToR in some detail.

The ERP thought it essential that members should visit the Paris Secretariat of ICSU just before the second ERP meeting. A subgroup visited on 7 January 2014. The visit started with a detailed presentation by C Smith of the history, current activities and future aspirations of ICSU which was particularly useful to those members who had not been able to join the panel at the first ERP meeting in Singapore, which had received a presentation from S Wilson, the current ICSU Executive Director. The subgroup had the opportunity to meet with the senior staff, and then an all-staff Q&A session. Finally a wrap- up meeting was held with the Chief Executive. Following this visit a summary of the findings were circulated to the rest of the ERP prior to the second ERP Meeting.

The Regional Offices (ROs) were identified by the ERP as an important new development within ICSU. A sub group of the ERP looked into the constitution of the ROs, and engaged with the staff of two of the ROs ; one RO was not visited in the end due to time constraints and the availability of members of the ERP but ICSU “family members” in the relevant regions were consulted where possible. The ERP was aware that individual regional reviews were underway conducted by ICSU itself.

The ERP instigated a request for stakeholder input with what were thought to be appropriate deadlines given the ERP timetable. Some of the stakeholders asked for more time to respond, and where possible this was accommodated. As a result the ERP received a reasonable spectrum of inputs from a large number of Unions and National Members.

The second ERP meeting was held in Singapore from the 10 to 13 January 2014, with a large member attendance. The ERP focused at that meeting on completing the analysis of items on the ToR. In particular, at this meeting, ERP was able to work on the stakeholder input, to review what had been learned from the Paris Secretariat visit, and from consultations on the ROs. The ERP benefitted greatly from having President Lee Yuan Tze for part of the meeting, and were able to hear his views on the current status and aspirations of ICSU as well as to feed back to him the provisional findings. The ERP had also formulated key questions which had been circulated in advance for which advice was sought from the EB. These were discussed in a very useful teleconference, after which some members of the ICSU officers also provided the ERP with written responses by e mail. Finally the ERP agreed on a provisional working document for the Review Report.

The third meeting in Singapore from 27 to 30 March 2014 agreed upon this draft report for circulation as tasked in the timetable, and drafted the presentation for the forthcoming General Assembly.

Executive Summary

ICSU must regain its position as THE Organization that speaks for the international scientific community. This role is made doubly important because: (a) the most pressing issues facing humanity are global in scope and transcend the borders of individual countries, as well as requiring the inputs of all disciplines, (b) scientists are increasingly working globally in a collaborative mode on many problems and a truly global enterprise of science exists and gets stronger every day.

ICSU has the legitimacy of playing this role because it is the only organization that has both national members and union members that reach into some 140 countries and 31 Scientific Unions. However, that presumes that the members recognize that the ICSU leadership speaks for it, and that the ICSU leadership has to be able to count on the members to participate in executing the general global initiatives adopted on behalf of the entire ICSU family, and that the general public and governments are aware of ICSU's stature.

It is essential that ICSU resolve areas of lack of clarity and overlap with other established organizations of global science, specifically IAP/IAC, and TWAS (and possibly WAAS). It should be a primary task of the ICSU leadership to work out an umbrella agreement with these bodies focusing on sharing responsibilities and modalities of collaboration to execute the kind of flagship projects that all agree on. Such division of labor and joint fundraising should be formalized in a written agreement. ICSU should be encouraged to concentrate on what we believe is their central role, that of articulating a single strong voice for science in international affairs. The multiplicity of bodies - ICSU, IAP, IAC, GRC, TWAS - is a confusion and needs to be dealt with.

ICSU should then focus on a limited number of initiatives that would fire the imagination of its membership and bring a major contribution to the international public debate by bringing in the views of the scientific communities as a clear input to global decision making. In addition it should be able to provide a mechanism to engage members on the broad front in terms of ICSU activities including the public concern with science. One opportunity is the provision of short policy briefing statements on major scientific issues of the day.

The ERP believes it is essential to solve a number of governance problems in ICSU, especially those related to RO's to improve the current relations between the membership, the regional offices, the central secretariat and the leadership. One step in that direction would be to have a dedicated senior staff member to deal with the regional offices at HQ to ensure the spread of best practices between the regional offices (e.g. the national members' involvement with the regional offices) and more connectivity of the regional office directors with other parts of the system. All this would go towards greater and more effective integration of the system and help produce a real sense of an integrated organic ICSU "family" rather than just interlinked structurally separated units. The ERP is aware that such a dedicated staff member had been deployed in this way previously but that issues prevented continuation; the ERP feel these need to be resolved.

Given the nature of global challenges and the needs for "pluri-disciplinarity" (a term used by the ERP to describe the complex multidisciplinary needed for such challenges) that they require, ICSU should address the gaps in its present range of coverage, specifically: a greater presence of the biological sciences (currently described to us as somewhat fragmented), and bridging the divide between the natural and the social sciences and the humanities. Future Earth, IRDR and the Urban Health programmes play a role in bridging this gap.

Finally, both by the nature of the challenges and the nature of the comparative advantage of ICSU's structure of unions, national members and regional offices, it is important that ICSU selectively promote transformative and pluri-disciplinary programs that bring together such domains as biological, nano and information technologies. Such programs should also ensure the participation of the social sciences and the humanities.

The international science and social science bodies need to accelerate their partnering relationship, as there are few major science policy issues whose framing can do without major social science input.

An effective "voice" needs not only awareness and impact in international policy circles, but also awareness and impact in the international science community and the public at large, for without the latter, not only will the input to ICSU be weaker, but the multi-dimensional support for ICSU positions through a variety of routes will not be achieved.

Finally we believe the acronym ICSU, a largely unrecognized badge should be changed to the ICS and a clear and comprehensive communication strategy be developed to make its role much more widely known. The U in the acronym is now meaningless in the organization's name ("The International Council for Science").

Key Recommendations

The world is in the throes of massive transformation. Global connectivity, big data, and newly emerging centres of excellence in science, all redefine the landscape of how science is done. The issues of global importance such as sustainable development, gender equity, and global health have made it imperative that the pluri-disciplinary studies, and the evidence that they include and generate must be the foundation to reach decision-makers and the public at large.

Within this context, ICSU must find its voice, and regain its pre-eminent position as the articulator of the position of global science on the issues of today and tomorrow. To do so, it must:

I. Adopt a **vision** and have ICSU leaders promote it, a vision that others can be inspired by and rally to.
II. Resolve the ambiguities in its **relations with other global institutions of Science**, i.e clarify the manner in which it cooperates or competes with the other institutions of science on a global scale, specifically Global Network of Science Academies (IAP) and Inter-Academy Council (IAC), the Global Research Council (GRC) as well as The World Academy of Sciences (TWAS) and World Academy of Art and Science (WAAS).
III. Secure the **funding** to support the programs that will involve its membership, engage its international partners and implement its vision.
IV. Resolve outstanding issues (which are described in what follows) in the current **governance of ICSU** so that it can truly speak for its whole membership and can count on that membership to be thoroughly engaged in the program that its leadership articulates; and
V. Specifically address the needs of the ICSU **Regional Offices (ROs)** so that they truly become a major part of the ICSU family.

If ICSU does not achieve these five pillars of its future role, the ERP fear there is a serious risk that it will wither on the vine and become irrelevant over the next few years.

The ERP recommends the following actions to achieve each of these five pillars, pointing out that these are very much mutually reinforcing, and the whole is very much more than the sum of the parts. Thus the incoming ICSU leadership will need to be extremely energetic across a broad front of issues to bring about the desired rejuvenation of ICSU and its global role. In the narrative section of this report specific recommendations are set out which elaborate upon the key recommendations.

The recommendations are grouped under these headings, but clearly with areas of overlap and synergies, but for convenience this presentation makes the ERP position somewhat clearer.

I. On Vision and Visibility:

ICSU must identify and adhere to a powerful mission statement that will inspire as well as motivate not just its members, but also the scientific community, the public at large, decision-makers, the media and the funders.

This mission statement must be stated in the ICSU literature consistently, and on the website in our communications with others. The broad vision must be translated into adoption and commitment to a strategy and a very limited number of **flagship projects**. Future Earth will be the primary such flagship project.

The vision developed from the Mission Statement must be translated into a strategy of *implementation* and a distinct implementation plan, separate from the strategy, or representing a slice of it, against which the outcomes can be measured. This implementation plan should be a living document regularly reviewed, updated and widely disseminated.

The selected flagships which fit into (and represent) this vision, strategy and implementation plan, should sharpen ICSU's objectives with a special focus on pluri-disciplinarity as a broad form of cooperation between societal partners, industry and academia in order to meet complex challenges of society.

Through its vision statement, flagship project and newly acquired visibility, ICSU should acquire a recognized advisory role in global science policy. The vision must include an open and flexible framework for embracing new scientific disciplines as they emerge as well as strengthening a productive relationship with the humanities.

Such a vision, with its strategy and flagship projects should be widely communicated. ICSU must ensure broad visibility for these efforts, by developing closer relations with the media and systematically distributing policy notes, updates, news items, to the multiple constituencies that must be moved, inspired and motivated by this vision: the membership of ICSU, other global scientists, the decision-makers, the public at large and the media.

This shared vision must be communicated to all stakeholders. ICSU should develop a communication plan for each of its constituents and develop priorities and milestones to achieve impact. It must be a living document that evolves and whose evolution is recorded and discussed with all concerned. Specifically, ICSU needs to:

I.1 To generate and widely disseminate regular and robust position papers and policy documents on major scientific issues of topical importance using the membership of the ICSU family. Such statements should be peer reviewed and formally approved by the EB prior to release.

I.2 Develop metrics and measures to demonstrate that the enhanced communication, outreach strategy and activities are making the overall impact that is needed and envisioned.

II. Relations with other Global Institutions of Science:

The reinvigorated ICSU, with its vision and flagship project(s), must seek out closer relations with other actors on the stage of global science. These are primarily IAC and IAP, as well as the newly created Global Research Council (GRC). This would argue for a move to more formal structural links to clarify roles and reduce confusion. Such continued confusion is likely to be damaging to a fundraising campaign, as well being unhelpful as we try to present a unified single voice for science world-wide. The pros and cons of such a closer liaison and even merger of these global entities should be further investigated by the EB.

II.1. ICSU should play a more active role in bringing together other coordinating bodies such as Engineering Councils, ISSC (International Social Sciences Councils), as combined together we are much more likely to realize the funding and impact necessary to deliver our vision.

II.2. Engagement strategies to bring all of these aforementioned stakeholders need to be developed by the leadership of ICSU and with the full buy-in of members.

III. Funding:

ICSU needs to focus its resources much more on a campaign to secure substantial funding for the flagship programmes, work on policy papers etc; the ERP is convinced this needs to become a top priority and adequate resources should be dedicated to this, in comparison to other less pressing programs at hand.

Future Earth is an exemplary mechanism that up-scales ICSU and promotes the visibility of ICSU at a global scale. It is an excellent example of a program that requires interdisciplinary thinking that only ICSU can contribute world-wide and has the potential for attracting substantial funding, were a vigorous campaign be mounted with participation from the whole ICSU family.

A dedicated funding campaign led by ICSU's senior officers (President, VP etc) and other co-opted leading scientists is required. The current strategic plan has very challenging aspirations that require a different way of working from that currently adopted by ICSU: there is a clear need for ICSU to change the way it operates in raising the profile of ICSU and in enhanced fundraising activities. The ERP recommends:

III.1 Engage the Past Presidents: The ERP believes that a "parliament" or high level forum of the past Presidents Forum can be utilized and engaged in major fundraising campaign. However, it is crucial that past presidents fully buy in to the current leadership's vision so as not to interfere with their vision. Such a Past Presidents Forum, led by the present President would also enable the present vision to be carried forward.

III.2 The EB should investigate the formation of a not-for-profit-foundation to encourage philanthropic and other support for their flagship projects. The ERP strongly recommend the development of an advisory committee to steer the role of the aforementioned foundation.

III.3 To have dedicated teams to execute flagship projects. The ERP sees the need to set up new mechanisms to drive these projects as has been proposed for Future Earth. This should not solely be the job of the Secretariat but requires the vision and dedicated leadership of the officers and other leaders of ICSU.

III.4 There is a need to involve business and industry. A special outreach mechanism is required to ensure their effective involvement. ICSU and especially its leadership should engage more in the various business leaders' forums, and other high profile public occasions, to cultivate much stronger links with individuals of wealth and corporate and government agencies who share ICSU's vision; this will materially enhance the fundraising activity.

III.5 The leadership of ICSU should engage more in high profile external and scientific forums as part of their strategy to improve ICSU's visibility and to aid the cultivation of fundraising allies.

The ERP is convinced that there exists a huge opportunity for ICSU to embrace this new manner of working in a timely manner: delay may well risk it slipping away to other, less representative scientific bodies.

IV. Improve Governance of ICSU:

If ICSU is to perform at the level that the ERP have indicated, and if it is to acquire that much larger role that we believe that it should have, ICSU's internal Governance must be substantially improved. Specifically, ICSU should:

IV.1 Initiate an extensive membership drive that encourages participation from across the disciplinary spectrum as well as from business and industry.

IV.2 Establish clearer mechanisms for recruiting new Union memberships and accommodating Associate Members.

IV.3 Establish avenues for increased participation by early career scientists in Unions, Academy and Funding agencies initiatives to raise the awareness and participation of early career scientists in ICSU activities and programmes.

IV.4 Establish appropriate mechanisms to ensure better strategic alignment between national research agendas and research priorities recommended and driven through ICSU.

IV.5 Continue to actively promote gender and diversity agendas to increase their profiles across all ICSU initiatives and leadership.

To clarify the internal decision-making of ICSU, and specify the roles of the Executive Committee and the Policy Committees, as follows:

IV.6 Ensure that the three policy committees focus their energies on providing policy advice to the EB/ Governance Board, and that EB/ Governance Board should be the single responsible body for providing appropriate governance oversight of ICSU.

IV.7 The ERP recommends that the EB should truly act on behalf of the General Assembly as the apex body of ICSU between the General Assemblies, as per constitution of ICSU. The role of the Policy Committees should be advisory and to serve as the think tank of the Board. In this context it is recommended that the EB may be renamed as the Governing Board. The Policy Committees should be renamed as Advisory Committees.

IV.8 Clear and unambiguous lines of command as indicated in the proposed new organogram should be implemented for efficient functioning of the ICSU Secretariat.

The Governing Board with the Secretariat should develop strategies for identifying and inclusion of new members, particularly those representing emerging disciplines and subject to budgetary constraints the following would be most desirable:

IV.9 A Communications and Outreach section of up to five staff members should be established.

IV.10 The Membership section should have sufficient staff to improve interaction with all members and partners, but particularly with the Unions.

IV.11 The Secretariat should establish a Science Policy and Advice section, with peer reviewed output.

IV.12 There should be a dedicated Development (fund-raising) section.

V. ICSU Regional Offices:

For the effective functioning of the ROs, the ERP recommends:

V.1 The Secretariat should establish a professional development strategy including annual performance reviews against agreed performance indicators for each member of Secretariat and each Director of the ROs. ROs should mirror this practice.

V.2 Reviews of the ROs should be conducted every five years in a timely manner at the beginning of year four so that staff employment expectations can be communicated well in advance.

V.3 The ROs require a more expedite relationship with the Secretariat as through a Liaison Officer point of contact in the Secretariat.

