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Evaluation of UNESCO's Work in Capacity Building in the Basic Sciences and Engineering

IOS Evaluation Office

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ABSTRACT

Basic Sciences and Engineering (BSE), the core of modern science and technology (S&T), are at the root of any innovative S&T response to meet basic human needs and foster peace and sustainable development. UNESCO has continuously been working in this domain to use science as a vehicle for international cooperation and understanding. UNESCO's capacity building work in BSE contributed among others, to the creation of major BSE institutions and, since 2005, the establishment of the International Basic Sciences Programme (IBSP). UNESCO's work in this area is also leaning on its broad network of partners, including Category 1 and 2 institutes and centres, international scientific unions, the African Academy of Sciences and other UNESCO programmes such as TWAS, the World Academy of Sciences for the advancement of science in developing countries. Despite the high relevance of capacity-building in this area, the BSE lost its role as a key strand of work in the Natural Sciences (SC) Sector following the financial crisis at UNESCO.

The evaluation found that that within a context of continued financial restrictions there is an urgent need to rethink UNESCO's capacity building work in the Basic Sciences and Engineering. There are opportunities for more clearly positioning UNESCO's contribution in this area to the Agenda 2030 but this can be only done with the support of its networks and partners. The evaluation suggests the UNESCO SC Sector to develop a focused strategy that foresees to delegate and reallocate activities in line with the comparative advantages in the UNESCO family, while pursuing a targeted fundraising strategy. Furthermore, capacity building in the BSE as an integral part of the SC Sector mandate could be designed to support and complement the upstream policy work of the Sector in order to achieve longer-term and sustainable impact.

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The Evaluation Office would especially like to thank the staff in the Natural Sciences Sector, in particular Romain Murenzi Director of the Division for Science Policy and Capacity Building (SC/PCB), the members of the evaluation reference group Mr. Jean Paul Ngome Abiaga, Assistant Programme Specialist, Section for Capacity Building in Basic Science and Engineering, (SC/PCB/CB) and Mr. Sandro Scandolo, Programme Specialist, Abdus Salam International Centre for Theoretical Physics (ICTP) as well as all evaluation interviewees and survey respondents who provided inputs throughout the evaluation process. Special thanks go to the representatives of the Permanent Delegations to UNESCO who agreed to participate in evaluation interviews, and the IBSP Board members who agreed to be interviewed during or after the 10th meeting of the IBSP Board.

Susanne Frueh

Director, IOS

Cover photo: UNESCO

John Emrys Morgan. Within the framework of Priority Africa, UNESCO in collaboration with the International Centre for Theoretical Physics (ICTP) and the University of Nigeria, Nsukka organized a series of conferences, training and demonstration workshops in Nsukka, Nigeria, over one week.

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Acronyms

ADG	Assistant Director-General
BSE	Basic Sciences and Engineering
BSP	Bureau of Strategic Planning
CEM	Centre d'Excellence en Microsciences
CERN	European Organization for Nuclear Research (Centre européen de recherche nucléaire)
ED	Education Sector of UNESCO
EO	Executive Office
ER	Expected Result (in UNESCO's programme and budget)
GE	Gender equality
GIS	GenderInSite
IBSE	Inquiry-Based Science and technology Education
IBSP	International Basic Sciences Programme
ICGEB	International Centre for Genetic Engineering and Biotechnology
ICSU	International Council for Science
ICT	Information and Communications Technology
ICTP	Abdus Salam International Centre for Theoretical Physics
IMU	International Mathematical Union
IOS	UNESCO Internal Oversight Service
IUCr	International Union of Crystallography
IUPAC	International Union of Pure and Applied Chemistry
LMIC	Low and Middle Income Countries
MIRCEN	Microbiological Resource Centre
MLA	Main Line of Action
NEPAD	New Partnership for Africa's Development
ODG	Office of the Director-General
OWSD	Organization for Women and Science for the Developing World
RB	Regular budget
SC	Natural Sciences Sector of UNESCO
SESAME	Synchrotron-light for Experimental Science and Applications in the Middle East
SDG	Sustainable Development Goal
SIDS	Small Island Developing States
SISTER	System of Information on Strategies, Tasks and the Evaluation of Results

SO	Strategic Objective
SPO	Strategic Programme Objective
STEM	Science, Technology, Engineering and Mathematics
STI	Science, Technology and Innovation
SWOT	Strengths, Weaknesses, Opportunities and Threats (analysis framework)
TWAS	The World Academy of Sciences for the advancement of science in developing countries
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
XB	Extrabudgetary Resources

Executive Summary

CONTEXT

Basic Sciences and Engineering (BSE), the core of modern science and technology (S&T), are at the root of any innovative S&T response to meet basic human needs and foster peace and sustainable development. UNESCO has continuously been working in this domain to use science as a vehicle for international cooperation and understanding. UNESCO's capacity building work in BSE contributed among others to the creation of major BSE institutions[1] and since 2005 to the establishment of the International Basic Sciences Programme (IBSP), an instrument for reinforcing international/intergovernmental cooperation for strengthening national capacities in science, sharing scientific knowledge, promoting science education and reducing the divide in the basic sciences. UNESCO's work also leans on the synergy between IBSP and its broad network of partners, including Category 1 and 2 institutes and centres, international scientific unions, the African Academy of Sciences and other UNESCO programmes such as the World Academy of Sciences for the advancement of science in developing countries (TWAS).

UNESCO's capacity building work in BSE is composed of a variety of thematic subject areas and multiple strands of work, including activities as diverse as workshops, training, seminars, research fellowships, development of e-learning tools, summer camps, creation/support of networks and partnerships, publications, open access resources, policy guidelines, competitions, exhibitions, international days and years. Activities focus principally on tertiary, but also secondary STEM education – education on Science, Technology, Engineering and Mathematics (STEM) - and on research and cooperation in BSE for sustainable development. UNESCO's current activities in BSE contribute to Strategic Objective 4 of the 2014-2017 Medium Term Strategy (37 C/4): "Strengthening science, technology and innovation systems and policies - nationally, regionally and globally."[2]

The capacity building work in BSE aims to advance, transfer, share and disseminate scientific knowledge and to transform this basic scientific know-how into useful applications for today's multiple sustainable development challenges, as well as to promote scientific infrastructure and normative and institutional frameworks for science development, which resonates well with the global Sustainable Development Goals (SDG) Agenda 2030, as well as with regional strategies such as the Science, Technology, and Innovation Strategy for Africa (STISA-2024). Notwithstanding the vast needs, BSE lost its role as a key strand of work in the Natural Sciences Sector following the financial crisis at UNESCO when Member States rated it as a low funding priority.

The evaluation was carried out by a team of evaluators from Technopolis Group with support from IOS and the Natural Science Sector between January and July 2017. The evaluation aimed at supporting the Natural Sciences Sector in making informed adjustments to its planned work and/or structure in time to incorporate them into the planning for the next Programme and Budget for the period 2018-2021. The present evaluation concentrates on the work approved under the UNESCO C/5 Programme and Budgets from the 2010-2011 biennium (35 C/5) to the current 2016-2017 biennium (38 C/5). The geographical scope of the evaluation is global, and particular attention is given to UNESCO's global priorities Africa and gender equality.

[1] such as the European Organization for Nuclear Research (CERN), the Abdus Salam International Centre for Theoretical Physics (ICTP) and most recently the Synchrotron-light for Experimental Science and Applications in the Middle East (SESAME).

2 In the 38 C/5 Programme and Budget (2014-2017) it contributes to the Expected Results (ER) 2 "Capacity-building in research and education in the natural sciences enhanced, including through the use of ICTs", and ER 3 "Interdisciplinary engineering research and education for sustainable development advanced and applied" of the Main Line of Action 2 "Building institutional capacities in science and engineering".

OBJECTIVES

Within this particular context, the evaluation supports evidence-based decision-making by UNESCO's Governing Bodies and the Natural Sciences Sector on the following aspects:

- The relevance of UNESCO's scope of activities and expected results (ERs) in Capacity Building for BSE
- UNESCO's comparative advantages in Capacity Building for BSE within the global sciences and development landscape
- The adequacy of its human and financial resources
- The effectiveness and efficiency of UNESCO's institutional setting for Capacity Building in BSE
- The performance and sustainability of its activities and outcomes in Capacity Building for BSE

METHODOLOGY

The evaluation methodology used a variety of analytical tools and information sources. These include:

- an extensive desk study of UNESCO documents and data
- visits to UNESCO Headquarters
- a Theory of Change workshop with UNESCO staff from the Division for Science Policy and Capacity Building
- attendance at the 10th meeting of the Scientific Board of the IBSP and interviews with partners and members of its Board
- field visits to multi-sectoral regional offices in Cairo and Yaoundé
- an online survey targeting National Commissions, UNESCO Chairs and Category 1 and 2 centres
- interviews with key stakeholders and partners of UNESCO's work in Capacity Building for BSE

KEY FINDINGS

UNESCO is uniquely positioned to support institutional Capacity Building in the BSE, in particular by highlighting the importance of science across the Sustainable Development Agenda and by drawing attention to women in science. UNESCO's work in Capacity Building in the BSE is highly relevant to the needs of low and middle-income countries (LMIC), in particular in Africa.