The sustainability of ROs should receive more focused attention, especially, if they are required to move around the regions on a regular basis as originally envisaged. The duration of support by host country should be at least five years.

ICSU should also address the concerns of its **ROs** as given below:

V.4 The ROs should establish formal links and agreements with the national science foundations of the Region, which often have a much greater influence in terms of resources and contacts with decision makers in Governments.

V.5 It is recommended that the RO Newsletters be distributed widely among the scientific societies and networks and national science foundations in the Region in addition to the academies. The relevant regional networks of academies need to be better engaged with the ROs.

V.6 Efforts are needed for training of the science officers in project management.

V.7 RO staff engaged on large flagship projects should have an attachment to the Secretariat and an active link with the EB.

V.8 Agencies and industrial partners from national adherent members and the RO host countries should consider seconding key staff to the Secretariat in order to share expertise and provide support for appropriate projects.

The Narrative which has Informed the ERP's Key Findings and Recommendations

1. Introduction

1.1 Globalization of Science and the Emergence of Grand Challenges

The global dimensions of many problems, a technological world in which extreme specialization is becoming widespread, and an increasingly globalized arena for innovation and development, together with widespread availability of the internet and easier air transport has radically changed the way we do science. There has been a major increase in collaborative research across the globe, yet these trends and the social benefits of scientific research are unevenly distributed geographically.

Along with these profound changes the past decades have seen the emergence of significant challenges to humanity that transcend national remits and capabilities and demand a coordinated global response from the scientific community. These include the Ozone crisis, climate change, pervasive poverty, inequality, water and food security, health and sanitation, energy and other dimensions of a sustainable future. Human activities, including their consumption trends, are altering the Earth system with significant impacts on the environment at the local, regional and global scales. Changes in the Earth's climate and loss of biodiversity are undermining improvements in human wellbeing and poverty alleviation. These grand challenges typically require interdisciplinary international collaborative efforts across a broad spectrum of the natural and social sciences and interface with industry and business.

The field of sustainability science has developed in response to these global challenges providing a framework which integrates the natural and social sciences and the humanities in order to better address the interdisciplinary, interrelated nature of the major challenges facing humanity today. Sustainability science was formally launched as a new scientific field at the July 2001 conference "Challenges of a Changing Earth" in Amsterdam, sponsored by ICSU. Sustainability science should not be regarded as restricted to environmental matters. Sustainability science considers both technological and social-ecological systems, aiming to create social system innovation, and cutting across sectors by building partnerships with industry, policymakers and civil society. It recognizes the imperative of capacity building, particularly in the developing world. In particular, it places a strong emphasis on reducing vulnerability and building the resilience of social and ecological systems. The challenge of achieving a transition to global sustainability is urgent given the potentially catastrophic and irreversible implications for human societies. On one hand, this is a threat to human prosperity on Earth; on the other hand, it provides incentives to develop new opportunities for innovation that supports sustainable development[1].

The progress made to achieve Millennium Development Goals (MDGs) is being reviewed by a number of stakeholders at international level. Deliberations at the UN level[2,3] and those of several

[1] http://www.icsu.org/future-earth/media-centre/relevant_publications/FutureEarthdraftinitialdesignreport.pdf
[2] Rio+20 United Nations Conference on Sustainable Development (June 2012)1.Meeting of UN System Task Team on the Post-2015 UN Development Agenda, May 2012
[3] ICSU-UN Expert Group meeting to debate framework for sustainable development goals and generate scientific input to the UN, March 2013

ICSU National Members[4,5] and bodies like G-Science Meetings[6,7] have led to reports and statements. These articulate the view of the S&T community on possible approaches to tackle these major challenges. In this context ICSU has a pivotal role to play in evolving global strategies keeping in mind the latest developments in science and technology. ICSU should strive hard to steer global science efforts in collaboration with international funding agencies and organizations similar to it. Developing regions of Africa, South America and Asia-Pacific need different strategies and ICSU through its wide network of Membership and Regional Offices should take initiatives to provide multiple policy alternatives.

In the context of addressing pressing and emergent global challenges, global organizations such as ICSU have a pivotal role to play in steering the global science effort in collaboration with international funders and partner organizations. To continue to be relevant and maintain its long-standing global leadership position, ICSU must build on past experiences but at the same time be aware of the necessity to incorporate changes and address issues that are consistent with a rapidly changing scientific landscape, radical shifts in the funding landscape and increased public awareness of the power of science.

1.2 Changing Scientific Landscape

In 1996 we relied largely on paper communication. Fax was the most sophisticated means of "instant" communication, e-mail was emerging, and social media were non-existent. In 2014 the "digital world" has changed the way in which information is acquired. E-mail, video and electronic communication are the norm and the internet is the source of most information. Historically ICSU has made its greatest impact in those areas that of necessity require international collaboration - polar regions, geophysics, space science. The most dramatic changes since 1996 have been the general globalization of science, the emergence of grand challenges in additional areas and the increase in spending on research and development. There has been an accompanying increase in the number of scientists and the output of peer-reviewed research. Manuscripts are today routinely submitted and reviewed electronically. Science is no longer the preserve of individual nations. It is a global enterprise[8]. Accompanying these changes has been the ability in the industrialized world to measure performance by criteria such as citations per paper, impact factor of journals, h-index and related measures and the ease of retrieval of data electronically. Large amounts of data have been accumulated and require management. In many countries paper archives are being relegated to single repositories and the modern library consists of computer terminals and printers. This is not a universal situation, and there are many developing countries that do not enjoy such privileges. Accompanying the growth in science in many nations there has emerged an increasing awareness of the potential to protect and exploit publically funded intellectual property and the requirement to codify research practices and research integrity. ICSU has played and should continue to play a major role in the provision of

[4] A Sustainability Challenge: Food Security for All: Report of Two Workshops, 2012; Using Science as Evidence in Public Policy, Kenneth Prewitt, Thomas A. Schwandt, and Miron L. .Straf, Editors, 2012.

[5] e.g. the briefing for the UN High Level Panel by UK Collaboration on Development Science, The role of science and evidence in designing post 2015 development goals.

[6] G-Science Academies Statement, Driving Sustainable Development: Role of Science, Technology and Innovation, May 2013

[7] G-Science Academies Statement, Drug Resistance Infections-A Global Threat to Humanity, May 2013

[8] Knowledge, networks and nations: Global scientific collaboration in the 21st century. RS Policy document 03/11. Issued: March 2011 DES2096. ISBN: 978-0-85403-890-9

reliable and authoritative sources of data in science and technology. An example of this is the important ICSU's CODATA activity on Fundamental Constants.

Since the 1996 review, the center of gravity of research activity in the world has moved much more towards an international arena. Globally, the average number of authors on papers in the Web of Science in 1981 increased from 2.48 to more than five in 2012[9]. In 1988, 8% of the world's Science and Engineering articles had international co-authors whereas by 2009, this share had grown to 23%; for the world's major S&T regions, the 2009 rate ranged from about 27% to 42%[10]. Moreover, internationally co-authored publications are increasingly multi-nationally co-authored[11]. As a result several emerging economies, including both small and large countries, have become increasingly integrated into the global science enterprise (Figure 1[12]).

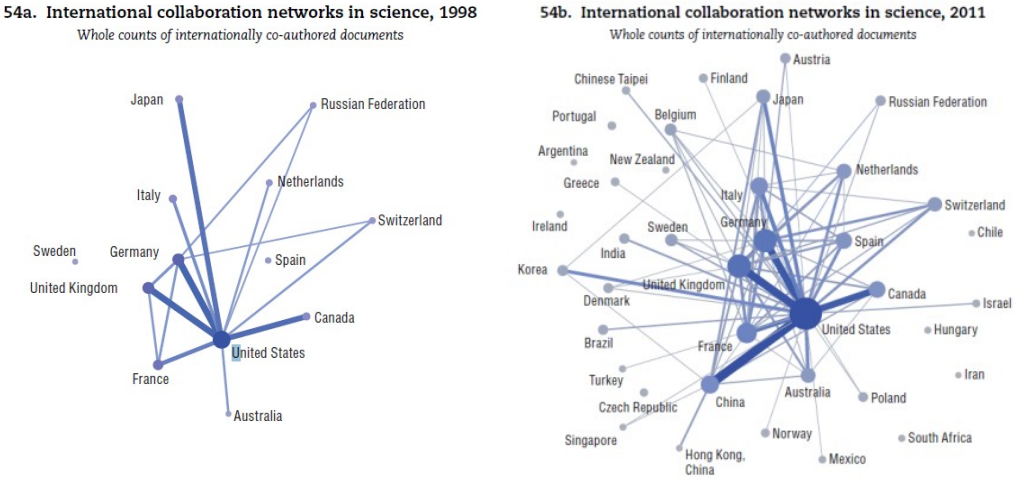

Figure 1: International Networks in Science

OECD (2013), "Knowledge economies: Trends and features", in *OECD Science, Technology and Industry Scoreboard 2013: Innovation for Growth*, OECD Publishing. http://dx.doi.org/10.1787/sti_scoreboard-2013-5-en

How to read these figures
The position of selected economies (nodes) exceeding a minimum collaboration threshold of 10 000 documents is determined by the number of co-authored scientific documents published in 2011. A visualisation algorithm has been applied to the full international collaboration network to represent the linkages in a two-dimensional chart on which distances approximate the combined strength of collaboration forces. Bubble sizes are proportional to the number of scientific collaborations in a given year. The thickness of the lines (edges) between countries represents the intensity of collaboration (number of co-authored documents between each pair).
The positions derived for 2011 collaboration data have been applied to 1998 values. New nodes and edges appear in 2011 as they exceed the minimum thresholds.

This increased research collaboration brings clear benefits to scientists and institutions, and to the broader global community — with internationally co-authored publications shown to have a greatly increased average impact[13]. Nevertheless, a significant disparity between the global North and the global South in terms of scientific knowledge generation remains. G20 countries are still responsible for 90% of papers published in science, medicine and

[9] Science Watch: http://sciencewatch.com/articles/single-author-papers-waning-share-output-still-providing-tools-progress
[10] National Science Board. 2012. *Science and Engineering Indicators 2012*. Arlington VA: National Science Foundation (NSB 12-01).
[11] Leydesdorff L, Wagner CS. 2008. International collaboration in science and the formation of a core group. Journal of Informetrics 2 (4): 371-325.
[12] OECD calculations based on Scopus Custom Data, Elsevier, version 5.2012, June 2013
[13] Adams, J., Gurnek, K. and Marshall, S. 2007. Patterns of International Collaboration for the UK and Leading Partners (Summary Report). Evidence Ltd.

engineering[14]. This gap is slowly narrowing, with the share of peer-reviewed publications by scientists from developing countries rising from 18% in 2003 to 25% in 2007[15]. However, this is largely due to rapidly increasing research output in a small number of developing countries—for example, China is responsible for over a third of the developing world's scientific publications and South Korea and India as well have dramatically increased their research intensity. Corporate research and manufacturing has taken an advantage of this geographical shift and as a consequence, we now see major Research & Development (R&D) activities moving towards Asia, both because markets and available trained individuals favor such a shift[16]. The gap between the developing and developed countries highlights the pressing need for South–South as well as North–South collaboration to build research capacity in the developing world and ICSU is ideally placed to have a major impact here.

International mobility is also a part of the changing landscape[17]. Not only are scientists building strong collaborations through short-term or transitory visits, but will also move to countries that are investing in research support and infrastructure. Indeed the ability to improve one's future and the presence of outstanding faculty or research teams were the two major factors cited in the "GlobSci" survey[18], a comprehensive survey that examined the mobility patterns of over 16,000 active scientists in 16 countries. Analyzing data from scientists with foreign origins and scientists working outside their home country demonstrated considerable variation in immigration and emigration patterns depending upon the country. One trend is that there are more foreign postdocs than foreign scientists within most of the 16 countries studied.

The "gender gap" is also becoming an important issue worldwide, with much attention focused on policies and practices to ensure gender equality in education, employment, earnings, and entrepreneurship[19]. The United Nations considers gender equality as one of eight Millennium Development Goals. A significant gender imbalance in the areas of science, engineering and technology continues to exist[20]. A recent report sponsored by Elsevier Foundation[21], carried out a pilot assessment of six countries (Brazil, India, Indonesia, the Republic of Korea, South Africa, United States) and one region (The European Union). This particular study found that "number of women in science, technology and innovation fields are alarmingly low in the world's leading economies.

[14] Data from Thomson Reuters Science Citation Index. Available in United Nations Educational, Scientific and Cultural Organization. 2010. UNESCO Science Report 2010.
[15] The World Academy of Sciences. 2011. TWAS Annual Report 2010. p11.
[16] Knowledge, networks and nations: Global scientific collaboration in the 21st century. RS Policy document 03/11. Issued: March 2011 DES2096. ISBN: 978-0-85403-890-9
[17] Van Noorden, R. "Science on the Move, Nature, " v. 490, pg 326-329, 2012
[18] Franzoni, C., Scellato, G., & Stephan, P., "Foreign-born scientists: mobility pattern for 16 countries", Nature Biotechnology, v 30 (12), pg 1250-1253, 2012
[19] OECD Factbook 2013: Economic, Environmental and Social Statistics-special chapter, Gender Equality
[20] Beyond Bias and Barriers: Fulfilling the potential of women in academic science and engineering, the National Academies Press, Washington, DC 2007
[21] Gender Equality in the Knowledge Society National Assessment in STI carried out by Women in Global Science and Technology (WISAT) and Organization for Women in Science for the Developing World (OWSD)

Another recent shift in the science landscape since the last ICSU review of great relevance to global scale scientific problems has been the emergence of big data sets from fundamental science[22]. Such big data sets have been driven by international science projects (global astronomy projects, mega genetic projects, large-scale physics experiments and the emergence of global data sets in the environment field) together with improved modeling and simulation capabilities. These exciting developments were facilitated by and sometime even fast-tracked immense improvements in hardware, software and storage capabilities across IT platforms. Such dramatic developments will accelerate over the coming decades and will at least engage with the next generation of accelerators and telescopes, genetics and predictive medicine, new drug discovery and development approaches as well as global environmental assessments.

The global research landscape continues to morph in a number of additional ways, creating new avenues of scientific discourse. Recent examples include the drive towards open access publishing[23] and the now widespread use of metrics to assess and evaluate research performance and impact[24]. In these pertinent and topical matters it is important for any global organization, such as ICSU, to articulate a clear position about how it views the emerging practices and trends and to facilitate appropriate discourse about the likely and potential implications of these developments for the global science enterprise.

In particular, the funding landscape for science has undergone a major transformation in the past decades. There is more cooperation and different kinds of approaches which connect different fields of science or even reach across institutional frameworks, but much more is needed. These developments are reflected in diversified funding sectors: public, governmental, industrial, civilian (foundations, donors etc.). ICSU, being a global network of stakeholders, can play a vital role in exchanging opinions and promoting agreements.

The growing closeness between different sectors of society as well as international collaborations makes research and funding procedures become subject to more strategic measures. As a reasonably small enterprise (< 1% of GDP invested) many governments were comfortable for science to be a self-regulating activity. As it became clear that science has the potential to become an influential driver of economic development and progress, many governments and multilateral corporations around the world increased their relative investments in science (2-4% of GDP) in order to reap economic benefits. In this regard science has become "a victim of its own success"[25] and an important driver of economic achievement. One consequence of this increased pattern of science investment around the globe is that oversight has become more intensive and regulated.