- UNESCO has a global mandate and a network of field offices which can deploy its mandate locally. UNESCO represents a powerful brand and a neutral platform. It is seen by partner organizations as a special entry point to be heard by Member States. Furthermore, it brings together national and international scientific organizations, researchers and networks.
- With these comparative advantages UNESCO can help Member States from LMICs compensate for their deficiencies in BSE and narrow the gap in scientific knowledge and technology. At the same time, UNESCO has decreased its human and financial resources in this area and the intervention logic[3] for BSE demonstrates a legacy of overambitious expectations. Execution of these expectations carries a high risk of dispersion of limited resources. The evaluation calls for a focused and clearly articulated strategy. The strategy should be defined in consultation with its Member States to prioritise a limited number of thematic areas, associated delivery mechanisms and the geographical scope. In addition, the Organization should reflect on how to better work with, and mobilise, its network of partners – in particular the Abdus Salam International Centre for Theoretical Physics (ICTP), the World Academy of Sciences for the advancement of science in developing countries (TWAS) and the Synchrotron-light for

[3] Based on the Theory of Change developed during the evaluation

Experimental Science and Applications in the Middle East (SESAME). Finally, a comprehensive fundraising strategy should be defined and deployed to bring extra resources for activities.

UNESCO's work on Capacity Building in BSE has implemented several significant initiatives to promote women in sciences and contribute to the Organization's Priority Gender Equality Action Plan. However, its low level of human and financial resources on the African continent have been a barrier to the contribution to UNESCO's Operational Strategy for Priority Africa.

- Some of UNESCO's activities for the promotion of women in science such as the L'Oréal UNESCO for Women in Science partnership or the Organization for Women in Science for the Developing World are highly relevant to promote a larger share of women in sciences. Capacity building in the BSE is very relevant to the needs of African countries. Nevertheless regional offices in Africa operate with insufficient human and financial resources (15-30k USD per year).

The sustainability of outcomes and impacts is challenged by the dispersion of resources on a high number of short-term and often not strategically connected projects and activities. Capacity development would suggest a more holistic vision that can only be achieved within large extrabudgetary projects or a much more focused strategy including geographically.

- While the majority of activities implemented by UNESCO are most likely to increase capacities in research and education at the individual or organizational levels, the high number of short-term initiatives such as *competitions, prizes, workshops and conferences dilutes the* prospect of an impact of such initiatives at the institutional and national level.

- Measuring, monitoring and evaluating outcomes and impacts of UNESCO's work beyond the output level remains challenging, in particular due to the absence of an adequate monitoring and evaluation framework, hampered further by scarce resources. Progress reports contain no or marginal data on medium or long-term outcomes and impacts, in particular regarding the effects on individuals, organizations or policies.

The IBSP has successfully fostered international and regional cooperation around a number of significant and relevant initiatives. Nevertheless its governance structures are inefficient and its new strategy lacks a clear intervention logic and implementation plan. The lack of adequate monitoring and evaluation data does not allow a comprehensive assessment of the programme's results and impacts.

- Despite the constantly decreasing resources dedicated to the Programme, the IBSP has provided a global forum for exchange on science topics leading to some successful initiatives such as the establishment of new Category 2 centres, the creation of the African Women Mathematics Association, as well as the initiation of the International Day of Light or the International Years on Chemistry or Crystallography. The programme's current strategy lacks a detailed implementation plan to achieve its goals and clarification of the role and contribution of the IBSP networks and partners. Enhanced resources and stronger governance structures are necessary to improve the programme's focus, its performance and its accountability framework.

UNESCO's various efforts to strengthen synergies and better utilising its partnerships and cooperation with the multitude of networks and partners could be better coordinated and more clearly positioned within the overall intervention logic of its capacity building work in BSE.

- UNESCO has successful collaborations with scientific unions, NGOs and networks created under the auspices of UNESCO such as TWAS, the European Centre for Nuclear Research (Centre européen de recherche nucléaire – CERN), ICTP or SESAME. Interaction with and involvement of UNESCO field offices, UNESCO Chairs in science and UNESCO Category 2 centres is less evident. UNESCO's partnerships with the private sector have also been growing in the past years with an increasing number of collaborations with large companies such as Intel, Airbus or small and medium sized companies. However, these collaborations were set up within UNESCO's Headquarters, and field offices remain less comfortable working with the private

sector. Furthermore, there seems little overall coordination among the different initiatives and it is unclear how these are complementary to the overall intervention logic of the Organization's capacity building work for BSE.

No UNESCO Programme sector has the lead on STEM education, making the decision-making process more challenging.

- Science education is a domain at UNESCO that requires collaboration and coordination between the Education Sector and SC. Despite the good relationships and close cooperation between the two sectors at the operational level, it is currently not clear who leads on this subject within UNESCO. Challenges specifically arise when it comes to decision making. External partners engaged in UNESCO's activities to promote inquiry based science and technology education (IBSE) have particularly stressed this and urged the Organization to improve intersectoral coordination in science education.

RECOMMENDATIONS

Recommendation 1: The Division of Science Policy and Capacity Building of the UNESCO Natural Sciences Sector should define a more focused strategy for its work on Capacity Building in BSE appropriate to UNESCO's limited financial and human resources. While focusing on its upstream policy work it should reallocate activities in line with comparative advantages in the UNESCO family. The development of a focused strategy could entail transferring activities to partners such as the ICTP, TWAS, the Organization for Women and Science for the Developing World (OWSD), Chairs and Category 2 institutes.

Recommendation 2: The Natural Sciences Sector should strengthen its engagement in Africa. While seeking to obtain a critical mass of human resources in the field, the above strategy should allocate a major part of the budget to Priority Africa (80%).

Recommendation 3: The Natural Sciences sector should define a monitoring and evaluation framework for a newly defined focused strategy for Capacity Building for BSE. The monitoring and evaluation framework should include a logic model and full indicator sets at the activity, output and high-level outcome levels.

Recommendation 4: The Natural Sciences sector should reconsider the mandate of IBSP within UNESCO's limited resource framework, by either discontinuing IBSP, or refocusing it by scaling back its function.

Recommendation 5: The Natural Sciences Sector should dedicate some regular programme resources and define targets to fundraising activities within a global resource mobilisation strategy to increase UNESCO's extrabudgetary resources dedicated for capacity building interventions in the BSE.

Recommendation 6: The UNESCO Natural Sciences and Education Sectors should clarify leadership on science education within UNESCO. Regarding STEM education and Inquiry-Based Science and Technology Education, the leadership for these could be transferred to the Education Sector with Natural Sciences providing support when required.

Recommendation 7: The UNESCO's Section for Capacity Building in Science and Engineering (CB) should focus on ensuring longer-term perspectives to capacity building initiatives in BSE to allow yielding higher level outcomes and impacts.

Management Response

Overall Management Response	
The evaluation report has provided a good basis of evidence to identify the gaps and successes in the intervention logic/theory of change for the Sector's work in Capacity Building in the Basic Sciences and Engineering. It has also pointed out some useful ways forward to address these. This will enable the Natural Sciences Sector to best allocate its limited regular programme funding and focus its resource mobilization strategy in this area.	
Recommendations	**Management response**
Recommendation 1: Define a strategy for UNESCO's capacity building work in BSE that focuses on supporting the Natural Sciences Sector's upstream policy work and reallocate activities in line with the comparative advantages in the UNESCO family.	The Sector will consult and explore options with ICTP, TWAS, UNESCO Chairs and Category 2 Centres towards a strengths, weaknesses, opportunities and threats (SWOT) analysis on strategic opportunities for capacity building in BSE, also including considerations on Recommendation 7.
Recommendation 2: Strengthen the SC Sector's engagement in Africa.	The Sector will consult with the Africa Department, the Division of Field Support and Coordination, and field offices in Africa on special needs and priorities according to the 39 C/5 and with a special focus on training and capacity development offered by ICTP and TWAS.
Recommendation 3: Improve the monitoring and evaluation of UNESCO's work in Capacity Building in BSE.	Based on the outcome of Recommendation 1, an evaluation policy will be defined. Three percent of respective programme funds will have to be allocated to monitoring and evaluation, and the results presented in the framework of the statutory reporting.
Recommendation 4: Reconsider the mandate of IBSP within UNESCO's limited resource framework, by either discontinuing IBSP, or refocusing it by scaling back its function.	Based on strategic directions as a result of follow up to Recommendation 1, the mandate of IBSP should be reviewed, also considering Recommendation 7 and future funding opportunities.
Recommendation 5: Dedicate some regular programme resources and define targets to fundraising activities within a global resource mobilisation strategy to increase UNESCO's extrabudgetary resources dedicated for capacity building interventions in the BSE.	As part of the intervention logic for the 39 C/5, some funds from regular programme activities will be dedicated to fundraising. Targets are in the process of being defined for the entire Sector, both at the expected result (ER) and the regional level.
Recommendation 6: Clarify leadership on science education within UNESCO.	The Education Sector and Natural Sciences Sector will meet to clarify and simplify responsibilities for STEM education for the 39 C/5.
Recommendation 7: Focus on ensuring longer-term perspectives to Capacity building initiatives in BSE to allow yielding higher level outcomes and impacts.	The Sector will link capacity building for BSE to its work on Science, Technology and Innovation (STI) policy development. It will give special consideration to Recommendation 7 when working on Recommendation 1.

1 Introduction

1.1 Context of the evaluation

1. This evaluation covers UNESCO's work in Capacity Building in Basic Sciences and Engineering (BSE) since 2011. It has been commissioned by the UNESCO Internal Oversight Service (IOS) Evaluation Office at the end of UNESCO's Programme and Budget for 2014-2017 (37 C/5) and aims to enable UNESCO's Natural Science Sector (SC) to make informed adjustments to its planned work and/or structure in time to incorporate them into the planning for the next Programme and Budget for the period 2018-2021.

2. The critical financial situation the Organization has been facing since 2011[4] has led to the restructuring of the Organization and a temporary freeze in the recruitments of staff. In this context of reduced available resources from the regular budget, Member States, with the help a specifically designated working group, conducted a prioritisation exercise[5] of all expected results in 2013 to inform future budgetary allocations. The ERs relevant for BSE were ranked among the lower funding priorities (category C)[6].

3. With this particular context in mind the evaluation addresses issues regarding the comparative advantages of UNESCO within the global sciences and development landscape, its value added and its ability to leverage its networks and partners with a view to optimizing its impacts. It aims to inform decisions regarding the future focus areas, the most adequate modalities of implementation, the most appropriate distribution of resources, roles and functions including with its networks and partners.

1.2 Purpose and scope

1.2.1 Evaluation purpose

4. The UNESCO SC Sector has called for an external evaluation of its work in Capacity Building in the Basic Sciences and Engineering (BSE). Based on the Terms of Reference and as agreed during the inception phase, the evaluation aimed to assess the following aspects under each evaluation criteria. The detailed evaluation questions are listed in Appendix A:

- Relevance: the appropriateness of UNESCO interventions in capacity building for BSE to the needs of the targeted beneficiaries and its positioning in the field of capacity building for BSE in comparison to other national, regional or global players in science and development. This includes the assessment of the relevance of UNESCO's work in Capacity Building for BSE and the ability to include underrepresented groups such as women and youth, the comparative advantage and complementarity of UNESCO's Capacity Building work for BSE within the global sciences and development landscape, and the adequacy of the geographical spread of activities and resources in order to meet Capacity Building needs in the BSE, with priority consideration for Africa.
- Effectiveness and impact: the performance of UNESCO's work in Capacity Building for BSE. This includes the assessment of the progress towards the objectives as formulated in the strategic plans being achieved, the successes and difficulties at the country level, in particular with a view to the inclusion of disadvantaged groups, such as women and youth, as well as any external factors that have had a significant positive or negative influence on the achievement or non-achievement of the objectives.
- Efficiency: the relationship between the human and financial resources mobilised for the implementation of UNESCO's work in capacity building for BSE and the results. This includes an assessments of whether the outputs and effects obtained are commensurate to the inputs,

[4] Following the acceptance of Palestine as a Member State in 2011, some Member States stopped funding UNESCO, leaving the Organization with a gap of about 20 percent of its budget.

[5] see 5X/EX/2.INF : Report of the working group established by 191 EX/Decision 15 (II)

[6] rankings categories : A = high funding priority, B = medium funding priority, C = low funding priority

whether the most efficient process has been adopted not only in terms of resources mobilised but also in terms of organizational setting, distribution of roles and responsibilities (see also below under: Partnerships and Cooperation)

- Partnerships and cooperation: The effectiveness and efficiency of UNESCO's institutional setting for Capacity Building for BSE. This includes an assessment of the extent and how effectively UNESCO is engaging and leveraging on its networks and partners to create synergies and complementarities, such as in terms of the distribution of responsibilities and potential synergies, nature and quality of partnerships, engagement between Headquarters and the field office structure, Category 1 and 2 institutes/centres and special programmes such as the IBPS and TWAS, the World Academy of Sciences for the advancement of science in developing countries, and interaction with external partners such as the International Council for Science (ICSU).
- Utility and sustainability: the likelihood of achieving sustainable effects on individuals, organizations and institutions. This includes an assessment of whether UNESCO has put in place the right conditions to allow for results to be further developed, scaled up, replicated, multiplied and/or financially/institutionally/politically sustained, and to what extent the benefits of UNESCO's work in capacity building in the BSE are likely to continue if UNESCO's funding for these activities ceased , as well as to what extent UNESCO is engaging and leveraging on networks and partners to create synergies and complementarities.

5. The evaluation will also produce recommendations for the future with a view to provide:

- Strategic orientation to the SC Sector in the area of Capacity Building in the BSE
- Guidance on the future of IBSP
- Guidance on how to leverage UNESCO's networks and partnerships
- Optimising UNESCO's contribution to the 2030 Agenda for Sustainable Development in particular to improvements quality education (SDG 4), industry, innovation and infrastructure (SDG9) and global partnerships for sustainable development (SDG17).

1.2.2 Evaluation scope

6. The evaluation concentrated on the work approved under the UNESCO C/5 Programme and Budgets from the 2010-2011 biennium (35 C/5) and to the extent possible the current 2016-2017 biennium (38 C/5).

- It considered findings of the 2010 evaluation of SPO4 as a baseline for assessing the evolution during the last six years and the implementation of the relevant recommendations.
- The geographical scope of the evaluation is global.
- It considers the activities in the context of UNESCO's two Global Priorities: Priority Africa and Priority Gender Equality.

7. The scope of UNESCO's work in Capacity Building in BSE is not limited to the activities implemented by the Section for Capacity Building in Science and Engineering (SC/PCB/CB). It also includes relevant work performed by UNESCO field offices and by its network of Category 1 and 2 institutes and centres.

8. UNESCO's capacity building work in BSE is composed of a variety of thematic subject areas and multiple strands of work, including activities as diverse as workshops, training, seminars, research fellowships, development of e-learning tools, summer camps, creation/support of networks and partnerships, publications, open access resources, policy guidelines, competitions, exhibitions, international days and years. Activities focus principally on tertiary, but also secondary STEM education and on research and cooperation in BSE for sustainable development. UNESCO's current activities in BSE contribute to Strategic Objective 4: of the 2014-2017 Medium Term strategy. 37 C/4 "Strengthening

science, technology and innovation systems and policies - nationally, regionally and globally."[7] Over 100 projects and activities were found for Major Programme II MLA 2 (ER 2 and ER 3) between January 2012 and February 2017 according to UNESCO extracted data from the System of Information on Strategies, Tasks and the Evaluation of Results (SISTER). Appendix C provides an overview of the main capacity building activities for BSE.

1.3 Methodology of the evaluation

9. In the evaluation, a variety of information sources and data collection methods were used to reach conclusions and recommendations. These methods target all of the evaluation questions that are listed in Appendix A. We made use of multiple techniques in parallel in order to increase the reliability of the results (in evaluation terminology this is called triangulation).

10. In addition to the consultation with the key stakeholders from the SC Sector in the initial design and scoping of the evaluation, an evaluation reference group was established to guarantee the transparency and soundness of the evaluation approach and methodology and to provide input into and validate the evaluation Terms of Reference and respective evaluation reports.

11. The methods applied in this evaluation are summarised as follows:

- Desk research of existing data regarding UNESCO's strategy for Capacity Building in BSE, its funded projects and activities undertaken from 2010 to date, relevant evaluation reports, and reports on the execution of the programme adopted by the Executive Board. A comprehensive list of the documentation consulted is displayed in Appendix B.
- Visits at UNESCO's Headquarters to conduct face-to-face pilot interviews with key staff at Headquarters, attendance at the 10th meeting of the Scientific Board of the IBSP and interviews with members of its Board. An inception meeting with the evaluation reference group was also organised during the visit.
- Reconstruction of the Theory of Change (and logical framework) of UNESCO's work in Capacity Building for BSE. The Theory of Change was built upon desk research and the results of a Theory of Change workshop organised on at UNESCO Headquarters with the reference group and staff from the Section for Capacity Building in Basic Science and Engineering within the Division of Science Policy and Capacity Building.
- Interviews with key stakeholders and partners of UNESCO's work in Capacity Building for BSE including Category 1 and 2 institutes, UNESCO regional/field and liaison offices, UNESCO retired staff, selected Member States' representatives, autonomous partner institutions and institutions or programmes administered or managed by UNESCO. A sample of interviewees was selected in view of obtaining a large representation of the different type of stakeholder groups and to guarantee a geographic and gender balance. The final list of interviewees was discussed and validated by the reference group. The full list of interviewees is presented in Appendix D. Appendix E provides an example of interview guidelines.
- An online survey was carried out among the following target groups as validated by the evaluation reference group: UNESCO National Commissions of the UNESCO Member and Associated States (199), the UNESCO Chairs in the domain of Basic Sciences and Engineering (89) and relevant Category 1 and 2 centres (20). Reaching the stakeholders in the main targeted regions (Africa and other developing regions) was a priority; however, evaluators also consulted actors from developed regions through the survey and the interviews, as the key objectives of the BSE activities include the advancement of South-South and North-South research and education links. A detailed analysis of the survey can be consulted in Appendix D. It shows a low representativeness of the findings from National Commissions (16% response rate). This is also

7 In the 38 C/5 Programme and Budget (2014-2017) UNESCO's capacity building work for BSE contributes to the Expected Results (ER) 2 "Capacity-building in research and education in the natural sciences enhanced, including through the use of ICTs", and ER 3 "Interdisciplinary engineering research and education for sustainable development advanced and applied" of the Main Line of Action 2 "Building institutional capacities in science and engineering".

true for interviews with Member States as several Member State representatives did not know about UNESCO's activities in the BSE.

- Field visits to UNESCO's multi-sectoral regional offices in Cairo and Yaoundé to collect on-site information used for in-depth field analysis of successes and challenges.
- Aggregation and triangulation of data collected to finalize and present the evaluation results.