[22] http://www.mckinsey.com/insights/business_technology/big_data_the_next_frontier_for_innovation.
[23] http://www.nature.com/news/open-access-the-true-cost-of-science-publishing-1.12676
[24] http://www.nature.com/nature/journal/v465/n7300/full/465845a.html).
[25] http://ec.europa.eu/research/science-society/document_library/pdf_06/global-governance-020609_en.pdf

Since the 1996 review, estimated R&D expenditure worldwide has grown from around $522 billion dollars to close to $1.3 trillion in 2009[26]. The centre of gravity of research activity in the world has moved much more towards an international arena. China, Singapore, South Korea and India have dramatically increased their research intensity. China's R&D/GDP almost tripled between these years (0.6% in 1996 to 1.7% in 2009) and the decade-long growth rates of R&D expenditures ranged from 9.5%-10.5% for Singapore to 12% for South Korea[27]. By comparison, the growth rates for US, EU and Japan were between 5.4%-5.8% during this period. Corporate research and manufacturing has taken an advantage of this geographical shift and as a consequence we now see major Research & Development (R&D) activities moving towards Asia, both because markets and available trained individuals favor such a shift.

Beyond the economic and technological benefits of increasing R&D expenditure, it is essential to continue support of basic research and freedom of inquiry (universality of science). These are unchangeable criteria and the most significant for the progress and development of our scientific system as a whole and any scientific branch within. The ERP believes this should remain a fundamental tenet of ICSU.

The importance of evidence-based decision-making as a prominent criterion for policy makers and funding agencies cannot be overstated. This becomes critical when global issues such as environmental change, energy, health and sustainability are under consideration. Factors such as trans-disciplinarity, international cooperation, and diversity should be the norms for relevant research. Here, ICSU should play a role in encouraging trans-disciplinarity.

The ERP note that in 2011 the ad-hoc Review Panel on Science Education (RPSE) chaired by Roberta Johnson proposed a new ICSU initiative dedicated to science education. The report of the RPSE was not supported by the EB and subsequently the recommendations were not proposed to the General Assembly in Rome. The ERP believes that science education should be an essential part of ICSU strategy in developing global initiatives.

1.3 Innovation and Intellectual Property

Both governments and the private sector demand increased returns on their investment. At the same time there has been a growing expectation of universities and research institutes as well as agencies that publicly funded research will provide tangible translational benefits from the exploitation of IP in universities. In addition industrially funded research in such establishments has evolved from the sponsorship of "curiosity-driven" research through unrestricted grants to highly focused and targeted sponsored research which is commercial-in-confidence. In parallel with that refocus of research funding there has been an explosion of spin-off companies and licensing agreements often arising from entrepreneurially-minded

[26] NSB 2012 Science & Engineering Indicators
[27] NSB 2012 Indicators

individuals. The power and economic influence on general economic activity has been profound.

A feature of the emergence of SMEs has been a parallel trend in the decisions of large corporations to abandon or significantly reduce corporate research activities with a presumed strategy that they will acquire their intellectual property through directly funded research with university and research institute providers or by acquisition of SMEs. This trend is most apparent in the pharmaceutical industry and the chemical industry. The ERP believes ICSU should engage better with its members on the important innovation agenda in the coming years (see for example the UK Government report[28] by Dr. Hermann Hauser and related documents in the footnote below).

2. Response to the Terms of Reference

2.1 Review of progress made since 1996 Assessment

Successes, failures, and lessons learnt in responding to the 1996 Assessment recommendations, with a focus on the period covered by the ICSU strategic plans.
In the light of the review of progress, and taking account of the external environment, make recommendations on the following to ensure that ICSU is fit for purpose for the next decade.

The Review Panel recognizes the considerable progress made by ICSU since the 1996 assessment, including the introduction of the strategic plans and much else. However, the current review panel noted that many of the recommendations made in 1996 remain to be fully acted upon. This observation is based on the information contained in the *Appendix: ICSU Since 1996 Assessment)* provided to us by the Secretariat. In particular, later in this report when we deal with membership issues, we will be reiterating many of the recommendations stated in the 1996 assessment report.

2.2 Mission, vision and strategic priorities

Appropriateness of ICSU's present mission and vision given the changing societal landscape and the rapid advances in science, and suggest directions for the future.

The ERP wants strongly to emphasize that visionary leadership is necessary to deliver the aspirations of ICSU in general, and not only for the flagship programs. For this a clear statement of the strategic mission and long term vision has to be made.

[28] The Current and Future Role of Technology and Innovation Centres in the UK (2010), a report by Dr. Hermann Hauser, BIS/pub/Xk/03/10.NP, Source ICSU statement on academic-industry partnerships (July 2012)
http://www.icsu.org/publications/cfrs-statements/academia-industry-partnerships-jul-2012/academia-industry-partnerships
International Workshop on Private Sector-Academia Interaction (Sweden 2011)
http://www.icsu.org/events/ICSU%20Events/international-workshop-private-sector-academia-interaction

For a better understanding of ICSU's mission it is important to recall its history which lies in the foundation of the International Association of Academies (IAA: 1899-1914) and the International Research Council (IRC: 1919-1931). The IRC began with a membership of 16 national members (national Academies, Research Councils or their equivalents) with full voting powers and 7 associated Unions. In 1922 the Unions were given representation on an Executive Committee. On 11 July 1931 the fifth IRC General Assembly converted itself into the first General Assembly of the International Council of Science Unions (ICSU). At that time the Unions achieved equality with the national adherents. From 1931-1939 ICSU suffered from the slow progress of reconciliation of animosities between the various European nations, but this was balanced by the rapid growth in the scientific strength of the United States. Both the first and second world wars saw enormous developments in applications of science for applied purposes. By 1945, ICSU needed to adjust to play an even larger part in world science in a new political world. The fourth ICSU General Assembly in 1946 led to the recognition of the importance of science in the plans for the creation of UNESCO and the eventual establishment of a suitable working arrangement with ICSU. By the fifth General Assembly in Copenhagen in 1949 the basis for the structure of the post-war ICSU had been firmly established, and the ICSU that we consider today is essentially based on these foundations. A comprehensive account of the history of the worldwide organization of scientists can be found in *Science International: A history of the International Council of Scientific Unions,* F. Greenaway, Cambridge University Press, 1996.

The ERP note that ICSU's Mission statement on the ICSU website and in Statute 3 of ICSU differ:

On the website ICSU's **mission** reads:

"...is to strengthen international science for the benefit of society. To do this, ICSU mobilizes the knowledge and resources of the international science community to:

- Identify and address major issues of importance to science and society.
- Facilitate interaction amongst scientists across all disciplines and from all countries.
- Promote the participation of all scientists—regardless of race, citizenship, language, political stance or gender—in the international scientific endeavour.
- Provide independent, authoritative advice to stimulate constructive dialogue between the scientific community and governments, civil society, and the private sector."

However, the Terms of Reference refer to Statute 3 "ICSU's **mission** is stated in its present Statute 3, as follows:

a) to encourage and promote international scientific and technological activity for the benefit and well-being of humanity;
b) to facilitate coordination of the international scientific activities of its Scientific Union Members and of its National Scientific Members;
c) to stimulate, design, coordinate or participate in the implementation of international

interdisciplinary scientific programmes;

d) to act as a consultative body on scientific issues that have an international dimension;
e) to encourage the strengthening of human and physical scientific resources world-wide with particular emphasis on the developing world;
f) to promote the public understanding of science;
g) to engage in any related activities.

Specific Recommendation

2.2.1 Clearly identify the correct mission statement to avoid any ambiguity.

The ICSU **vision** is stated on the website:

"The long-term strategic vision is for a world where science is used for the benefit of all, excellence in science is valued and scientific knowledge is effectively linked to policy making. In order to achieve this vision, ICSU developed a Second Strategic Plan, 2012–2017[29] which identifies key priorities and associated activities. These activities focus on three areas:

- International Research Collaboration[30]
- Science for Policy[31]
- Universality of Science[32]

The ERP noted the presentation of the Chief Executive to the first review meeting that referred to the strategic plans for 2006-2011 and 2012-2017. It remains unclear as to how the strategic plan was formulated and on what basis the information was assembled. What was the input of the Rome General Assembly into the Strategic Plan II and how the enactment of the Strategic Plan will be evaluated?

Specific Recommendation

2.2.2 There should be a distinct implementation plan separate from the strategy against which the outcomes can be measured. This implementation plan should be a living document regularly updated, widely disseminated and periodically evaluated.

It was noted that the Strategic Plans had been accompanied by a foresight exercise, but the ERP questions whether it was and is still planned to hold regular Horizon Scanning processes. The ERP recommend that ICSU carry out regular horizon scanning to set the scene for strategic development. There had been particular interest in the approaches for formulation of strategy, and how science should and could be made available to all. A

[29] http://www.icsu.org/publications/reports-and-reviews/icsu-strategic-plan-2012-2017

[30] http://www.icsu.org/what-we-do/@@category_search?path=/icsu/what-we-do&Subject:list=International%2520Research%2520Collaboration

[31] http://www.icsu.org/what-we-do/@@category_search?path=/icsu/what-we-do&Subject:list=Science%2520for%2520Policy

[32] http://www.icsu.org/what-we-do/@@category_search?path=/icsu/what-we-do&Subject:list=Universality%2520of%2520Science

bottom-up strategy (as happens now) may well need to be modified with some strong top-down thinking. The ERP took notice that there is presently under way an analysis of ICSU's policy position in the areas of open access and the use of metrics for citation analysis. These were considered to be a good start to the necessary process.

The question of the value of ICSU serving as a body
"*..to ensure that science is integrated into policy development at the international and national level and that relevant policies take into account both scientific knowledge and the needs of science*" was scrutinized. The ERP sees that future challenges which
ICSU must address, include

- Taking a lead in the way science is communicated in the 21st century
- Understanding the best way to place scientific knowledge in the hands of policy-makers, where it should reflect whether it is reasonable to expect ICSU to influence science policy beyond national and international boundaries
- Recognizing the *pluri-disciplinary* and global nature of scientific research, where *pluri-disciplinarity* is seen as a new form of learning and problem solving involving cooperation among different parts of society and academia in order to meet complex challenges of society[33].]
- . Incorporating science education as a integral part of ICSU programs and initiatives.
- Introducing strategies to embrace the new scientific disciplines, particularly in the biological sciences, information and computer sciences.
- Introducing a commitment to relationship with the humanities into the vision statement (noting that this was lost in 1946 when the separate existence of IIIC was abandoned)
- Continue to stress the principle of universality as set out in the ICSU monograph by Greenaway on the role of a 21st century international science organization
- Meeting the objectives of the needs of the developing world in a realistic way and capturing local traditions, customs and knowledge in communication
- Building a strong working relationship with other international bodies, particularly the Global Network of Science Academies (IAP) and the Inter-Academy Council (IAC) and stakeholders in industry and societal institutions both in governmental and non-governmental areas
- Addressing open access to scientific data and information and the question how it revolutionizes science and the communication of science and scientists with each other. Who will fund open access and how it will change academic system of citations and metrics?

In summary, the ERP believes that ICSU has adapted historically to many great challenges in scientific development in the past (e.g. the emergence of nuclear weapons after world war II).

[33] Julie Thompson Klein et al., 2001. Interdisciplinarity: History, Theory, and Practice. Wayne State University Press, Detroit, 1990.

The modern challenges relate much more to the rapid development in scientific opportunities in many more and quite diverse nations. ICSU will wish to consider its present structure and decide whether the earlier processes that evolved and served the post-second world war (and cold war) eras so well are the appropriate ones for a digitally connected world. Science is both global and more collaborative than ever before. In addition today we recognize a finite limit to resources and a growing pressure on the environment.

Specific Recommendations

2.2.3 ICSU should sharpen and, when indicated, restrict its objectives with a special focus on pluri-disciplinarity as a broad form of cooperation between societal partners and academia in order to meet complex challenges of society[50].

2.2.4 ICSU should put effort in the development of information and communication formats and standards both among science and research (i.e. open access etc.) and to the general public, including policy makers. ICSU should discuss its advisory role in global science policy if and when reasonable.

2.2.5 ICSU should redefine the conception of itself and adapt its genuine principle of universality corresponding to the role of a 21st century international science organization. This includes an open and flexible framework for embracing new scientific disciplines as they emerge as well as strengthening a productive relationship with the humanities (noting that this was lost in 1946 when the separate existence of IIIC was abandoned).

2.3 Communications, visibility and influence

Review ICSU communications with members and other audiences, with regard to increasing ICSU's visibility and influence.

Communication comes from Latin meaning "to share" and is defined as the activity of conveying information by exchange of thoughts, messages or information through a variety of mediums[34]. It is essential for ICSU to continue to produce and publish "policy documents" that have an effect on the scientific community, decision-makers and the public at large. The 2012-2017 Strategic Plan[35] recognizes the importance of improving ICSU's communication and outreach as a means to increase visibility and subsequently impact. Towards this end, the Paris Secretariat established a full-time communication officer in 2008 and subsequently an additional comms officer/web editor and launched a first-rate website in 2011. The ERP stresses that communication and visibility are crucial to ICSU and that at present are not adequately addressed.

Unfortunately, ICSU remains, as noted in their Strategic Plan 2012-2017 "invisible" for many active scientists (e.g. the scientific community) and also for the public as a whole. As a

[34] http://en.wikipedia.org/wiki/Communication#cite_note-1
[35] http://www.icsu.org/publications/reports-and-reviews/icsu-strategic-plan-2012-2017

consequence the many policies on science that ICSU advocates and the valuable products it delivers are largely unknown to the scientific community. Moreover, the public is poorly aware of the stature of ICSU and its vital role as a speaker for the many important science issues of today. Finally, it has become very evident that ICSU must also continually *demonstrate its value* to its Members, the Unions and the Academies of Science, as well as their strategic inter-governmental partners.

Thus, for ICSU to stay effective and clearly demonstrate its value, a multi-prong communication strategy must be developed and implemented. In a rapidly evolving digital world, it is becoming increasingly important for global organisations to embrace emergent digital platforms and media, including social media, to increase their communication efficacy and global stakeholder footprints. This is especially important in attracting broader participation from younger generations of professionals from around the world. Increasing the global reach through these media channels also transcends geography and ensures that formal membership modes gain more local relevance, participation and traction. This is an opportunity to be fully explored and embraced in a modern science enterprise. These mediums foster a climate of bottom-up participation for many non-governmental organisations (NGO's) and a clear visibility and presence on social media (Face book, Twitter, blogs etc) will enhance the general awareness and influence of any global organization. Thus, different mediums of communication are required for each of ICSU´s constituents and it is important to employ the most effective means to communicate to each.

A better balance between communication to the public in general and the scientific community is required. In relation to the first point, we suggest that ICSU endeavors to develop a closer relationship with the media so as to place articles in high-profile magazines (scientific and non-scientific). Today public knowledge of and perception of science is greatly influenced by the media. Reflecting the current high interest in science, some reputable weeklies and a very large number of newspapers worldwide now contain science and technology pages and popular science magazines, and science web pages abound. Such greatly increased exposure to scientific discoveries is positive and is empowering the public to make more informed decisions on scientific issues, a trend that is likely to increase. Yet worldwide, scientists are often unwilling to engage with the public or with reporters. Fear of inaccurate reporting and inability to explain results in a way that is understandable to the general public are important factors here. Subsequently, ICSU can fill this void to become the go-to voice for the Scientific Community.