12. The evaluation has been carried out by the Technopolis Group in close collaboration with IOS. Given its mandate, IOS has been responsible for managing the evaluation and for assuring the quality of the deliverables jointly with the reference group. Data collection and analysis as well as report writing has been carried out principally by the Technopolis Group.

1.4 Limitations of the evaluation

13. This section sets out the challenges and limitations to the evaluation methodology encountered throughout the evaluation and how the team's approach, method and tools have affected the scope of findings.

- The evaluation covers a very large thematic and geographical scope and a period of 6 years: the performance, results and impacts of the very diverse set of all types of activities and programmes within SC/PCB/CB - ER 2 and ER3 could not be assessed in detail given the limits imposed by the time frame and resources available for the evaluation. However, all the evaluation issues set out in the Terms of Reference were covered through adequate sampling.
- The lack of consistent collection of performance data (baseline and monitoring data) and assessment of progress towards outcomes limits the ability to measure the effectiveness and impacts of UNESCO's work in Capacity Building for BSE. Also UNESCO's work in Capacity Building for BSE had no overarching strategy or predefined logic model and no evaluation and monitoring framework. As such, the development of a Theory of Change was agreed with the reference group as a tool for the evaluation and a Theory of Change model was reconstructed by the evaluation team with input from the Section for Capacity Building in Basic Science and Engineering. However a substantial number of assumptions had to be made by the evaluators without certainty about the underlying rationale in the absence of an overall strategy.

2 Theory of change for UNESCO's work in Capacity Building in Basic Sciences and Engineering

2.1 Overview statement

14. The development and refining of a Theory of Change helps to lay out the issues or problems an organization or programme intends to address, the actions being taken, and how these will lead to the final objectives that it is set up to achieve. Articulating a Theory of Change offers a clearer picture of the intended results and explains how organizational and program activities and results are connected with each other and contribute to achieving results at different levels.

15. In the context of this evaluation the reconstructed Theory of Change explains what the Organization intended to do. It is a comprehensive description and illustration of how and why a desired change is expected to happen, and it traces the rationale behind the interventions. The evaluation presents later in the report what is actually done/implemented and how it compares to what was intended. As this Theory of Change was reconstructed by the evaluation team with only initial input from SC/PCB/CB team during a dedicated workshop, it is not to be considered as the formal or final intervention logic for the UNESCO's work in Capacity building in the BSE, but as a starting point to be further refined and adapted in the framework of the future strategic orientation of UNESCO's capacity building work for BSE. The Theory of Change workshop helped to illustrate that there are missing links between the different activities and programmes and how these feed into the higher level objectives of the SC Sector's capacity building work for BSE.

16. Findings and conclusions from the previous evaluation of the Strategic Programme Objective 4 (SPO 4)[8] in 2010 pointed to several challenges that are relevant to UNESCO's work in capacity building for BSE and also provided input into the discussion of the Theory of Change.

Figure 1 Main issues identified in the SPO 4 evaluation related to BSE

For the overall Strategic Programme Objective 4:

- In general, across Strategic Programme Objective 4, UNESCO's expected outcomes were found to be too ambitious and not always consistent
- The evaluation recommended that UNESCO must streamline available funds and human resources into fewer and more strategic approaches

Main conclusions and recommendations in the area of BSE:

- The relevance of the BSE area was found to be high: UNESCO's comparative advantage in promoting scientific activities was confirmed
- However, it was considered that the majority of the BSE activities were too small and lacked the characteristics needed to take advantage of UNESCO's global and regional comparative advantages
- The BSE portfolio was found to be under-funded with respect to the actions to be undertaken, intending to do much with too little resources. The evaluation also pointed to a lack of strategy and focus leading to inefficiency and reducing effectiveness
- The organizational structure and strategy for BSE was not found appropriate and was recommended to be rethought
- Major weaknesses were identified in monitoring and review of activities and improved selection of activities and assessments, and quicker in-house evaluation of programs and projects was suggested.

2.2 UNESCO's vision of change in Capacity Building in the BSE

17. Capacity building is one of the five key strategic functions that UNESCO performs to fulfil its mandate.[9] UNESCO's thesaurus defines Capacity Building as "the enhancement of capabilities of people and institutions to improve their competence and problem solving capacities in a sustainable manner".

18. Adequate national capacity in the basic sciences and engineering is a major prerequisite for harnessing science in the service of society. Efficient applied research, technology transfer, modern education and industry call for a sound national BSE infrastructure and necessitate a commitment to strengthen basic sciences capacities through national efforts and international cooperation. However, there exists a lack of support for the BSE in many countries which find themselves excluded from both the creation and benefits of scientific knowledge.

19. Moreover, a strategy of investment in favour of applied research, which exclusively seeks immediate short-term returns, has an adverse long-term effect on national basic science and requires determined remedial action. Hence, from the inception of UNESCO there have been significant motivations for the Organization to launch and sustain its action in the BSE as one of principle elements of its mandate in the Sciences.[10]

[8] UNESCO Medium-Term Strategy 2008-2013: SPO4: Fostering Policies and Capacity-Building in Science, Technology and Innovation

[9] UNESCO's five key strategic functions are: knowledge broker, clearing house, standard setter, facilitator and capacity builder.

[10] Source : Mission Statement of the Division for Basic and Engineering Sciences (BES), March 2006

2.2.1 Domains of Change in Capacity Building in Basic Sciences and Engineering

20. UNESCO has come to focus on six main domains of change which are conditions to build institutional capacities in science and engineering. These main domains of change or areas of focus are:

1. Building human capacities in BSE research for development
2. Improving tertiary and secondary STEM education
3. Promoting and catalysing international and regional collaboration and networks in BSE
4. Advocacy and awareness raising of BSE for development
5. Facilitating open access to scientific information and access to scientific infrastructure
6. Promoting a vision to advance engineering for sustainable development

21. BSE in UNESCO cover a range of subjects including: life sciences, mathematics, physics, chemistry, and renewable energies. These subjects are part of UNESCO's activities in its six domains of change.

2.2.2 UNESCO's intended contributions to change

22. UNESCO aims to contribute to the six domains of change by utilising the knowledge, expertise, resources and connections within its Headquarters, regional, field and liaison offices and network of partners. The contributions to intended change are planned in the following way :

1. Building human and institutional capacities in BSE research for development
    - Supporting individual Capacity Building through long-term and short-term training courses, post graduate training for young researchers, research fellowships, workshops and seminars.
    - Training topics vary according to the local needs; they include transfer of up-to-date information, approaches and techniques to scientists, training in proposal writing, ethics behind research, etc.
    - Establishment, development or support to Centres of Excellence in the basic sciences all over the world such as CERN in 1951, the Central and Latin American centre for Physics (Centro Latino-Americano de Fisica – CLAF) in 1977, ICTP in 1969, the International Institute of Molecular and Cell Biology in 1995, or more recently SESAME in 2004.
2. Improving tertiary and secondary STEM education
    - Support to tertiary STEM education focuses on the introduction of innovation in university science teaching through teacher training, curricula development, fostering the quality of university foundation courses and the use of new methods and science experiments.
    - Enhancement of secondary STEM education concentrates on the introduction of innovative pedagogical models through teacher training and curricula development, the promotion of inquiry based science education and the use of information and communications technology (ICT) in delivering education programmes. Efforts have also focused on the popularisation of science in particular through science and engineering fairs, science camps and summer schools.
3. Promoting and catalysing international and regional collaboration and networks in BSE
    - Contributing to the creation and development of numerous regional and international networks among academic and research institutes.
    - Supporting national and regional partnerships between academia, research and decision-makers.
    - Collaborating with non-governmental organizations actives in the BSE.

4. Advocacy and awareness raising of BSE for development

   - Raising awareness on the importance of BSE for development among all: governments, school systems, academics, researchers, the mass media, private business and civil society.
   - Permanent and interactive communication deployed through implementation of various programme delivery mechanisms such as international years/weeks/days, conferences, publications, science fairs and camps, and meetings with government officials.

5. Facilitating open access to scientific information and access to scientific infrastructure

   - Promoting and supporting open access to scientific information[11] (journal articles, conference papers and datasets of various kinds) for the benefit of global knowledge flow, innovation and socio-economic development.
   - Improving awareness about the benefits of open access among policy makers, researchers and knowledge managers.
   - Facilitating the development and adoption of open access-enabling policies.
   - Engaging in global open access debates and cooperating with local, regional and global initiatives in support of open access.

6. Promoting a vision to advance engineering for sustainable development

   - Promoting engineering education at the secondary and tertiary levels.
   - Inspiring the next generation of engineers highlighting the roles and accomplishments of women and youth in the engineering field.
   - Emphasizing the importance of renewable and alternative energies for sustainable engineering practices.

2.3 Key assumptions about the context and external factors

23. It is assumed that this Theory of Change will succeed if the following assumptions hold:

- Policy makers are engaged and committed to change: coherence of policy, sustainability of support and continuity of funding are key requisites for a lasting effect and impact. UNESCO assumes that local authorities are actively engaged to support and sustain UNESCO initiatives that are developed in their country.
- Academics and researchers are engaged: introducing new models and approaches may create resistance and withdrawal if stakeholders are not approached openly and in a participatory fashion. UNESCO assumes that academics and researchers will be actively engaged in its Capacity Building activities and that their input, knowledge and experience will be actively sought to develop initiatives that will be relevant, useful and effective.
- Partners and networks are engaged: activities led by UNESCO regional and international partners, UNESCO networks of Category 1 and 2 institutes and centres and UNESCO Chairs are critical for the deployment and success of this Theory of Change. UNESCO assumes that through its support to these organizations it can inspire their initiatives for Capacity Building in BSE. It assumes that engagement of its partners and networks will be maintained and will grow.
- There is strategic exploitation of change: enhanced capacities in research and education in the BSE will lead to having qualified researchers and engineers, new research outputs and technologies that will need to be exploited in order to contribute to sustainable development. If academia and the industry are not prepared to hire and use these capacities, they will be wasted. UNESCO assumes that its Theory of Change will be implemented in a coordinated and

[11] i.e. the online availability of scholarly information to everyone, free of most licensing and copyright barriers

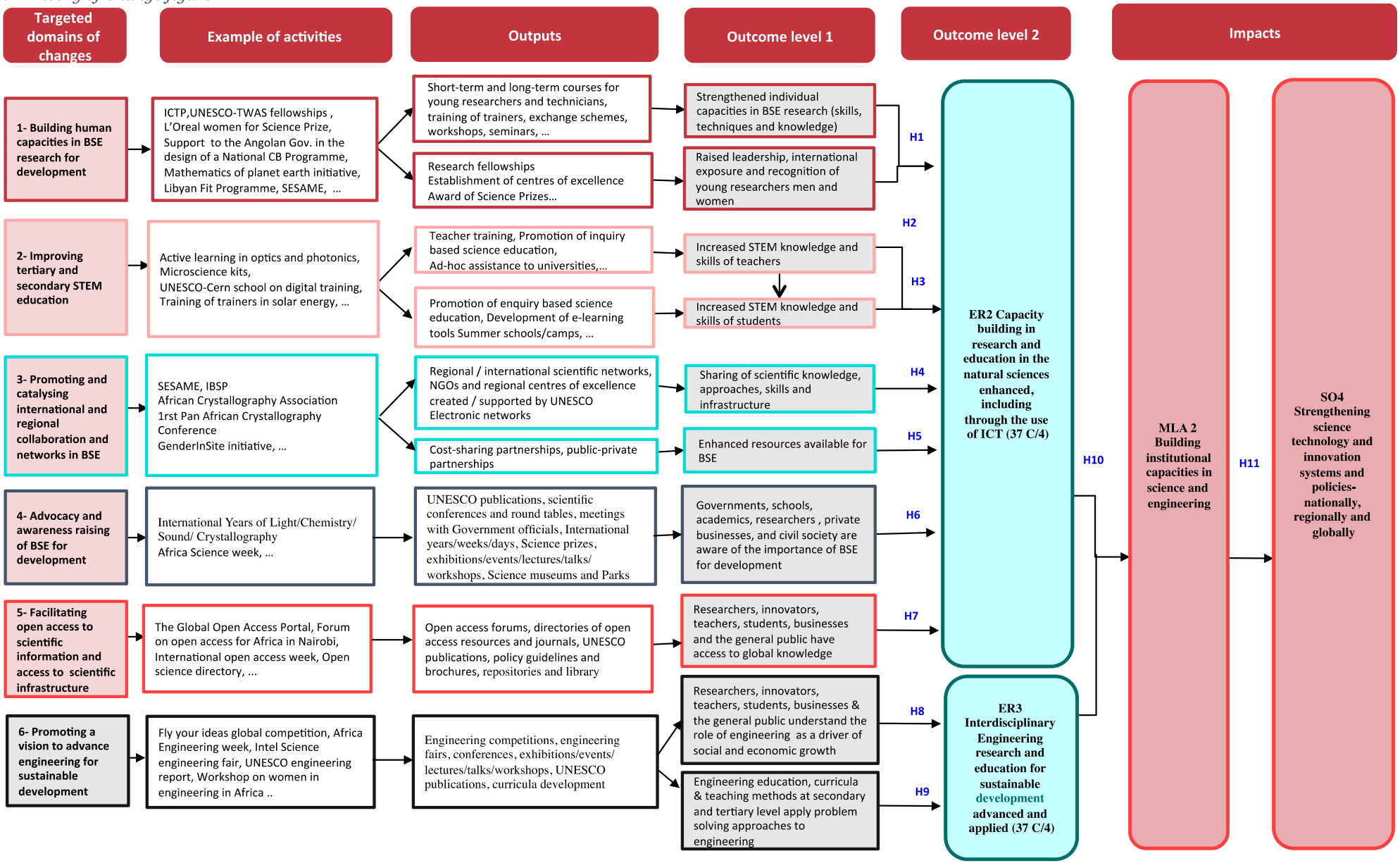
integrated manner, by UNESCO and its networks and partners, allowing all key actors to be prepared to make positive use of these changes.

- Basic sciences are recognised as the foundation of knowledge societies: the basic sciences form the foundation of modern science education that provides the scientific and technological knowledge and the skills needed by every citizen in order to meaningfully participate in the emerging knowledge society. UNESCO assumes that its capacity building work in BSE contributes to building a strong body of basic researchers and knowledge that need to exist in order for applied research to flourish.

2.4 Theory of change figure

24. The figure presented hereafter draws a map of UNESCO's work in Capacity Building for BSE displaying the rationale for intervention, activities, outputs, outcomes and long term impacts. Moreover the figure aims to identify links between these stages. The targeted domains of change are presented in order of importance. Over a hundred activities implemented during the period 2012-2017 were identified, of which only a sample is presented in the Theory of Change figure (Figure 2). Appendix C provides a more detailed list of activities.

Figure 2 Theory of Change figure



2.5 Hypotheses of change

25. The table below presents the hypothesis of change that were defined to understand the missing links at outcome and impact levels in the Theory of Change figure.

Table 1 Hypotheses of change

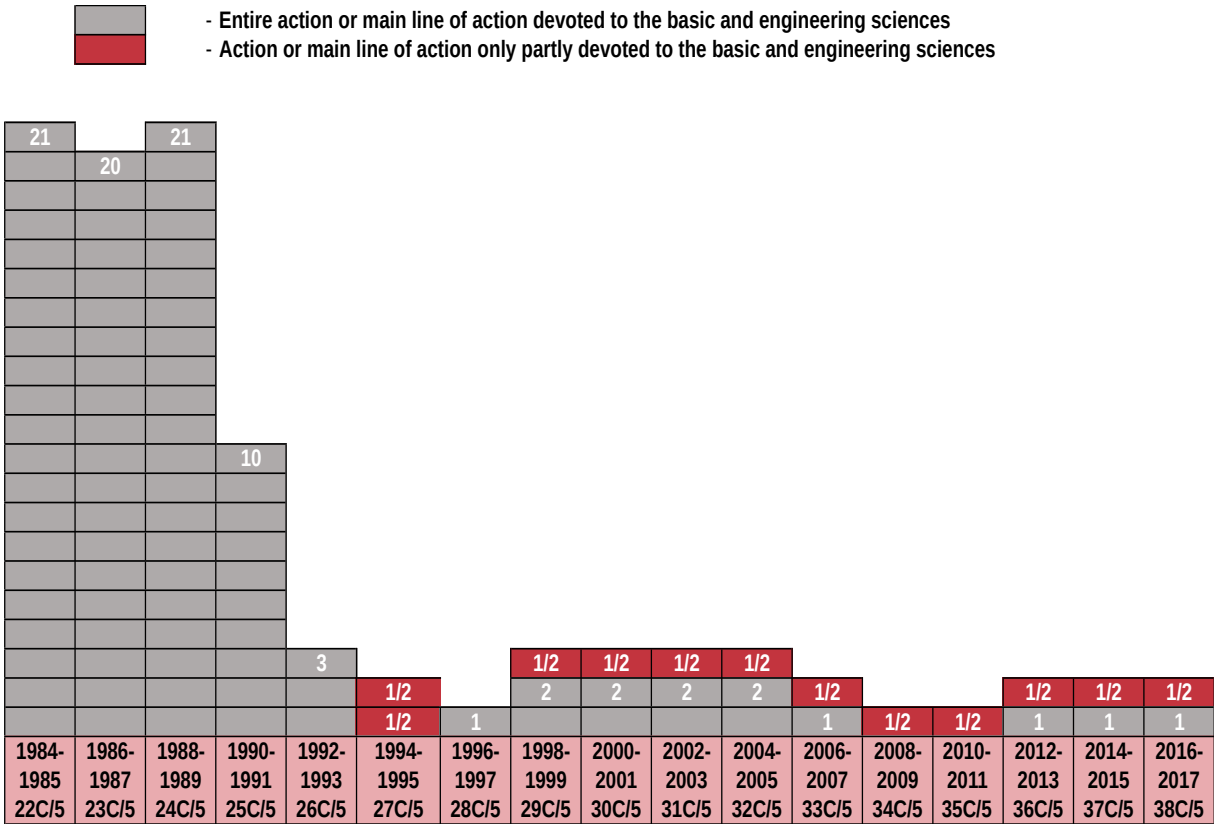
H1	The training and production of a critical mass of researchers/scientists, men and women, will enhance the research capacities of developing countries in the natural sciences
H2	The use of ICT can support developing the critical mass of researchers, academics and engineers through online training programmes open to a large number of beneficiaries
H3	Increased STEM knowledge and skills of teachers and students will boost interest and performance and consequently enrolment in STEM related courses and careers. This will contribute to enhance the research and education capacities of developing countries in the natural sciences
H4	The sharing of scientific knowledge, approaches, skills and infrastructure through an expanded number of collaborative projects at national, regional and international level will contribute to enhance research and education capacities at individual and organizational level
H5	Cost sharing partnerships and public-private partnerships augment resources available for BSE projects that can contribute to enhancing Capacity Building through initial or continuous training
H6	Increased awareness on the importance of BSE for development will enhance interest and investments in STEM education and Capacity Building in research in the natural sciences
H7	Access to global knowledge will support research and education Capacity Building in the basic sciences in particular through the increasing use of ICT
H8	Public and policy awareness of the role of engineering for sustainable development will contribute to the development of interdisciplinary engineering research and education for sustainable development
H9	Introducing problem solving approaches in engineering education will contribute to the use of interdisciplinary engineering research and education for the solving of global issues and challenges such as poverty reduction, climate change, pandemics, natural disasters and socio-economic development
H10	Addressing BSE Capacity Building in research and education on a strategic level that aims to impact individuals and organizations, relations, culture and political systems will contribute to the building of institutional capacities in science and engineering
H11	Strong institutional capacities in basic science and engineering is the precursor of a knowledge based society with solid science, technology and innovation systems and policies that will lead to educational, cultural, intellectual and socio-economic enrichment of humanity and sustainable development