Currently some press releases can be found in the ICSU web site. For a large and important organization, however, the number of reports that have appeared in major newspapers and TV outlets based on information given in the "*ICSU in the News*" section of the web site is limited.

The Website continues to be an important vehicle to communicate and needs to be continually maintained and updated. However, in a world with an excess of web sites, ICSU

must move beyond the assumption that information found in the web site is effectively cascaded down through member unions and national academies. More proactive approaches are required, such as better utilization of member contacts to distribute ICSU information, distribution of newsletters beyond the contact institutions (e.g., academies of science) directly to the scientific societies, national science foundation's and other relevant institutions. For example, ICSU issues four newsletters annually through its web site, and although anybody can sign up to receive the newsletter, it is not clear how widely the newsletters are read by the scientific community. The Online Community Facility is valuable, but a proactive campaign is required to make its existence more widely known. Incursion into Twitter is a very important step forward.

As defined, communication is and must be a two-way process. We suggest ICSU better harnesses bottom-up communication opportunities by greater exchange of web links with partner sites, major research portals, national funding agencies, academic institutions, research laboratories, etc. The importance of national funding agencies cannot be overlooked, especially for reaching younger scientists. National members pay annual dues to ICSU; thus it should be in their interests to negotiate arrangements with their national science bodies whereby brief ICSU "headlines" along with the ICSU link are placed on the web sites of their funding agencies, many of which today have their own news sections.

It is also important for the Paris Secretariat to continue to utilize both the President and the Executive Board as communicators given their tremendous prestige with the scientific community. Indeed, such esteemed scientists could be enlisted more frequently to bring ICSU to the attention of the major decision- and policy-makers.

In relation to influence, a major challenge for ICSU is to evaluate whether ICSU's policies and interventions make a difference. Leadership in the Rio+20 Earth Summit (2012) and organization with the UN Department of Economic and Social Affairs and ISSC of the Expert Group Meeting on Science and Sustainable Development Goals (2013) are evidence of growing ICSU influence at high political levels, as is participation in Future Earth in relation to major scientific issues, but better follow-up of any recommendations made by ICSU is needed and wider communication of policy successes to the scientific community is desirable.

To continue to measure impact, it will be critical to develop metrics and measures to demonstrate that enhance communication and outreach activities are making the overall impact that is needed and envisioned.

Public Perception of Science and Research Integrity are themes that bear direct relationship to Communications, visibility and influence. Thanks to a large body of comprehensive surveys carried out in recent years, we now have a much better understanding of the public perception of science. While countries vary, it is fair to say that the public currently has a mainly "positive view of the impact of science and technology on their personal well-being"

(average of around 70% positive responses); and support for federal spending on basic research. Moreover they continually view scientists as one of the most prestigious occupations[36]. However, a significant fraction of the population has "mixed or critical opinions as regards the balance of the beneficial and harmful effects of scientific research"[37], this being more pronounced in European countries. Indeed in a comparison of the public and scientists attitudes towards science-related issues conducted by the Pew Foundation and reported in the NSB Science and Engineering Indicators found little alignment between the groups on issues such as climate change, nuclear power, embryonic stem cells and animal research. In some countries the public is currently more interested in science (in particular health issues, medical discoveries and environmental issues) than news about sport, films or politics[38,39]. However, some surveys have noted citizens tend to feel that they are not sufficiently informed about scientific discoveries so as to be able to understand their significance for human well-being or are unable to follow developments in science and technology because the speed of development is too fast for comprehension[40,41] indicating that in today´s world a greater outreach effort is required. The internet is rapidly becoming the main source for the public to learn about specific scientific issues whereas both the internet and television are tools to gain general science and technology knowledge.

The scientific community needs to be aware that issues such as Climate Change, Genetically Modified Organisms, nuclear power and the use of animals in research continue to be divisive with opinions varying greatly. For example, the percentage of Americans considering Climate Change to be "very serious" in 2010 had decreased 10 points from 47% in 2007[42], whereas in 2008 62% of Europeans considered Climate Change to be one of, if not the most serious problem, the world is currently facing[43]. In a 22-nation survey carried out by the Pew Foundation in 2010 (summarized in[44]) respondents from the United States, China, and the UK were less likely to consider Climate Change as "very serious problem" than those in a number of other countries, including developing nations such as Brazil and Mexico. One evident problem is that the public perceives differences in opinions among scientists regarding Climate Change and this is also true for other divisive issues. ICSU and its members need to take a more proactive role in these debates for improved public understanding of such issues.

The current positive perception of science by society needs to be treasured and retained by the global scientific community. In this sense research integrity has always been a crucial element in the trust and understanding that scientists have established between each other and with the community at large. A core priority committee in

[36] NSB S&E 2012 Indicators
[37] OECD (2013), "Knowledge economies: Trends and features", in OECD Science, Technology and Industry Scoreboard 2013: Innovation for Growth, OECD Publishing.
[38] Public opinion about science. 2010. ANUpoll. The Australian National University.
[39] Special Eurobarometer 340/ Wave 73.1 – *TNS opinion & social.* Science and Technology *2010.*
[40] Public opinion about science. 2010. ANUpoll. The Australian National University.
[41] Public attitudes to Science 2011. Summary report. Ipsos MORI Social Research Institute
[42] National Science Board. 2012. *Science and Engineering Indicators 2012*. Arlington VA: National Science Foundation (NSB 12-01).
[43] Special Eurobarometer 300 / Wave 69.2 – *TNS opinion & social.* Europeans' attitudes towards climate change. *2008.*
[44] National Science Board. 2012. *Science and Engineering Indicators 2012*. Arlington VA: National Science Foundation (NSB 12-01).

the ICSU structure is the CFRS. This committee was established in 2006, some ten years after the last review of ICSU. Quoting from the report of the 13th Meeting of the CFRS in May 2013 "CFRS's remit includes the promotion of research integrity. It was therefore engaged in the organization of the 3rd WCRI in Montreal on 5-8 May and several members presented the Committee's work on aspects of the rights and responsibilities of scientists."[45]

In the last two decades of the 20th century an increasing number of cases of breach of basic trust have emerged. It is not easy to determine whether this is due to an increase in incidence, or an increase in detection, or to identify the causes. However, one might identify the speed of communication through electronic means as both enabling the dissemination of scientific results more rapidly, the ability to question and communicate opinions on results appearing in the peer-reviewed literature. Add to that the ability to measure citations through the digitalization of publications, and the consequent pressures to publish in high impact factor journals that has emerged as a measure of esteem, one might not be surprised that research integrity could more easily be compromised. Clearly more fundamental scientific work needs to be carried out on the underlying intrinsic and extrinsic factors associated with breaches of conduct and here the social sciences are very relevant. ICSU is in an excellent position to stimulate this research area.

ICSU has played a key role in identifying best practices and contribution to the world wide debate on this important topic. It is noted that CFRS has been supportive of the San Francisco, Singapore, and Montreal Declarations on these issues and more recently, the IAP and IAC have produced substantive documents on research integrity. Another obligation that is insufficiently heeded is for collaborators to be completely aware and understanding of the full details of any publication on which they are co-authors. ICSU has a special sub-committee that is presently examining the common use of citation data in research assessment, open access and evaluation metrics[46]. Concern over this matter in general has seen recent conferences on research integrity[47,48] and issue of the Singapore Statement[49] and the Montreal Statement[50].

In parallel with these activities many research funding agencies and publishers have enhanced their ethical guidelines that have been used to encourage compliance in order to receive a grant or to publish in a particular journal respectively. The listing of author contributions to the published work requested now by leading journals, funding sources and other competing interests, and the prior registration of clinical trials, which have been mandated by many journals, are welcome measures that should help improve research integrity.

[45] http://www.icsu.org/publications/cfrs/14th-cfrs-meeting-may-2013
[46] http://www.ascb.org/dora/files/SFDeclarationFINAL.pdf
[47] http://www.esf.org/index.php?id=4479
[48] http://www.wcri2010.org/
[49] http://www.singaporestatement.org/downloads/singpore%20statement_A4size.pdf
[50] http://www.wcri2013.org/Montreal_Statement_e.shtml

A further development has been the awareness that communication of good scientific practice is the responsibility of research group leaders. Historically, the culture of communicating good and ethical research practice relied largely on oral communication and teaching by example. As new nations and new researchers enter the field they may never have had the benefit of such direct mentoring, opening the need for a written manual on the subject. A manual has now been released by the Global Network of Science Academies (IAP) and the Inter-Academy Council (IAC) and has received wide acclaim[51].

Today public knowledge of, and perception of science and scientific issues is greatly influenced by the media, including newly emerging social media which is especially popular among the younger generation. The internet is rapidly becoming the main source for the public to learn about specific scientific issues whereas both the internet and television are tools to gain general science and technology knowledge. Some reputable weeklies and a very large number of newspapers worldwide now contain science and technology pages and popular sciences magazines and science web pages abound; healthy relationships need to be forged with these to increase visibility and influence. Such greatly increased exposure to scientific discoveries is empowering society with an expanded knowledge base and the ability to make more informed decisions on scientific issues, a trend that is likely to increase, placing further demands on the scientific community and steering research priorities in particular directions. In a rapidly evolving world of communications, it is essential for global organizations like ICSU to embrace the media to increase their communication efficacy, global stakeholder footprints, and leadership role.

Specific Recommendations

2.3.1 Develop a communication plan covering all constituents, and metrics and measures to demonstrate that the enhanced communication and outreach strategy and activities are making the desirable impact.

2.3.2 Reexamine a timely mechanism to generate and widely disseminate regular and robust position papers and policy documents on major scientific issues of topical importance. Such statements should be peer reviewed and formally approved by the EB prior to release.

2.3.3 Highlight research integrity, through the CFRS and provide ongoing opportunities in teaching good research practice

Other suggestions

- We suggest that the CFRS site[52] adds a further bullet point: "Scientific Integrity" that has links to the documents attached, as well as to offices and

[51] http://www.interacademycouncil.net/File.aspx?id=28253
[52] http://www.icsu.org/freedom-responsibility/science_human_rights/right-to-enjoy-the-benefits-of-scientific-progress

ombudsmen for research integrity in those countries that have them, to the Committee on Publication Ethics (COPE), and gives some advice to those who are concerned about this issue.

- A world map showing the accumulation of visits by location and a web hit counter would be very useful additions to the ICSU webpage, along with a larger and more strategically-placed search facility.
- To further improve visibility in the scientific community, ICSU might also consider instigating a high-profile prize/award to be presented at the General Assembly, perhaps targeting early career scientists and senior scientists alternatively each year. The call should be made widely throughout all member countries and Unions.

2.4 Funding strategy

Review ICSU's present funding arrangements and their long-term viability for the future. If necessary, recommend alternative or additional funding strategies.

The ERP recognizes that ICSU is currently constrained by its very modest budget. Aspirations for the future in realizing what is set out in the rightly ambitious ICSU Strategy will present even greater challenges for funding. The ERP sees a need to upscale ICSU from a responsive to a more proactive organization if it is to successfully implement the vision presented in the Strategy document.

As a stakeholder driven organization, ICSU is deeply dependent on the goodwill and support from a large number of constituents. This not only makes the organization potentially powerful, but also vulnerable to the budgetary and cash-flow constraints of all its members. In particular, the substantial contributions provided through government agencies as well as the respective Union members form the core of ICSU's income.

The funding of ICSU's programmatic activities has traditionally been very diverse and highly fragmented. An illustration of this complex reality is depicted for the global Change Programs in Figure 2.

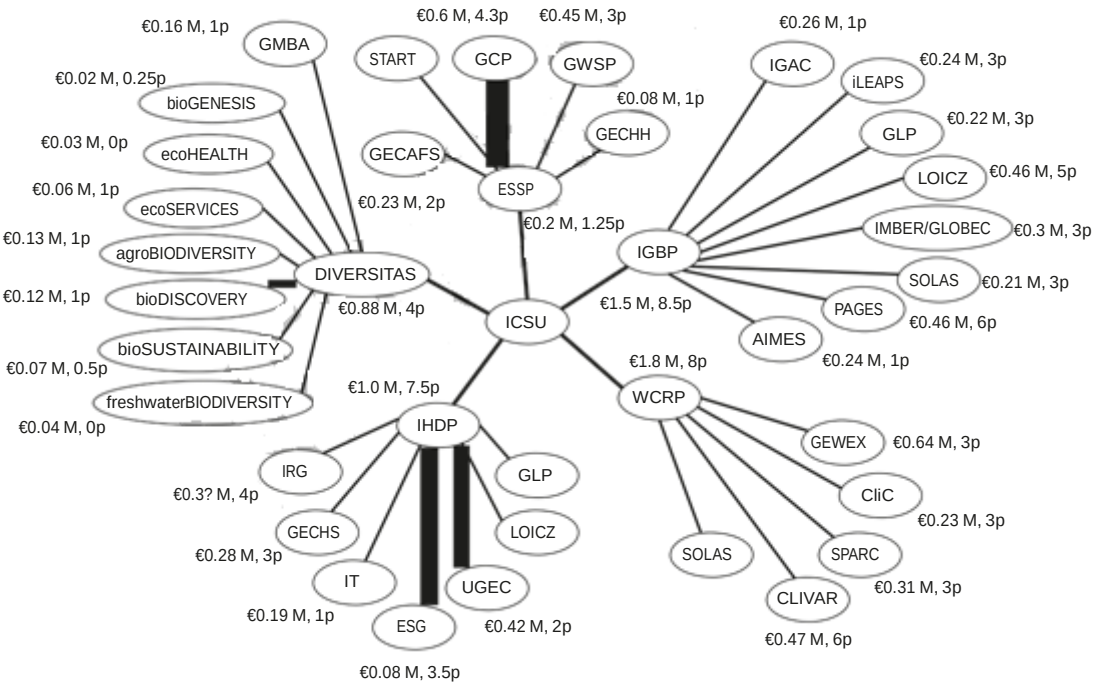

Figure 2. Network diagram of the major global programs and their associated projects. The funding on this figure is for the international project offices, typically 0.2-0.5M euros or so per project. These projects are coordinating/ leading, with typically many 10s M euros per project, with thousands of scientists involved around the world

Sustaining such a complex funding network is taxing and may become an inefficient enterprise. In consolidating many of these previous activities into the Future Earth initiative, ICSU was presented with an important opportunity to rationalize and streamline its funding approaches for the Future Earth initiative. The strategic alliance that was developed between

ICSU, The Belmont Forum (a consortium of science funding agencies that fund global change research), traditional Developmental Agencies and Private sector funders will allow a more coherent funding approach to global change research that needs to be conducted collectively. The recent competitive call for bids to host the Future Earth secretariat is welcomed as this will not only strengthen the Future Earth initiative immeasurably but will place it on a very firm footing. We commend ICSU's foresight in pursuing this alternative source of funding for Future Earth but emphasize the critical role that ICSU scientists can play in strengthening the peer review systems for Future Earth. This strategic alliance with key funders can therefore become mutually beneficial.

It is important that ICSU ensures that all the aspirations and funding requirements for Future Earth, summarized in the second ICSU strategic plan are adequately funded though the mechanisms outlined above and more.

Although the potential reach of Future Earth is very broad and extensive, ICSU may also start considering additional broad initiatives for other disciplinary groupings that may be of particular interest to the funding community, the ICSU Unions and policy makers (e.g. predictive medicine, big data etc.)