3 Overview on human and financial resources

3.1 A declining programming and budget in recent and historical context

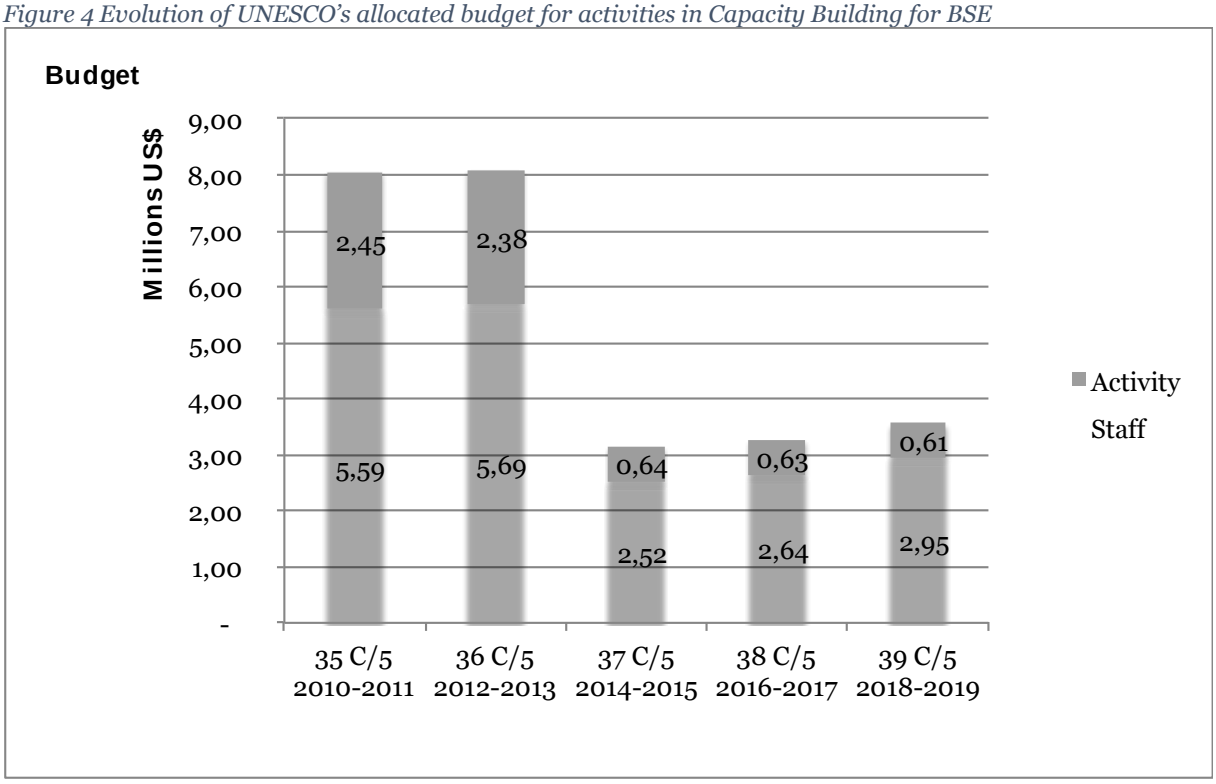
26. The years up to 1988-1989 (24 C/5) were the ones of substantial programme actions for the basic and engineering sciences. There used to be around 20 entire actions or main line of actions devoted to BSE up until 25C/5 program that halved that number. Figure 4 illustrates the evolution of the number of programme actions in BSE. Actions devoted to engineering were reduced but not only. Interviewees at UNESCO Headquarters mentioned an important reduction of activities in life sciences and renewable energies. The figure shows that between 2010 and 2016, the number of programme actions in the BSE remained quite constant. However, Figure 4 shows that the budget dedicated to the financing of these activities greatly decreased over that period. This shows that UNESCO was forced to continuously dilute its decreasing resources to a constant number of actions, while on the other hand there is a strong request for ensuring critical mass and demonstrating impact.

Figure 3 Evolution of the number of programme actions in basic sciences and engineering



Source: UNESCO Programme and Budget (C/5) 1984/85 – 2016/17

Figure 4 Evolution of UNESCO's allocated budget for activities in Capacity Building for BSE



Source: UNESCO Programme and Budget (C/5)

27. Most of UNESCO's regular budget covers staff-related expenses. The share of the budget dedicated to activities has decreased between 2010 and 2016. In 2010, 30% of the total budget was dedicated to activities compared to 19% for the current biennium. As can be seen in the figure above (Figure 4), the biggest shift in budget occurred in 2014-2015, during 37 C/5 biennium.

3.2 Analysis of expenditure

28. This trend is also observed through the analysis of figures extracted from UNESCO's SISTER database[12]. Table 2 shows that engineering was greatly affected by the dwindling scope of UNESCO work in Capacity Building in the BSE. Indeed, the regular budget expenditure devoted to engineering went from US$ 308 368 to US$ 44 294, which constitutes an 86% decrease over the last three biennia. The elimination of the post of Senior Programme Specialist (P5) in charge of engineering after his retirement in 2011 has significantly reduced the staff capacities for engineering. As a consequence the funds given for engineering were not all spent and budgets were reduced.

Table 2 Evolution of the regular budget expenditure dedicated to Capacity Building in engineering (US$)

	2012-2013	2014-2015	2016-2017
Engineering	308 368,00	76 124,00	44 294,00

Source: SISTER database

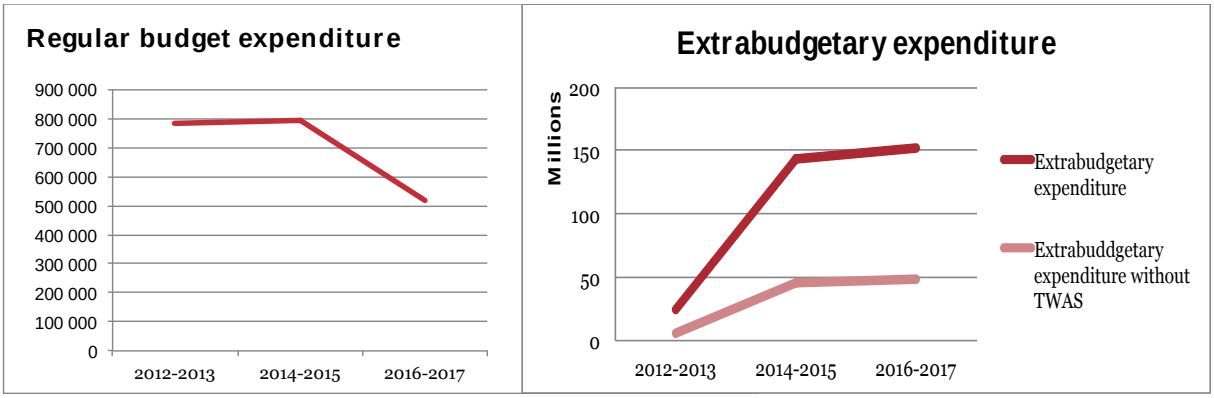
29. More generally Figure 5 shows that between 2012-2013 and 2016-2017, there has been a 34% decrease in regular budget expenditures to support UNESCO activities in BSE. This decrease went in tandem with an increasing role played by extrabudgetary resources that go up to more than US$ 150 million for the current biennium. However extrabudgetary funds are allocated for the implementation

[12] i.e. data relative to the financial resources mobilised for each activity conducted in BSE between 2012-2013 and 2016-2017. The extraction was provided by UNESCO SC/CB in February 2017.

of specific activities and cannot replace or compensate core funding. If we exclude funds related to TWAS only US$ 49 million were spent in the current biennium among which more than 30 million dollars serve the Libyan Fund in Trust projects[13].

30. Despite highly ambitious objectives UNESCO operates with a very small regular budget, its extrabudgetary resources target specific projects and specific Member States with the risk of leaving gaps in ensuring full implementation of the Organization's intervention logic.