The ERP believes that as part of the funding strategy, ICSU itself needs to focus on a few flagship projects while recognizing that the unions themselves need to step up and contribute to these major trans-disciplinary activities, bringing their very considerable expertise to bear on global issues. Direction for ICSU's leadership in flagship programs such as Future Earth will resonate well with the funding agencies (national, international and philanthropic). But ICSU needs to establish a mechanism that can create a buy-in from funders with substantial resource and this requires dedicated, sustained senior scientist leadership in a funding campaign. The ERP recommends that the Senior Officers (Presidents, VPs etc) in ICSU needs to engage at this level in Future Earth and other programs. It should not solely be carried out by the Secretariat, who is fully capable of supporting such a campaign, but effective "pitches" for really substantial funding need to be made by scientists of vision and repute as only they can open the necessary doors to funders.

The strategic plan has, as we have noted, very challenging aspirations that require a different way of working form that currently adopted by ICSU: there is a clear need for ICSU to change the way it operates. The ERP believes that a "parliament" of the past Presidents Forum can be utilized and engaged in major fundraising campaign. However, it is crucial that past presidents fully buy in to the current leadership's vision so as not to interfere with their vision. Such a Past Presidents Forum, led by the present President would also enable the present vision to be carried forward.

There is a need to involve business and industry more in ICSU activities. ICSU and especially its leadership should engage more in the various business leader's forums, and other high profile pubic occasions, to cultivate much stronger links with individuals of wealth

and corporate and government agencies who share ICSU's vision; this will materially enhance the fundraising activity.

ICSU should also be more visible as active identifiable participants in various forums such as the World Economic Forum and the Science and Technology in Society (STS) Forum where scientists can contribute, to ensure that our work is recognized better by potential funders.

ICSU should play a more active role in bringing together other coordinating bodies such as Engineering Councils, ISSC (International Social Sciences Councils) as combined together we are much more likely to realize the funding necessary to deliver our vision. Engagement strategies to bring all of these aforementioned stakeholders in need to be developed by the leadership of ICSU and with the full buy-in of members.

Driving the flagship projects should not solely be the job of the Secretariat but requires the vision and dedicated leadership of the officers and other leaders of ICSU. Future Earth is an exemplary mechanism that up-scales ICSU and promotes the visibility of ICSU in a global scale. It is an excellent example of a program that both requires interdisciplinary thinking that only ICSU can contribute world-wide and has the potential for attracting substantial funding were a vigorous campaign be mounted with participation from the whole ICSU family. The ERP is convinced that there exists a huge opportunity for ICSU to embrace this new manner of working in a timely manner: delay may well risk it slipping away, to other, less representative scientific bodies.

The ERP regrets the fragmentation of scientific representations by various organizations. We see there are attractive ways to bring together such bodies, such as IAP/IAC, to be more unified as a voice for science.

Specific Recommendations

2.4.1 Create a dedicated funding campaign led by ICSU's senior officers (President, VP's etc) and other coopted leading scientists

2.4.2 Create a Past-Presidents' Forum led by the current President to advise on fundraising opportunities

2.4.3 That the EB investigate the formation of a not-for-profit-foundation to encourage philanthropic and other support for their flagship projects. We strongly recommend the development of an advisory committee to steer the role of the aforementioned foundation.

2.4.4 To cultivate fundraising allies, the leadership of ICSU should engage more in high profile external and scientific forums.

2.4.5 ICSU needs to focus its resources much more on a campaign to secure substantial funding for the flagship programs; we are convinced this needs to become a top priority and adequate resources should be dedicated to this, in comparison to other less pressing programs at hand.

2.5 ICSU model of National and Union membership and Associates

Review ICSU's membership model and "umbrella" function, and; taking into account members' expectations, the expected benefits of membership.

ICSU membership has been contentious for some time. As the global science system develops it is important for ICSU to periodically review its membership model and to ensure that it serves the purposes of ICSU as well as its member organizations. Traditionally the strength of ICSU lies in its scientific unions. However, national academies and independent science funding agencies are now a pervasive feature of the international science landscape and all of the above influence the global science agenda and determine funding priorities to varying degrees. In order to maximize the impact of its initiatives and programmes, ICSU should strive to provide an overarching "umbrella" organization that fosters harmonious partnerships between the Unions, National Academies and Funding organisations. Each of these different membership groups should be aware of the respective complementary roles and functions and ensure that effective partnerships deliver on the ambitious aspirations of ICSU.

Scientific Unions are essential members of the ICSU family. They set the directions and provide international leadership for disciplines. They enthusiastically promote different disciplines of science across international boundaries by organizing periodic international conferences, topical workshops, training schools and other such meetings, which are vital to the growth of all branches of science; many are involved in publishing journals and monographs. Union membership embraces a range of scientists from the most senior experts through to beginners in research. Therefore, Unions are large bodies of great experts, active middle-level scientists and fresh entrants. ICSU is uniquely able to reach the grass root level of scientists through the Unions.

The fast growth of all branches of science has been possible through a substantial and growing number of practising scientists, the availability of well-equipped laboratories, computing infrastructure and unhindered access to the latest literature and knowledge. The specializations have multiplied at a great speed. This has led to the situation that all areas of current scientific knowledge are yet to be fully represented in the existing Unions. The biological sciences are a glaring example of areas not adequately covered under the present set of unions. Normally new Unions are established through the initiatives of the science leaders of the relevant field. In the biological sciences this has taken place largely through learned international societies. In order to be a fully inclusive over-arching body ICSU should serve as a catalyst to create appropriate unions to embrace more biological disciplines, in order that the legitimate demands and needs of this very important field of science can be met.

Some illustrative examples of disciplines that are not served by ICSU include Genetics including human genetics (represented by organizations such as the International Federation of Human Genetics Societies; the International Genetics Federation); plant sciences (represented by societies such as the Global Plant Council and the International Society of Plant Pathology) and crop sciences (represented by bodies such as the International Crop Science Society). Similar examples could be provided for Engineering disciplines.

The ERP was not convinced that the existing ICSU membership approach is the most appropriate way to recognize these complementary roles and to foster productive and efficient partnerships. Thus we propose a number of mechanisms to improve functionality that will:

Expand membership.
ICSU membership should clearly recognize all qualifying scientific unions and strive to increase its Union memberships. This will ensure that ICSU becomes more inclusive and representative of the full scope of the modern scientific enterprise. This broader membership profile will also support the more effective delivery of ICSU flagship programmes.

The active recruitment of members from the medical, agricultural, engineering, social sciences and humanities disciplines should be pursued.

There should also be greater clarity about the mechanisms that are used to foster new members and emerging scientific unions.

Develop critical linkages.
There is a need to connect ICSU more closely to a broader community, especially early career scientists though the Academies, Unions and even the Funding Agency activities.

The Unions have already demonstrated a strong capability to effectively engage early career scientists by bringing together their expertise and engaging their support in flagship projects, but these efforts should become more pervasive.

Similar Academy activities for emergent scientists are also encouraged.

Successful programs organized by the Unions to engage early career scientist can again be used to build scientific networks within and among Unions.

Improve governance.
The three policy committees should fulfil a supporting and advisory role rather than supplanting the governance role of the Executive Board. Therefore they should be renamed as “Advisory Committees” instead.

Improve alignment.
National members and Unions should work together at a national level to achieve better alignment between funding agencies, national committees and academies with global ICSU strategies, priorities and initiatives. Excellent examples of how this can be achieved include the very successful *International Polar Year*, a model which will hopefully be emulated in rolling out Future Earth.

Address
Membership Issues.
During the review it became obvious that membership issues have been a pertinent topic in the ICSU family for some time. In fact, the 1996 Assessment report identified a number of critical membership issues that needed to be addressed. Many of these remain unresolved and this review presents an opportunity to clarify these in support of an improved and an elevated impact for ICSU. The following quotes from the 1996 Assessment report illustrate these legacy membership issues:

"ICSU should not solicit enlargement of the Union Member representation from the social sciences, until it is clear these disciplines decide how best to organize internationally, but should find the best ways of cooperation on critical concerns to build bridges between the natural and social sciences, and should welcome national representation by individuals from these disciplines."

"ICSU should encourage membership by unions representing the engineering, medical, and agricultural sciences."

"ICSU should make an effort to increase its capabilities and membership in recently emerging and growing areas of science such as telecommunications, computer science, and biotechnology."

"ICSU should encourage participation in its activities by scientists from private industry and institutions."

"ICSU should encourage the participation of scientists from developing nations in its activities."

The panel recognizes the importance and role of Scientific Associates within the ICSU family. These Associates also offer unique opportunities to develop trans-disciplinary approaches and linkages. It is also proposed to expand this Associate membership category to include critical business and industrial organizations.

The panel was unsure of the strategic approach used by the Executive Board or the General Assembly to capture new members, or whether the "Scientific Associate" status is viewed as a transient route towards membership for some Associates. If not, this is viewed as a missed opportunity.

Promote diversity.
The ERP recognizes the importance of pursuing gender, diversity and early career issues in the planning and execution of all ICSU programmes and believes these issues should have a higher priority and visibility across ICSU.

From the above quotes as well as the deliberations at the General Assembly in Rome it appears that the issue of ICSU membership is still unresolved. However, the ERP feels that the time has arrived to resolve these perceived obstacles as many of the historic objections no longer seem valid.

As stated previously, ideally an organization like ICSU should welcome new memberships, be they scientific Unions, Funders, Academies or Associate members. ICSU's membership strategy should embrace the following categories:

a. **Scientific Unions:** Ideally this should be open to unions that represent all disciplines that can demonstrate the appropriate degree of global coherence and organization to contribute their membership dues in a sustainable manner.
b. **National members:** These include either National Academies or National Funding organizations that are designated to be formal ICSU members, recognizing that there will be only a single adherence fee payable and one vote per National member (this preserves the status quo but allows broader participation from multiple organisations).
c. **Associate memberships**: This category of membership may carry a small membership fee. Members will be able to attend the General Assembly but will not have voting rights.
d. **Partner organizations:** These are strategic partners that engage with ICSU on a regular and intermittent basis (e.g. UNEP, World Bank, UNESCO etc.).

This broader and more inclusive approach will provide adequate protection for the science voice but ensure an open and inviting organization that attracts and encourages participation from across the global scientific community and science agenda setting organizations to maximize the impact of ICSU. ICSU will truly be able to fulfill its "umbrella" objectives.

Specific Recommendations

2.5.1 ICSU should initiate an extensive membership drive that encourages participation from across the disciplinary spectrum as well as from business and industry.

2.5.2 In view of the fast developments in different branches of science and technology and continuous emergence of new fields, ICSU should put in place mechanisms proactively to create new Unions, accommodate new associate members or similar bodies to ensure promotions of all frontier areas. In gap areas such as those in Biological Sciences and Engineering there is an urgent need for creation of additional Unions, and ICSU can play a catalytic role.

2.5.3 Establish avenues for increased participation by early career scientists in Unions, Academy and Funding agencies initiatives to raise the awareness and participation of earl career scientists in ICSU activities and programmes.

2.5.4 Establish appropriate mechanisms to ensure better strategic alignment between national research agendas and research priority areas recommended and driven through ICSU.

2.5.5 Actively promote gender and diversity agendas to increase their profiles across all ICSU initiatives and leadership.

2.5.6 Ensure that the three policy committees focus their energies on providing policy advice to the Executive Board/ Governance Board who should be solely responsible for providing appropriate governance oversight of ICSU.

2.6 Partnerships

Consider how ICSU should work with its peer organizations and its partners in the UN system.

We are facing many global challenges such as climate change, biodiversity loss and food scarcity. Since ICSU's overall mission is "to promote science for the benefit of society", it will be crucial for ICSU to contribute in solving such pressing global challenges through its integrative scientific approaches in collaboration with UN and other International Organizations.

Since the value of ICSU wholly depends on its effectiveness in dealing with policy making bodies like the UN Organizations and other International Organizations, mechanisms to strengthen such collaborative efforts need to be further developed in order to provide remarkable impacts to society.

In the recent years, ICSU has tried to collaborate with other UN initiatives such as the establishment of Sustainable Development Goals (SDGs), Intergovernmental Panel on Climate Change (IPCC), and the newly created Intergovernmental Science-policy Platform on Biodiversity and Ecosystem Services (IPBES). Such collaborations have served to mutually benefit both ICSU and the initiatives mentioned, and it is strongly recommended for ICSU to continually enhance its contribution and visibility through such UN initiatives.

Another important element that ICSU needs to demonstrate is its partnership with other International Academic Organizations. Since the last external review held in 1996, a number of International Academic Organizations have emerged such as IAP, IAC and others. Particularly, we should recognize that there are significant overlapping of mandates and memberships with IAP and IAC. Therefore, the panel encourages a collaborative effort or alliance between ICSU and its similar counterparts (IAP/IAC) as ICSU has the opportunity to bring together, in a coherent fashion, such bodies in the best interest of science. The present situation is confusing and is likely to be damaging to a fundraising campaign, as well as being unhelpful as we try to present a unified single voice for science world-wide

The role of partnership on the regional scale is important, particularly in the developing countries. In developing countries, Academic communities often suffer from the various constraints such as shortage of knowledge generation system and capacity development. As ICSU has regional offices in Latin America, Asia and Africa, these regional offices can also collaborate with regional offices of other UN and international organizations such as UNESCO, UNEP, UNDP, FAO and IUCN in the running of future flagship programs. Thus, with ICSU's involvement in these regions, these countries will be able to receive assistance from ICSU through academic transference while ICSU will, in turn, be able to implement its vision and mission to these countries.

Future Earth is a very important initiative from ICSU as a leader in the global academic community through interdisciplinary approach. However, delivery of such flagship programs requires the cooperation of other strategic partners including social scientists, engineers, business and industrial partners, etc. The review panel is concerned by the fragmentation of different stakeholders that purport to achieve ICSU's aim.

Two interesting examples reviewed as part of this study are the US initiative Partnerships for Enhanced Engagement in Research (PEER) Science, and Japan's Science and Technology Research Partnership for Sustainable Development (SATREPS). Launched in 2010, PEER combines USAID funding for researchers in developing countries with NSF funding for their US-based partners. Similarly, since 2008 SATREPS has been supporting joint research through JICA in developing countries and through JST in Japan and other countries. These two initiatives provide strong models for enhancing cooperation between scientists in developing and developed countries. In particular, they create opportunities to engage regional science communities in leading research projects, creating academic mass and broadening research and policy impact.

In 2009, the National Science Foundation (NSF) and the Bill & Melinda Gates Foundation (BMGF) announced a partnership program entitled "Basic Research to Enable Agricultural Development" or "BREAD" administered by NSF. The goal is to support innovative basic scientific research where the outcomes have direct relevance and potential application to agriculture in the developing world. The 2013 "Ideas Challenge" competition differed in that

it used a two-prong approach. In the first stage, NSF and BMGF offered prizes of up to $10,000 for innovative ideas from individuals (eligibility ranged from graduate students to faculty to non-profit organizations) from all fields of biology, physical sciences and engineering that could potentially transform basic research ideas into significant benefit to smallholder farmers in developing countries. The second stage was to use these winning ideas to solicit proposals through the Early Concept Grants for Exploratory Research (EAGER), a mechanism where the number of pages is limited to 5-8 pages and only has internal review. The BMGF funds were used as a means to provide support to researchers from the developing countries.

Specific Recommendations

2.6.1 ICSU should play a more leading role in and create a task force to promote international discussion and negotiation with UN and other International Organizations through a trans-disciplinary approach.