Figure 5 Evolution of expenditure in Capacity building for BSE (US$)



Source: SISTER database

31. Table 3 shows expenditure per offices in the BSE between 2012 and 2017. Only 19 field offices spent money in Capacity Building work for the basic sciences and engineering during this period. Among them, UNESCO's Regional Bureau for Sciences in the Arab States and the Cluster Office for Egypt, Libya and Sudan which is the one that spent the most with US$ 105 498 from regular budget spent on Capacity Building activities for BSE in the last six years. Yet this represents less than US$ 20 000 per year. Table 3 shows that the office benefits from high extrabudgetary resources. This can be misleading as these funds are almost exclusively linked to the Libyan Fund in Trust projects[14].

32. Over the last three biennia, between 2012 and 2017, the Regional Bureau for Science in Latin America and the Caribbean has spent US$ 96 278 from its regular budget in capacity building activities for BSE, an average of US$ 32.000 per biennium.

33. In Sub-Saharan Africa the Multisectoral Regional Office in Nairobi and the Multisectoral Regional Office in Yaoundé have had the highest regular budget expenditures in the period 2012-2017, respectively US$ 51 810 and US$ 45 189. Over the three biennia, this is less than an average of US$ 10 000 per year.

[13] The Libyan Fund in Trust projects for the strengthening of BSE capacities in Libya were established with Libya as a donor and a recipient country in the early 1990's. However because of political instabilities funds were not all used and some activities are still on-going.

[14] Note that during the course of the evaluation the Director-General requested that all the Libyan Fund in Trust projects be moved back to Headquarters.

Table 3 Expenditure at field level in Capacity Building activities for BSE (US$)

	2012-2013		2014-2015		2016-2017		2012-2017	
UNESCO Field Offices	RB	XB	RB	XB	RB	XB	Total RB	Total XB
Regional Bureau for Sciences in the Arab States and Cluster office for Egypt, Libya and Sudan- Cairo	6 098,00	27 994,00	48 398,00	181 983,00	51 002,00	31 677 062,00	**105 498,00**	31 887 039,00
National Office to Gabon - Libreville	-	39 197,00	-	1 024 496,00	7 343,00	2 622 018,00	7 343,00	3 685 711,00
Regional Bureau for Sciences in Asia and the Pacific and Cluster Office to Brunei Darussalam, Indonesia, Malaysia, the Philippines, and Timor Leste - Jakarta	13 366,00	585 666,00	63 683,00	1 058 687,00	-	1 348 776,00	77 049,00	2 993 129,00
Multi sectoral regional office for East Africa - Nairobi	11 067,00	725 661,00	27 994,00	863 676,00	72 665,00	-	111 726,00	1 589 337,00
Cluster Office to Bangladesh, Bhutan, India, Maldives, Nepal and Sri Lanka - New Delhi	-	210 285,00	-	159 865,00	-	894 878,00	-	1 265 028,00
Cluster Office to the Democratic People's Republic of Korea (DPRK), Japan, Mongolia, the People's Republic of China and the Republic of Korea (ROK)- Beijing	-	-	-	-	-	236 975,00	-	236 975,00
Regional Bureau for Sciences in Latin America and the Caribbean and Cluster Office to Argentina, Brazil, Chile, Paraguay and Uruguay - Montevideo	6 106,00	50 000,00	63 733,00	-	26 439,00	-	**96 278,00**	50 000,00
Multi sectoral regional office for Central Africa - Yaoundé	-	-	45 189,00	13 480,00	-	15 830,00	45 189,00	29 310,00
National Office to Mali- Bamako	-	-	-	-	12 749,00	-	12 749,00	-
National Office to Congo - Brazaville	-	-	-	-	7 177,00	-	7 177,00	-
Multi sectoral regional office for West Africa (Sahel) - Dakar	-	-	24 727,00	-	-	-	24 727,00	-
Liaison Office with the African Union and with the Economic Commission for Africa - Addis-Ababa	-	-	24 988,00		-	-	24 988,00	-
Multi sectoral regional office for Southern Africa - Harare	-	-	31 987,00	-	-	-	31 987,00	-
Multi sectoral regional office for West Africa - Abuja	-	-	25 005,00	-	-	-	25 005,00	-

Source: SISTER database

4 Evaluation findings

34. As mentioned in the evaluation limitations, one of the main challenges of this evaluation was to capture and assess the entire range of UNESCO's work in Capacity Building in BSE given the large number of projects and activities implemented[15] over the past 6 years. The findings presented in this section focus on the evaluation issues set out in the Terms of Reference. The analysis maps these issues against the different evaluation tools mobilised for the evaluation: desk research, interviews among UNESCO staff, partners and Member States, surveys to UNESCO Category 1 and 2 centres, UNESCO science Chairs and UNESCO National Commission, and field missions to the Multisectoral Regional Offices in Cairo and Yaoundé.

4.1 Relevance of UNESCO's work in Capacity Building for BSE

4.1.1 Capacity building for BSE is fully aligned with UNESCO's mission and strategy, the 2030 Agenda for Sustainable Development and the needs of its Member States

35. The relevance of UNESCO's work in Capacity Building for BSE is unquestionably high, in particular for low and middle-income countries. Several initiatives, as highlighted in chapter 4.2 further demonstrate the high relevance of UNESCO's action in specific thematic areas. (see chapters 4.2.2. to 4.2.6).

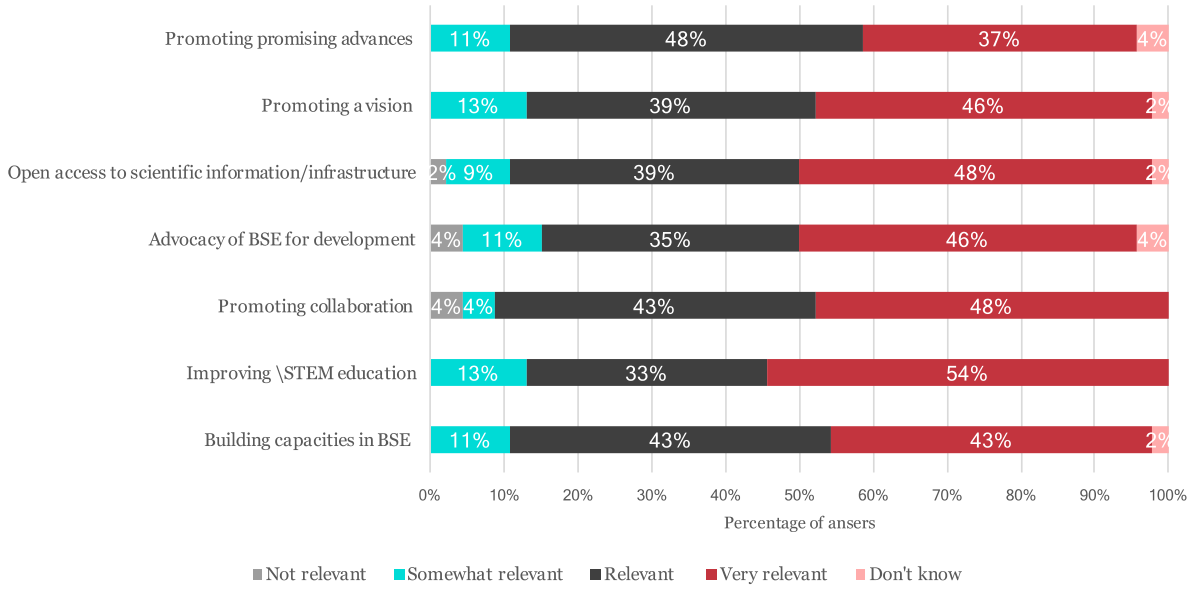
36. UNESCO was stated by interviewed stakeholders as the only international organization which can help narrow the scientific gap and support Member States to compensate their deficiencies in BSE. The gap in scientific knowledge and technology creates divisions and UNESCO has a role to play in promoting basic sciences as a prelude to applied sciences and technological advancement but also as a common language, a philosophy that connects countries and contributes to peace building.

37. Numerous international organizations contribute to strengthening Capacity Building in BSE but they focus on a specific thematic area and/or a specific geographic region: for example the World Bank through its African higher education centres of excellence project (22 centres across Africa), the Technical Centre for Agricultural and Rural Cooperation through its Science and Technology programme, or the African Ministerial Council on Science and Technology established in 2003 under the auspices of the New Partnership for Africa's Development (NEPAD) and the African Union that supports over 7000 scientists in Africa. Except the World Bank, none of these organizations or programmes have a global mandate and very few target institutional or policy level Capacity Building.

38. Both the desk review and the electronic survey among key UNESCO stakeholders (National Commissions, Category 1 and 2 Research Centres and UNESCO Chairs) confirmed this picture (see survey results in Figure 5 below). All main UNESCO goals in this area are deemed relevant or very relevant by at least 85% of respondents, with actually very little differences between the priorities.

[15] Over 104 projects and activities were found for Major Programme II MLA 2 (ER 2 and ER 3) between January 2012 and February 2017 according to UNESCO extractions

Figure 6 How relevant are the following objectives for your country?



39. The relevance of UNESCO's intervention in Capacity Building for BSE was also underlined by all interviewees during the field missions in Cairo and Yaoundé. Key stakeholders from national governments, the Education Sector and researchers in Central Africa clearly indicated that UNESCO's priorities are highly relevant for their own objectives, and only one of the few international bodies with a mandate in this field. The relevance is highlighted by the fact that Capacity Building for BSE is now included in policy strategies at various levels:

- Globally, the Sustainable Development Goals (see also below)
- Regionally, through the Agenda 2063 of the African Union (Chapter 2)
- Nationally, with the inclusion of Capacity Building in science and engineering in national development frameworks such as Cameroon's 'Emergence 2035 strategy'
- Sectorally, through ministerial conferences such as the AMCOST (African Ministerial Conference on Science and Technology), ANSTI (African Network of Science and Technology Institutions) and NEPAD

40. UNESCO's support for low and middle-income countries is particularly important, as these countries generally have very few resources of their own to invest in science in general, let alone in the BSE. UNESCO plays an important role in keeping Capacity Building in these fields on the agenda of governments. It is widely considered as a lead player in this area.