2.6.2 ICSU should further consolidate collaborative and strategic partnerships with IAP and IAC. The pros and cons of such a closer liaison (even merger) should be further investigated by the EB.

Other suggestions:

- In particular ICSU needs to strengthen the global and regional partnership with academic organizations such as national science foundations and policy making organizations.

2.7 Operational structure

Review the ICSU governance structure, and how to continue to ensure high quality representation on ICSU's governing bodies.

The ERP has looked into details of the functioning of ICSU as an organization including election of its Executive Board, constitution of Policy Committees (CSPR, CFRS and CF), linkage and close contacts with union Members, National and Associate Members, guiding and monitoring progresses of Regional Offices evolution, establishment and mentoring of major global flagship programmes, interaction, collaboration and advice to major international agencies, particularly the UN organizations and ensuring that Information about latest developments are efficiently communicated to all the stakeholders in the most efficient manner. The ERP recognizes that ICSU is a complex organization and there is need for a greater rationalization of reporting lines and responsibilities.

The highest authority of ICSU is the General Assembly, consisting of the representatives of the Scientific Union Members and of the National Scientific Members. Executive Board, elected by the General Assembly, executes the decisions of the General Assembly and links

with stake holders and remains engaged in creating new major initiatives and monitoring and piloting those which it inherits on starting its term. The Board is assisted in these tasks by the Policy Committees which are created by set up by the General Assembly, with members appointed by the EB, and are responsible to the Executive Board and to the General Assembly.

The ERP recommends that there is a need for clarity in terms of the function of the EB as a Governing Board and in particular the relationship between EB and the CSPR.

- The ERP notes the existence of the nominating committee and would suggest that its role and membership needs to be extended to include the EB in making recommendations to the General Assembly of candidates for election and to involve the Unions and National members in this process. There may be merit in empowering the nominating committee to be proactive as a search committee.

The relationship between the ROs and the Paris Secretariat Office are critically important for ICSU and do not appear to be optimal at present. The ToR of the ROs and the expectations need to be clarified and monitored effectively. Clustering of Unions together to form collective responses of certain major scientific and/or societal issues is desirable and has begun to happen. The ERP welcomes this and believes that this could improve and strengthen engagements across disciplines and throughout ICSU. The EB is engaged in ensuring this and there is need for taking a strategic view of this type of initiative.

The original organogram for ICSU as presented to the ERP by the ICSU secretariat is presented in Figure 3. This organogram seems to be conflating the decision-making and advisory roles in a single structure.

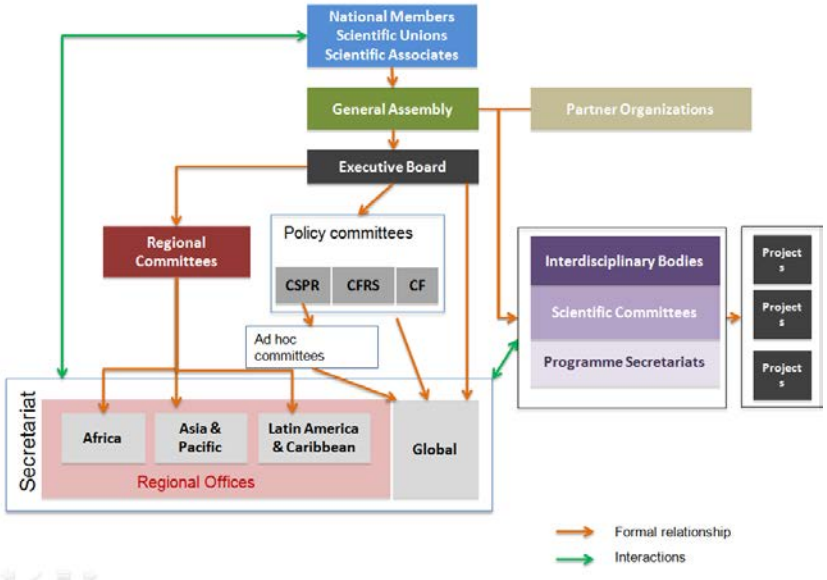

Figure 3. Organogram received from the ICSU secretariat

The ERP felt that it would substantially simplify the organogram of ICSU if the advisory structures were placed on the side of the management and decision making structures (see Figure 4). The proposed governance model discussed by the ERP is incorporated into Figure 4. With these changes the proposed new structure would be unambiguous, the Secretariat would be able to execute the decisions of the Board efficiently and its accountability will be easier to assess.

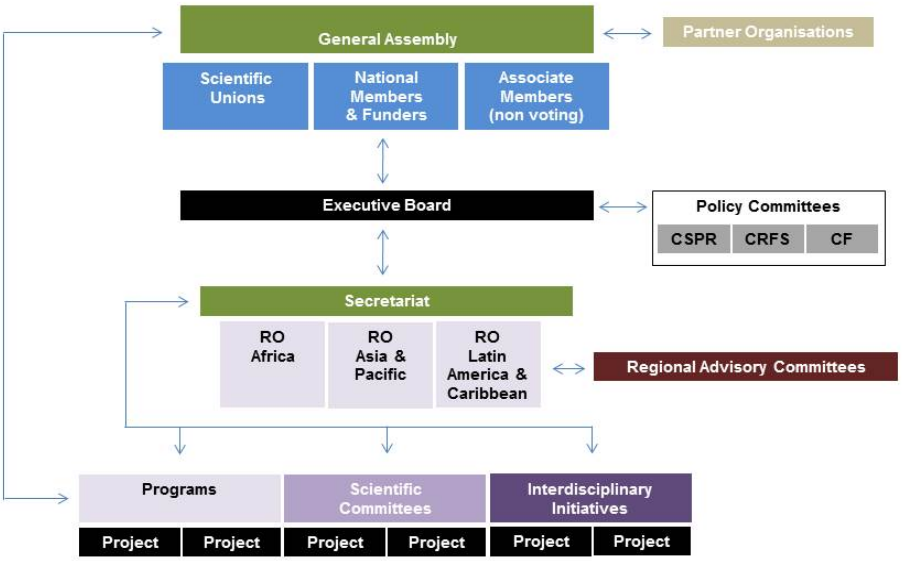

Figure 4.. Proposed new ICSU Organogram

Functions of the ICSU Regional Offices: Engagement with their local stakeholders as well as the ICSU global office

During the review process it became clear that the roles, objectives, functions and modus operandi of the regional offices were not adequately resolved. Fully understanding the origins of the regional offices as a mechanism to expand the regional influence and footprint of ICSU, it was not clear to the ERP whether and how this broad objective was being achieved.

For example, how has the presence of the ROs enhanced the reputation and regional impact of ICSU? Has this resulted in increased national memberships or even Scientific Unions or better funded local initiatives that contribute to the ICSU science mandate? It was felt that clear answers to the following questions may help assist ICSU to determine clearly the role of the ROs:

a) Are the ROs considered to be part of the expanded ICSU secretariat or are they expected to operate on a federal model like a mini-ICSU?
b) Do the ROs have a mandate to raise funds and resources locally or are they expected to implement the agenda of the Global Secretariat office (Paris) in the region?
c) The ROs have developed elaborate science plans but most of these appear to remain unfunded to date (e.g. the science plans of the RO for Africa) and the central question is whether these ROs carry an unfunded mandate or are they expected to generate their own funding autonomously?
d) Is there an active staff exchange programme between the ROs and the Paris office to assist in training and development of staff at the regional offices and to ensure that there is a clear and mutual understanding of their respective roles and objectives?

These questions are central to developing a clear understanding of the role and responsibilities of staff at the regional offices. This clarity will also help define the functional relationship between the regional offices and the ICSU Global office in Paris, which will in turn clarify the appropriate performance management and reporting relationships. A lack of clarity around these matters is further confounded by the funding arrangements of regional offices. The hosts for the regional offices are just that and cannot be expected to monitor and measure performance of staff at regional offices. The regional host organizations sometimes contribute the bulk of the funding for the regional offices and opens the door to conversations around who actually sets the agenda for the regional office, the ICSU Paris office or the regional funders. These matters require urgent and focused attention to ensure that the ROs play their anticipated roles.

The sustainability of ROs should also receive more focused attention, especially if they are required to move around the regions on a regular basis as originally envisaged. This model has implications for funding and staff continuity and can be damaging to and even undermine the original spirit and intention. To visualize the consequences of such, one can imagine the disruptions and lack of continuity that will emerge if the ICSU Secretariat, now in Paris was expected to re-locate to another country's legal system jurisdiction every five years. The sustainability of this model needs to be critically evaluated.

The ERP feels that a critical analysis of the following issues would be beneficial: federal system versus “expanded secretariat”; local funding versus ICSU Global Office’s influence in the region; assessment of the level of activity in the context unfunded, mandate;

expansion of the number of ROs; and autonomous proactive involvement of the ROs in generating funds from their respective regions. The duration of support by the host country should be at least five-years.

For the long term health of management of ICSU affairs a well laid out succession planning in the ROs is as important as in the ICSU Secretariat. If feasible, the Secretariat may offer secondments to the ROs and may receive staff from there. It will be worthwhile to explore the possibility of internships. Indeed, the functional relationship between the ROs and the ICSU Secretariat will dictate the performance management of the RO.

The ERP assigned members to acquire information from the ROs on the following,: *the status of implementation of the science plans and assessments; the functional relationship between the Paris Office and the RO; influence of the host country on the agenda of the RO; status of a performance agreement; assessment of level of autonomy to ensure a regional impact; extent of success in terms of raising funds other than operational funds availed by hosts/ICSU; the size of the annual operational budget; the extent of engagement with countries of the region and the strategies that have been most successful; and possible new initiatives that can enhance the effectiveness of the regional offices?* The results of these interactions are summarized in the following:

ICSU Regional Office for Africa (ROA)
During October 2004, and following recommendations by a regional committee, an agreement was concluded between ICSU and the National Research Foundation (NRF) of South Africa to host the Regional Office for Africa (ROA) for a 10-year period, with the provision that a five-year joint review will determine the continuation of a second 5-year term. The regional office commenced with operations during 2005 – the first of the ICSU regional offices. ROA focus on 4 areas aligned with the Millennium Development Goals, namely: Sustainable Energy; Health and Human Well-being; Natural and Human-induced Hazards and Disasters; and Global Environmental Change (including Climate Change and Adaptation).

Following the first five-year review of ROA, it was agreed that the NRF would host ROA for a second term, with due recognition that another hosting country be identified from 2015. Discussions have already been initiated with ICSU Paris to initiate the process of evaluation and planning for the regional office beyond this period. The ERP believes the Regional Office of Africa needs to have a sustainable future plan with credible engagement across the entire region and adequate financial resourcing.

ICSU provides an annual contribution of €75 000 towards the expenses of the regional office (increased from €35 000 from 2012), with an annual NRF and DST contribution of €245 000. The secretariat is staffed by 5 persons, with operational expenses and salaries amounting to 60% of the budget. Recent efforts for resource mobilization for additional projects are commendable, but it is of a small-scale and limited nature. More impetus was provided through the appointment of a new Regional Director in 2011. However, there is

clear misalignment with the large number of global and continental initiatives that could serve as a strategic framework within which to deliver on ROA's mandate. A large number of activities are in operation, but clear direction, goals, and especially impact, are not perceived or displayed. It is granted that some innovation exists with some of the activities, but in general it is a collection of engagements that are not strategic enough to contribute towards the goals of ICSU. This is exacerbated by a very limited visibility of ROA on the continent, and knowledge at appropriate levels of its value-adding function or engagements.

We note the potential for a new host to manage and support ROA in anticipation of another African country becoming the host from 2015. The guidance and strategic direction of ICSU, in collaboration with the Regional Committee, should have been stronger and more prominent, in the context of the mandate and increasingly global role ICSU is playing.

There is general agreement that the engagements of ICSU ROA should be more networked and strategic with clear deliverables, inclusive of regional and continental strategies. The role and composition of the Regional Committee for Africa should be reconsidered. It is clear that a strategic consideration should be whether ROA is facilitating scientific networks and linkages, or driving a scientific agenda.

ICSU Regional Office for Latin America and the Caribbean (ROLAC)

ROLAC was inaugurated in Río de Janeiro in April 2007 where it was hosted by the Brazilian Academy of Sciences and supported by the Brazilian Government, ICSU, and CONACyT, Mexico.. A major product of this period was the development of regional science plans. The office moved to Mexico in early 2011, under the auspices of CONACyT. ROLAC identified the following four priorities areas while functioning at the first location in Brazil: Sustainable Energy, Disaster Risk, Biodiversity and Mathematics Education. ROLAC is presently engaged in setting up relative priorities on these and other themes. Keeping in view the fact that the Mexican office became operational in early 2011, significant progress has been made. There is some confusion over assessment and science plan domains. The relationship between the ICSU office in Paris and this RO seems to be fluid but there have been no problems. Even though the office seems to be still in the process of developing its long term activities and strategy, it would be useful to formalize performance agreements. The Centre does enjoy an adequate level of autonomy.

ROLAC has made efforts to look for new funding sources and there are some fairly concrete possibilities for the future. While funding for science is presently good in many Latin American countries, the number of sources for regional programs is very limited. Private foundations are basically non-existent. The regular budget for 2012 was $US 356,166 (US$290.166 from CONICYT, Mexico + US$66,000 from ICSU). They also received a grant from SIDA which financed the Latin America Future Earth workshop (US$51,373). Fifty-seven percent of the budget was spent on running the office, which seems to be a large fraction. However, if new sources of funds are found, this percentage will drop.

It appears that ROLAC is doing a good job of consolidating political contacts, drawing in the unions and bringing more countries into ICSU. However, ROLAC is still poorly known among scientists in Latin America. In addition to its annual

reports, the office produces a newsletter, which can be found in its webpage. This newsletter is not getting through to the Latin American scientific community at large though it would be desirable that it should be distributed widely among the many scientific societies and networks and national science foundations in the Region. On the whole ROLAC is doing valuable work, and is carefully developing a long-term path for the future. However, strong efforts are needed to make it known throughout Latin America.

ICSU Regional Office for Asia and Pacific (ROAP)

This regional office was inaugurated on 19 September, 2006. The office is supported by a secretariat of two science officers and an administrative officer. It receives advice from a regional committee chaired by Professor Hong Kum Lee of the Korea Polar Research Institute. The ROAP has taken about four years to develop.

The relationship between ROAP and the ICSU Secretariat was described as good. They have regular communication through monthly Skype conversations. The overall work programme was agreed at the annual meeting of The Director and Chair of the Regional Committee with the ICSU Executive Board in Paris. This had been followed by a debriefing joint session with the ICSU office in Paris after the Executive Board had met with the Committee on Science Policy and Research. However, the expected annual debriefing did not take place in October 2013. It is felt that the ROAP was working well. They have recently been concentrating on developing the Future Earth Programme while not neglecting the four agreed priority areas: Hazards & Disasters; Urban Health; Sustainable Development; and Ecosystems. It was claimed that the ROAP is the most advanced among ICSU ROs in promoting Future Earth. The Strategic Plan produced by the Monsoon Asia Integrated Regional Study has been considered as a good approach and would work on expanding it to a much broader mandate. However, their attempts to connect with the Programme on Ecosystem Change and Society (PECS) in Stockholm have not been successful.

The income of the ROAP for the year 2012 was ~390,000 EUR plus ~1.6 million MYR. This included ICSU contribution of about 50,000 EUR. The office felt that ICSU financial support was not sufficient. Therefore, ROAP is seeking money from alternative sources. It was emphasized the future in the regions will depend on being more responsive to the needs of the developing world. More emphasis is needed on scientific capacity-building in the developing world.

The governance and the relationship with the ICSU Secretariat is an issue. ROAP felt that there should be “one ICSU” operating as “science for society in the regions”. There is a feeling that the ICSU should listen closely to the views from the regions. In the past they had dealt on all issues with a single International Programme Officer (IPO), whereas now they dealt with different IPOs in various parts of the world according to the topic under consideration. The example of the International Polar Year was cited as a success story in which member states built up large programmes that drew in members not previously involved. The attitude was co-operative and not directive. The view was expressed that

members who are paying should have a say in what happens.

Information about the Regional Offices can be obtained from the web pages:

- http://www.icsu.org/latin-america-caribbean/
- http://www.icsu.org/asia-pacific/
- http://www.icsu.org/africa/

Specific Recommendations

Operational Structure

2.7.1 The EB should act on behalf of the General Assembly as the apex body of ICSU between the General Assemblies, as per constitution of ICSU. The role of the Policy Committees should be advisory and to serve as the think tank of the Board.

2.7.2. Implement clear and unambiguous lines of command as indicated in the proposed new organogram for efficient functioning of the ICSU Secretariat.

Other suggestions

- The EB may be renamed as the Governing Board. The Policy Committees may be renamed as Advisory Committees.

Regional Offices

Recommendations concerning the functional relationship between the Regional Offices and the Paris Secretariat are addressed under recommendations 2.2.10 to 2.8.8.

2.7.3 The Regional Offices should establish links with the national science foundations of the Region, which often have a much greater influence in terms of resources and contacts with decision makers in Governments.

2.7.4 Efforts are needed for training of the science officers in project management.

Other Suggestions

- Widely distribute RO Newsletters among the scientific societies and networks and national science foundations in the Region in addition to the academies.

2.8 Secretariat support

Review the functioning of the ICSU secretariats in Paris and the regions and assess their adequacy for delivering and supporting ICSU's mission.

A subgroup of the ERP visited the Paris Secretariat in January, 2014. The ERP became aware of the generosity of the Government of France in making substantial in-kind support for

ICSU through provision of an elegant office building in rue August Vacquerie together with a substantial annual cash contribution of €500,000.

The ERP was impressed by a loyal, hard-working, and dedicated group of staff who had apparently committed themselves to employment in the NGO sector by choice. The Executive Director, the Deputy Executive Director and the Assistant Executive Director form the senior management team, supported by the Heads of Communication and Human Resources. There are some eighteen staff members in total and numbers fluctuate according to the number of external projects being supported at any one time. This number is more than two and one-half times the size of the Secretariat at the time of the last review (1996).

Although individual staff members may have specific job designations, the nature of the work in the Secretariat demands that many people share a range of duties. The main function of the Secretariat is to support the implementation of the current strategic plan including interaction with the Directors of the Regional Offices who are formally supported by ICSU. Support is provided for the following activities (we list a few examples):

- Science for Policy;
- Universality of Science and CFRS;
- Data Handling;
- Science Education (although it was later admitted that not much had been done since the Rome GA); Structure-Function Goal (membership, partnership, resources);
- Communication with the Governing Board.

The ERP concluded that the Secretariat was a lean organisation that was attempting to support the traditional areas of ICSU while providing increasing levels of support to large flagship projects such as Future Earth. Flexibility in appointments is constrained by French employment law and there is a need to explore opportunities of secondment of staff from agencies and industrial partners from the national adhering bodies and from the Regional Offices. The ERP recommends that ICSU maintains an efficient core Secretariat while retaining the flexibility to meet the challenge of an upscaled ICSU vision in which large standalone flagship projects are initiated with a separate staff who are attached to the Secretariat and maintain an active link with the EB.

The present financial constraints limit expansion of core members of the Secretariat. Nevertheless, the ERP considers it essential for ICSU to find ways of creating an enlarged Communications section that can deliver the proposed outcomes listed under the ToR paragraph 3 & 4. In addition consideration should be given to provision of an enlarged Science Policy section to support the dissemination of policy and position statements. Proper support should also be provided for a Membership section that can fulfil the recommendations regarding engagement of Unions, Associates and Partners under ToR paragraph 5 & 6.

In order to empower all members of the Secretariat it is recommended that a more inclusive policy be developed so that ideas that are generated in the Secretariat can be considered and where appropriate implemented by the Executive Board.

The obligation of any organisation is to provide support for professional development, including an annual performance assessed against previously defined and agreed performance indicators. If a performance review system is not already in place within the entire Secretariat it should be implemented for all staff members including the Directors of the Regional Offices. Clear pathways should be developed for staff remuneration and retention strategies.

The Secretariat should give consideration to developing a clear process for communication between staff and the Executive Director and between the Secretariat and the Executive Board, including the President.

The Regional Offices have the potential to deliver many of ICSU's core values, activities and contributions to their respective region, and ICSU should continue to welcome the funding contributions from Host countries. However, it is also crucial that ICSU through the Secretariat is able proactively to capture the grants from external sources to promote RO's independence.

The ERP was of the firm view that there should be a single point of contact for the Regional Office in the Paris Secretariat. A five-year review of a Regional Office should take place in a timely fashion (say) at the beginning of the fourth year, so that staff employed in the Regional Office are made aware with certainty of the expectation of either another renewal for five years or are given significant advance warning that contracts are unlikely to be renewed.

The ERP noted that ICSU is at present reviewing the Regional Offices and thus hope that the aforementioned points will be taken into consideration in their review.

Specific Recommendations

2.8.1 Staff employed on large flagship projects should have an attachment to the Secretariat and an active link with the EB.

2.8.2 Agencies and industrial partners from national adherent members and the RO host countries should second key staff to the Secretariat in order to share expertise and provide support for appropriate projects.

2.8.3 A Communications and Outreach section of up to five staff members should be established.

2.8.4 The Secretariat should establish a Science Policy and Advice section, with peer reviewed output.

2.8.5 The Membership section should have sufficient staff to improve interaction with all members and partners, but particularly with the Unions.

2.8.6 There should be a separate Development (fund-raising) section.

2.8.7 The EB with the Secretariat should develop strategies for identifying and inclusion of new members, particularly those representing emerging disciplines.

2.8.8 The Secretariat should establish a professional development strategy including annual performance reviews against agreed performance indicators for each member of Secretariat and each Director of the Regional Office. The ROs should mirror this practice.

2.8.9 Reviews of the ROs should be conducted every five years in a timely manner at the beginning of year four so that staff employment expectations can be communicated well in advance.

2.8.10 The ROs should have a single ICSU Liaison Officer point of contact in the Secretariat.

3. Concluding remarks

The ERP found the review process to be stimulating and challenging. We found the1996 review to be most informative but believe that ICSU needs to be reviewed much more regularly. Thus the ERP recommends a review process every decade, but linked to the General Assembly's timescales, given the pace of scientific change. A stakeholder survey should be instigated by the EB prior to such reviews to ensure the ICSU family has been properly engaged.

Given the concerns raised by the stakeholders, the ERP believes the GA needs to be reassured that the items raised are being addressed and that management response is formally tabled for discussion.

Acknowledgements

The ERP thank the many people and organizations that have assisted us in this Review. In particular, we are especially grateful to the Singapore MRS Team and IUMRS for their generous hospitality and financial support during three meetings in Singapore (B V R Chowdari, C H Khoo, S J Chong, F Qiao). The ICSU Paris Secretariat and the Regional Offices gave us much needed advice and information. We are also grateful to the President and the ICSU Officers who engaged with us during the Review. The Stakeholders (Unions and National Members) provided valuable insights.

Appendix 1: 1996 Assessment Response and Comments from the Executive Director

Everything in red and italics is the Secretariat response.

1.1. ICSU should be an incubator of "entrepreneurial" activities at the nexus of interdisciplinary, international scientific activities. It should generate essential new scientific programs and sound advice on science to guide policy formulation.

The Committee on Scientific Planning and Review (CSPR) was established in 1999 essentially to implement this recommendation

CSPR undertook a set of priority area assessments in the period 2002-2006, focussing on Capacity Building; Scientific Data and Information; and the Environment and its relation to Sustainable Development, providing the basis for many current ICSU initiatives. Since 2008, international programmes on Disaster Risk, Urban Health and Wellbeing, Ecosystem change, Polar research, and research for sustainability have been developed by CSPR.

1.2 The ICSU Grants Program should be converted into a seed fund to launch new initiatives. Procedures for promoting proposals, reviewing them, overseeing on-going programs, and terminating old ones should be codified and put into practice.

The ICSU grants programme is now a fully peer-reviewed, openly competitive programme. Priority areas and transparent assessment criteria are clearly defined. Funding for routine operational activities or multi-annual projects is no longer available via the grants programme and the focus is on 'seed-corning' new activities that require collaboration between different ICSU bodies. [More detail on the grants programme, including presentation of several large grant projects, will be available at the GA under item 7.]

The ICSU grants programme is now financially smaller than it was a decade ago (typically now 300kEuro pa). It is being refocused on 'new horizons' activities, which will help ICSU and its members develop the programmes and initiatives of the future.

1.3 ICSU should establish clear policies and processes for conducting high quality, authoritative "science for policy" studies at the request of intergovernmental bodies or by governments through their National Member or private agencies who would pay for them. ICSU should solicit such activities in areas where it has the competence to do so.

ICSU has not carried out any studies that have been directly commissioned by intergovernmental bodies or governments. With the establishment of the InterAcademy Panel/InterAcademy Council (IAP/IAC), National Members have another international, non-governmental body to go to should they require such studies. Nevertheless, using its own prioritorization process, there are several important science for policy areas that have been identified by ICSU over the past three years and significant 'science for policy' activities initiated. Most notable

amongst these is ICSU's major involvement in the UN intergovernmental summits – the Multi-Stakeholder Dialogue on Sustainable Energy and Transport in April 2001 and the World Summit on Sustainable Development (WSSD) in September 2002 [item 8]. As part of the WSSD process, an ICSU Series on Sustainable Development consisting of 9 reports on key 'science for policy' topics has been produced. There are also two important studies on GM foods that will be presented at this GA [item 10] and several other position statements have been produced by ICSU bodies as a follow-up to the Unions meeting in February 2001. In the light of past experience, new guidelines and criteria for the issuance of ICSU position statements have recently been developed and are included in the documents for the Unions' and National Members' Fora.

1.4 ICSU should consolidate and enhance its activities for promoting science in the developing countries, and should call upon the extensive human resources in developing countries to assist in programs of sustainable development and to identify appropriate partners in regional and global collaborative scientific ventures.

The CSPR has carried out a review of COSTED and following this review, the Executive Board has recommended a new structure, including ICSU regional offices, in order to better promote science in developing countries [item 7.3.1]. The CSPR has also identified 'capacity building' as one of the initial priority areas for a Strategic Area Assessment; the first step in this assessment will be the scientific forum on capacity building at the GA.

A report on capacity building, focussing mainly on developing countries, is included in the ICSU series for the WSSD and a session in the Science Forum during the WSSD in Johannesburg will focus on this topic. This latter session is being organised by ICSU with TWAS, LEAD and the IFS.

ICSU regional offices are now operating in Latin America and the Caribbean (Mexico City), Asia Pacific (Kuala Lumpur) and Africa (Pretoria), together with occasional events held in the Middle East and North Africa.

1.5 ICSU should conduct a comprehensive, rigorous comparative review of existing bodies and programs with the objective of restructuring them to conform to current needs.

The CSPR has now finalised its plan for a new process for strategic planning and review [item 7.3.2]. This will entail both broad forward looking 'strategic Area Assessments' and, where appropriate, *ad hoc* reviews of specific ICSU bodies/programmes. One of the major underlying principles of this review process is that form should follow function.

Up to 2006 , 6 Interdisciplinary bodies and 6 policy or advisory committees were disbanded. Between 2006 and 2011, another 4 Interdisciplinary bodies have been disbanded or restructured (excluding the current process to merge three global environmental change programmes into Future Earth).

1.6 ICSU should establish a "sunset" provision for committees and programs.

In considering how ICSU should take forward new priority initiatives, the CSPR has strongly recommended that in future all new ICSU activities should be developed and implemented by *ad hoc* groups/committees. ICSU will not establish any more interdisciplinary committees unless multi-year planning has clearly demonstrated the need for such establishment. *Ad hoc* committees should receive ICSU support, as necessary, during their first three to five years in existence, after which they will either be dissolved or have developed their own income sources for routine operational functions. Where such committees become financially independent, an interdisciplinary body may be established and would be eligible to apply to the ICSU grants scheme for 'project' funding if this fits with the priorities for this scheme. [The new CSPR review procedure will be presented in detail under item 7.3.2 at the GA.]

An illustrative example for this new *ad hoc* committee approach is the Committee on Sciences for Food Security (CSFS). This committee was established in 1996 and has now completed its function, *i.e.* a scoping of what the research needs are in relation to food security, which will be presented under item 10 at this GA. The CSPR has now recommended that this Committee, which has served its function, be dissolved.

Point 2: ICSU should be the umbrella for concerns of "policy for science" in the international arena.

2.1 ICSU should continue to provide advice, guidance and recommendations on policies that affect the integrity and effectiveness of the conduct of science (e.g. freedom of inquiry, movement, and communications: ethics in science; intellectual property rights; etc.).

ICSU has two key policy committees – the Standing Committee for Responsibility and Ethics in Science (SCRES) and the Standing Committee on Freedom in the Conduct of Science (SCFCS) - concerned principally with 'policy for science' issues. It also has several other bodies, such as the Advisory Committee on Genetic Experimentation and Biotechnology (ACOGEB) that have an interest in some of these areas. However, the Executive Board has decided that a broader strategic review of ICSU's role in ethics and science – including 'science and society' - is necessary [see item 12 for more detail]. Again, with 'form following function' in mind, this review should come up with clear recommendations on the unique role that ICSU can play in the 'policy for science' arena.

As a result of the review mentioned, SCRES was dissolved and its functions assumed to some degree by the Committee on Freedom and Responsibility in Science (CFRS).

2.2 ICSU should address issues that affect the vigour and utility of science (e.g., science education; balance of basic and applied science; public understanding of science; capacity building, etc.).

These cross-cutting themes continue to be a major priority for ICSU.

The Committee on Capacity Building for Science (CCBS) has been very active in the field of primary school science education and participated in an important scoping meeting with all the ICSU Unions in February 2001 on capacity building. Capacity building, including science education, is one of the initial topics identified by the CSPR for a priority area assessment (see 1.3 above).

The value of basic sciences is one of the topics identified at the Unions' meeting in February 2001 and a position statement on this topic has subsequently been prepared by several of the Unions.

[ICSU's role in relation to the public understanding of science is discussed in the communications strategy paper under item 5 of the GA.]

Various reviews have been undertaken in recent years including 'Science Education' [http://www.icsu.org/publications/reports-and-reviews/report-of-the-icsu-ad-hoc-review-panel-on-science-education/Report%20on%20Science%20Education%20final%20pdf.pdf]and an analysis of the necessary capacities to implement the Belmont Challenge on Regional Environmental Change [http://www.icsu.org/publications/reports-and-reviews/belmont-report/regional-environmental-change-human-action-and-adaptation]

2.3 ICSU should issue timely "white papers" on such topics of "policy for science.

ICSU's role in relation to the issuance of position statements is discussed above (1.2) and new guidelines and criteria for the production of such statements, either 'science for policy' or 'policy for science' are included in the documents for the Unions' and National Members' Fora.

Over the past three years ICSU has continued to be active in the 'policy for science' area. One example of this is the report of the Traditional Knowledge Working Group [item 6]. This report, on a controversial topic, is an attempt to clarify the confusion between traditional knowledge and pseudo-science, and their relationship with science. The report has also formed the basis of a report in the ICSU WSSD series. A joint UNESCO-ICSU session during the Science Forum of the WSSD will discuss this issue involving other sectors of civil society, industry and governments.

Point 3: ICSU should strive to be a strong voice for international science through an aggressive outreach campaign.

In recent years, ICSU has strengthened its communications team, launched a new website, created a more consistent visual branding, engaged in social media and launched new products, for example the Future Earth blog – www.futureearth.info

3.1 ICSU should review its current array of publications and restructure them, including: (i) reducing the portion devoted to "cataloguing", perhaps using electronic modes of distribution for such information; (ii) improving and making more widely appealing and available information about programs, activities and issues addressed by ICSU; (iii) establishing an editorial board of experts in public relations and publishing to guide ICSU in making these changes.

The first stages in the development of a new communication strategy for ICSU are discussed in detail in a document under item 5 of the main GA agenda. The 're-branding' of ICSU is underway, with a new graphic profile being adopted for the most recent publications – the WSSD series, introduction to ICSU and the 2002 Year Book. Most importantly the CSPR and Executive Board have developed a new mission statement for ICSU, and a more succinct one line version of this – 'strengthening international science for the benefit of society'. These statements are integral to the new 'branding' and graphic profile.

3.2 ICSU should have a public relations/publications expert on its staff, charged with strengthening and broadening knowledge of ICSU and its activities in the global scientific community.

A new Communications Officer position has been created within the Secretariat. Initially this post will be shared between ICSU and DIVERSITAS, but it is expected that the communications/press function within the Secretariat will expand and additional expertise will eventually be required. In addition, Mustapha Mokrane has recently started at the ICSU Secretariat responsible for IT and the ICSU website

Point 4. The governance system of ICSU should be streamlined and restructured to reduce overlapping responsibilities of existing bodies, to cut costs, and to speed up actions.

Many of the recommendations below were discussed at the Extraordinary GA in Vienna in 1998, when the necessary changes to the Statutes and Rules of Procedure were agreed.

4.1 The General Committee should be discontinued and its functions transferred to an enlarged Executive Board.

The General Committee was disbanded in 1998 and the CSPR was appointed in 1999. The Executive Board was also restructured, with new functions being defined for the Vice-Presidents.

Although there was little opposition at the time to the disbandment of the General Committee, it is clear that this has led subsequently to a feeling that Members are excluded from influencing ICSU's strategy and priorities. The CSPR has been very sensitive to this concern and the new process for strategic planning and review is deliberately designed to include an ongoing dialogue with all ICSU members and affiliates [item7.3.2]. Further to this, the meeting of

the Unions in February 2001 was considered by most participants to have been a very productive event and the usefulness of similar 'subject focussed' meetings of ICSU members in the future will be considered at the meetings of Union and National members during the GA.

4.2 The name of ICSU should be changed to reflect more accurately its structure and function. The Executive Board should be charged with recommending such a change to the membership.

A new name - The International Council for Science - was agreed at the EGA in Vienna in 1998.

The ICSU Executive Board is currently discussing whether and how to give this name higher profile over the ICSU acronym.

4.3 Ad hoc groups should replace "standing" committees for common concerns and services, giving more flexibility to growing or shrinking committees to fit needs. Many of the present standing bodies could operate as subsidiary bodies of the General Assembly, and could be convened concurrently with the Assembly.

Under item 12 of the main GA agenda, it is proposed that the Committee on Governance (CG) be disbanded. Whilst the Executive Board considers that it is premature to disband the Standing Committee on Finance and Fund-raising at the current time, its role and usefulness ('added value' vs overhead) will be considered over the next 3 years.

The ICSU Committee on Finance is now a subgroup of the Executive Board.

4.4 The Executive Board should institute a formal system of succession planning to ensure both the quality and the continuity of future staffing of the Secretariat. The positions within the Secretariat should be re-evaluated to grant responsibility and relevant authority to staff members according to agreed portfolios, based on programmatic rather than administrative needs, linked with advisors from among the officers, and supervised by the Executive Director.

New appointments of scientifically qualified staff have been made to the Secretariat over the past year and the Secretariat now has a good mix of experienced and new staff, which should help to ensure continuity. The addition of a Deputy Executive Director is particularly important to ensure continuity.

After the appointment of a new Executive Director and a Deputy Executive Director over the past year, all the positions with the Secretariat have been reviewed internally and clarification of job descriptions and responsibilities has been carried out as necessary.

5. The membership of ICSU should be reviewed to consider the role and balance of small and large National Members and Union Members, the increasing fragmentation

and proliferation of "disciplines", the potential role of disciplines not now represented, and the character of national scientific bodies.

Refer to: Page 5 & 6, no. 5 from 1996 assessment report

- *Representatives selected by National Members and Union Members to serve on ICSU bodies and to launch new ICSU interdisiplinary programs should be accomplished scientists who also understand the international landscape of science, including the role that organizations can play in scientific cooperation. Both National and Union members should stress the scientific credentials of their representatives in ICSU activities, and seek scientists with breadth of vision and executive competence.*
- *ICSU should not solicit enlargement of the Union Member representation from the social sciences, until it is clear these disciplines decide how best to organize internationally, but should find the best ways of cooperation on critical concerns to build bridges between the natural and social sciences, and should welcome national representation by individuals from these disciplines.*
- *ICSU should encourage membership by unions representing the engineering, medical, and agricultural sciences.*
- *ICSU should make an effort to increase its capabilities and membership in recently emerging and growing areas of science such as telecommunications, computer science, and biotechnology.*
- *ICSU should encourage participation in its activities by scientists from private industry and institutions.*
- *ICSU should encourage the participation of scientists from developing nations in its activities.*
- *The Officers and Executive Board of ICSU should further study the feasibility and desireability of a new (non-voting) class of membership that could improve the linkages with national funding agencies, other national scientific bodies (e.g., professional organizations), and corporations with interest in the development and application of science.*
- *ICSU should encourage each National Member to set up mechanisms for sharing information between national representatives and other of its participants in Union Member activities, as there is a critical need for enhanced national coordination.*
- *ICSU should develop criteria for membership with a view to avoiding redundant representation of disciplines; discouraging the fragmentation of disciplines, especially in the biological sciences; avoiding undue proliferation of members in general; and overcoming the perception that Associate status is an automatic step toward full membership. It should solve the existing dichotomy among the National Members and Union Members carrying equality of votes of the two categories of membership in the General Assembly, but not having equal capacities within their own members (some represent small communities; others are large) or in their dues contributions.*

We are aware that our proposals have budgetary implications. Some will save money, but others may be costly. We believe that the cost savings incurred by eliminating the General Committee will more than offset the expense of additional personnel and of more resources devoted to fueling new initiatives. In the short term these may appear expensive, but in the long run, these should have a net positive effect on the overall budget of ICSU.

Overall this is not an area where significant progress has been made; a major factor being that ICSU, quite correctly, has no direct control on how different disciplines and scientific groupings decide to organise themselves either nationally or internationally. However, under item 12.5 on the GA agenda, it is proposed that an *ad hoc* committee be established, in place of the standing Committee on Governance, to address these membership issues. Collaboration is also being strengthened with the engineering, medical and social sciences as part of the WSSD process.

5.1 Representatives selected by National Members and Union Members to serve on ICSU bodies and to launch new ICSU interdisciplinary programs should be accomplished scientists who also understand the international landscape of science, including the role that organizations can play in scientific cooperation. Both National and Union members should stress the scientific credentials of their representatives in ICSU activities, and seek scientists with breadth of vision and executive competence.

These are worthy aims, which ICSU continues to strive towards. However, it is clear that the 'work pressure' on such respected representatives is very high and the 'pool' from which such representatives can be drawn is not infinite. The combination of these factors means that it is often difficult to identify and recruit such people into ICSU activities. One recent example of this was the first call for nominations to the ICSU Policy and Advisory Committees earlier this year which received a very poor response from members.

It is crucial for the future of ICSU that it continues to recruit the best people to its activities and that a good balance on ICSU committees, with regard to gender, age and geographic coverage is achieved. It is the responsibility of all members to provide suitable nominations. It will be particularly important for the Strategic Area Assessments, the quality of which will be a direct result of the calibre and vision of the scientists who participate on the *ad hoc* strategic committees.

5.2 ICSU should not solicit enlargement of the Union Member representation from the social sciences, until it is clear these disciplines decide how best to organize internationally, but should find the best ways of cooperation on critical concerns to build bridges between the natural and social sciences, and should welcome national representation by individuals from these disciplines.

The Executive Board has considered the situation with regard to the social sciences on several occasions since 1996 and continues to agree with this recommendation, albeit with considerable regret that there is still no sufficiently strong partner organization representing the social sciences. ICSU continues to work closely with the International Social Sciences Council (ISSC), most recently with regard to the WSSD. The ICSU membership itself is also not without some expertise in the broad area of social sciences, e.g. IUAES, IGU, IUPsyS, and using this expertise and

linking with other groups on an *ad hoc* basis is a pragmatic (and largely adequate) way forward for the time-being.

ICSU continues to engage with the International Social Science Council, which has become stronger over recent years. ICSU's membership has also expanded to include greater social science competence, for example, the International Sociological Association.

5.3 ICSU should encourage membership by unions representing the engineering, medical, and agricultural sciences.

With regard to medical, *i.e.* clinical, sciences a recent initiative by the national academies of medicine from around the world to form an 'umbrella' organization the Inter-Academy Medical Panel (IAMP) provides some promise. The IAMP met for the first time in Paris in March this year and ICSU was represented.

ICSU has worked with the World Federation of Engineering Organizations (WFEO) in preparing for the 9th Session of the Commission on Sustainable Development (ICSU Series on Sustainable Development Report 2), as well as for the WSSD. ICSU is also collaborating with the International Council for Engineering and Technology (ICET) and will cosponsor its World Congress on "Megacities of the Future" scheduled for 2005.

As concerns the agricultural sciences, the global change programmes have launched the Global Environmental Change and Food Systems (GECAFS) programme in collaboration with CGIAR and FAO. ICSU is also involved in the planning for an International Assessment on the Role of Agricultureal Sciences and Technology in Reducing Hunger and Improving Rural Livelihoods (together with the World Bank, FAO and others).

During the WSSD process, ICSU has also collaborated in the FAO/Major Groups process on Sustainable Agriculture and Rural Development (SARD).

ICSU has had informal partnership discussions with CAETS and IET (both international engineering bodies). It has also supported the development of the Climate Change, Agriculture and Food Security (CCAFS) project, led by CGIAR and is working with IAMP in the development of the Urban Health and Wellbeing programme.

5.4 ICSU should make an effort to increase its capabilities and membership in recently emerging and growing areas of science such as telecommunications, computer science, and biotechnology.

Many of these 'emerging' areas are developing out of traditional scientific disciplines and/or interactions between these disciplines and hence the current ICSU membership is largely representative. However, the emergence of new branches of science will continue to be monitored, *e.g.* via the CSPR Strategic Area Assessment process, and if important and representative new international organizations arise, then partnerships will be developed.

5.5 ICSU should encourage participation in its activities by scientists from private industry and institutions.

The availability of 'high-level' scientists from the private sector is even worse than that in the public sector. Wherever possible, scientists from industry are coopted onto ICSU Committees, *e.g.* the CFF, but it is difficult both to identify the key individuals and persuade them to participate. Again, this is an area where several of the ICSU members, who have good contacts with the private sector, may be able to help. ICSU has been working with the International Chamber of Commerce in preparing for WSSD and has developed good communication channels with the private sector. Much remains to be done, however.

This area remains an important challenge, but programmes such as Future Earth are proving to be of stronger interest to the private sector, and helping with engagement (for example, through participants at the ICSU Science, Technology and Innovation conference at Rio+20, and in the new Future Earth engagement committee).

5.6 ICSU should encourage the participation of scientists from developing nations in its activities.

Facilitating interactions between developing and developed country scientists is a major objective of ICSU and is explicitly stated in the new mission statement. Part of this involves capacity building *per se*, which is discussed under 1.3 above. The other part is ensuring developing country input to, and representation on, ICSU's bodies and committees. Again there is a problem in identifying appropriate individuals who are able to give the necessary time commitment. However, geographical balance is a key criteria for all ICSU committees and this is taken very seriously.

The COSTED review proposed the establishment of a new Policy Committee, and the Executive Board has decided to establish an *ad hoc* committee to develop the remit and terms of reference for an ICSU Policy Committee on Developing Countries.

[The Unions will be discussing the inclusion of Developing Country representatives (and women and younger people) in their activities in their meeting immediately prior to the GA on 24 September]

The ICSU regional offices are playing a major role in this area, working in partnership with other regional bodies.

5.7 The Officers and Executive Board of ICSU should further study the feasibility and desirability of a new (non-voting) class of membership that could improve the linkages with national funding agencies, other national scientific bodies (e.g., professional organizations), and corporations with interest in the development and application of science.

The proposed *ad hoc* committee review of membership (see 5 above) will consider how to more fully implement this recommendation.

For the global change research programme, the International Group of Funding Agencies for Global Change Research (IGFA) serves as an excellent example of how this can be handled for a specific segment of ICSU's activities.

ICSU works closely with the Belmont Forum of environmental research funders, together with the broader IGFA grouping

5.8 ICSU should encourage each National Member to set up mechanisms for sharing information between national representatives and other of its participants in Union Member activities, as there is a critical need for enhanced national coordination.

This is the topic of discussion for the joint plenary session between the Unions and National members on 24th September immediately prior to the GA. However, it is fully recognised by the Executive Board that, whilst ICSU can encourage and facilitate, it cannot implement this recommendation. Eventually the responsibility for taking this forward lies with individual ICSU member organizations

5.9 ICSU should develop criteria for membership with a view to avoiding redundant representation of disciplines; discouraging the fragmentation of disciplines, especially in the biological sciences; avoiding undue proliferation of members in general; and overcoming the perception that Associate status is an automatic step toward full membership. It should solve the existing dichotomy among the National Members and Union Members carrying equality of votes of the two categories of membership in the General Assembly, but not having equal capacities within their own members (some represent small communities; others are large) or in their dues contributions.

The proposed *ad hoc* committee review of membership (see 5 above) will consider how to implement this recommendation more fully.

The membership review ultimately led to a review of the dues and the introduction of a new dues structure which in turn allowed weighted voting on financial matters to be introduced.

Appendix 2: Acronyms Used in the Report

CFRS: Committee on the Freedom and Responsibility of Science
GMOs: Genetically Modified Organisms
IAC: the Inter-Academy Council
IAP: Global Network of Science Academies
ICSU: International Council for Science
IP: Intellectual Property
MDGs: Millennium Development Goals
R&D: Research and development
SMEs: Small and medium enterprizes
WCRI: World Conference on Research Integrity

Appendix 3: Executive Director's Report to the ERP, Slide 19, 27 October 2013