41. Interviewed Permanent Delegations from high income countries mentioned that UNESCO's work in Capacity Building in the BSE is less relevant to the needs of their countries that already have strong science, technology and innovation systems but they have acknowledged the importance of UNESCO's role in this field to support LMICs.

42. A few interviewees at UNESCO mentioned the pressure to focus on applied sciences. Some Permanent Delegations confirmed this trend, and the particularly difficult situation for basic (fundamental) sciences also resonated during the field visits. Nevertheless the majority of interviewees highlighted the importance of basic sciences as a foundation to sciences and a prerequisite to applied sciences. However, basic sciences are sometimes perceived as a 'difficult sell' to policy makers in less developed countries, as a field with only very-long term returns on investments.

43. UNESCO's work in Capacity Building for BSE is also aligned with UNESCO's mission to contribute to peace and security by promoting collaboration among the nations through education, science and culture; fostering and maintaining intellectual solidarity.

44. The 37th session of the UNESCO General Conference (in 2013) adopted the Medium-Term Strategy for 2014 to 2021 (Document 37 C/4) which sets out the strategic vision and programmatic framework for UNESCO's action for this period.

45. UNESCO's work in Capacity Building for the BSE is intended to contribute to the two overarching objectives for the Organization:

- Peace: contributing to lasting peace; and
- Equitable and sustainable development: contributing to sustainable development and the eradication of poverty

46. Through MLA2 « Building institutional capacities in science and engineering » UNESCO should contribute to Strategic Objective 4 set out for the Natural Sciences Sector « Strengthening science, technology and innovation systems and policies - nationally, regionally and globally ». These expected contributions can be traced in the Theory of Change presented in Figure 2.

47. As mentioned in the most recent edition of the UNESCO Science Report[16] science cuts across virtually all 17 of the Sustainable Development Goals within the 2030 Agenda. UNESCO's activities in Capacity Building for BSE also contribute to the entire 2030 Agenda for Sustainable Development and in particular to:

- SDG4: quality education
- SDG9: industry, innovation and infrastructure
- SDG17: global partnerships for sustainable development

"Basic sciences and engineering are key to all development aspects. They are key to achieving all key sustainable development goals". Permanent Delegation

4.1.2 A strategy that needs to be more focused on UNESCO's comparative advantages

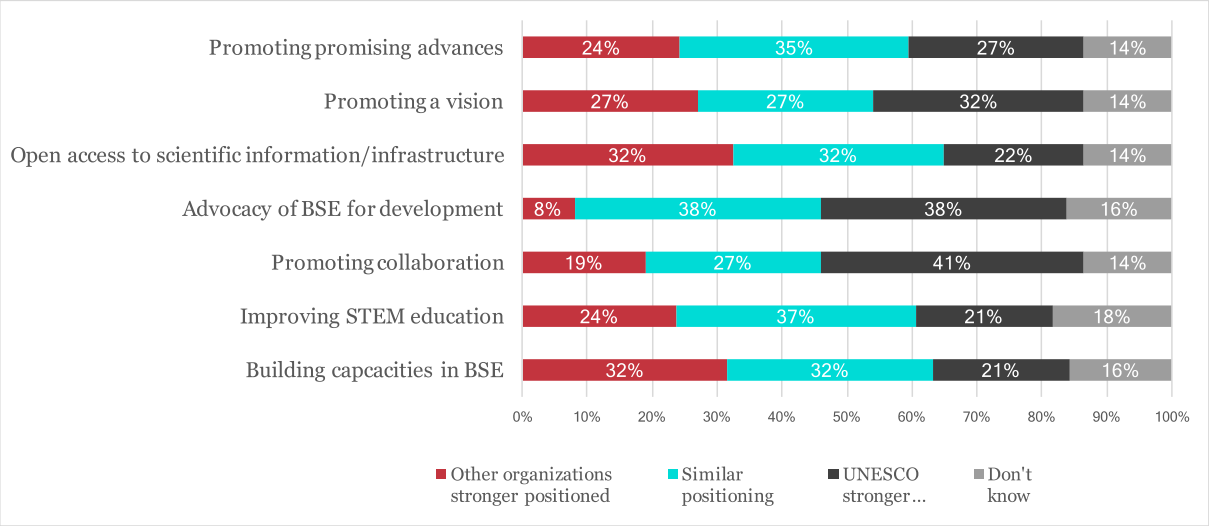
48. The large scope of UNESCO's activities in Capacity Building for BSE reflects the wide variety of needs of its Member States. It also points to the risk of dispersion of the Organization's limited resources.

49. There is a clear consensus among all categories of interviewees regarding the need for a more coherent and focused strategy but discordance on the priority areas to focus on. Results from the online survey among National Commissions, UNESCO Category 1 and 2 institutes and UNESCO Chairs also reflect the disparity of opinions in terms of where UNESCO should focus its efforts. Figure 7 shows that a slightly larger number of respondents consider that UNESCO is *best positioned* to address the following challenges or domains of change:

- Advocacy and awareness raising of BSE for development
- Promoting and catalysing international and regional collaboration and networks in BSE

[16] UNESCO's Science Report : Towards 2030 : http://unesdoc.unesco.org/images/0023/002354/235406e.pdf

Figure 7 How well is UNESCO positioned to address the following challenges in BSE in your country, compared to other national, regional or international organizations over the next decade?



Source: Survey among National Commissions, UNESCO Chairs and UNESCO Category 1 and 2 institutes and centres – Technopolis Group

50. These challenges refer to UNESCO's role as a catalyst for international cooperation and its role as a laboratory of ideas. The exchanges with key stakeholders during the regional field missions strongly confirmed these priorities, but also added a third priority: the essential specialist expertise that can be deployed though technical assistance. Especially throughout less-developed regions such as Central Africa, local actors lack expertise to develop policies and programmes in these areas, and look towards UNESCO for strategic advice and matchmaking with potential funders. However, with limited personnel on the ground, UNESCO is struggling to cope with the demand for such technical assistance.

51. All interviewees agree that UNESCO's value added is not as a funding or implementation organization. Interviewed Permanent Delegations and Member State representatives highlighted the importance of its function as a laboratory of ideas supporting its Member States to tackle today's challenges and prepare for those of tomorrow, keeping an eye on global trends and offering benchmarking of best practices and advice on their possible transferability. It is through this function that UNESCO can best advocate and raise awareness of BSE for development. Interviewees among UNESCO's network of partners and Permanent Delegations underlined UNESCO's credibility and echo among policy makers.

"UNESCO has a political convening power. It has no money, but it can convene ministers of science, and education. It can help build the capacity of national science and regional science systems. They should do it more, and more in partnership." _ Partner organization

52. Major BSE institutions and institutional partners of UNESCO[17] also acknowledged the Organization's value added as a catalyst for scientific cooperation, fostering dialogue among countries and among organizations, between policy makers and scientists, and between public and private sectors. UNESCO is seen as a neutral actor with a global and cross-disciplinary mandate that makes it unique to foster international cooperation.

53. STEM education is another area where UNESCO was often mentioned as well positioned and its intersectoral mandate seen as a comparative advantage. Several Permanent Delegations, government representatives and partners highlighted the role UNESCO can play to influence school curricula and improve pedagogy through teacher training. UNESCO has played a key catalysing role in promoting

[17] IUCr, ICSU, EPS, TWAS, AAS, etc.

good quality science education, a good example being the UNESCO Category 2 Institute in Microsciences in Yaoundé, which promotes the use of 'microkits'. These microkits allow students to experiment with key physical and chemical processes, moving beyond theory-only classes.

54. Many partner organizations and government representatives interviewed during the field missions have acknowledged the importance of UNESCO's role in strengthening research capacities. The relevance and effectiveness of the work performed by ICTP, TWAS and SESAME was highlighted together with the need for UNESCO to continue supporting these organizations.

55. Engineering sciences was also mentioned as a priority area for UNESCO in particular in Africa and for women.

56. Other domains of action were not stated as a priority but nevertheless considered as relevant in particular UNESCO's role to facilitate open access to scientific information.

57. Interviewed staff at UNESCO highlighted that no surveys were conducted to collect needs from Member States. While organizations such as TWAS or ICTP have a needs-based dialogue with their Member States, UNESCO is yet to consult its Member States on priority needs.

58. There is no doubt that UNESCO is uniquely positioned to deliver institutional capacity building in the BSE at a global level, in particular by positioning itself for highlighting the importance of science across the sustainable development agenda and by drawing attention to women in science. The variety of priority areas stated by different stakeholders makes it challenging to select key priority themes and exclude others. Several stakeholders also consider that capacity building in the BSE should not be seen as a separate strand of work and should also support the SCs policy work in this area. A more focused and regionalised strategy can also concentrate on geographical areas with higher needs, for example Africa.

A more focused strategy should be defined in consultation with Member States. Priority needs should be regionalised as they are different from a context to another." _ Permanent Delegation.

Recommendation: Define a focused strategy for UNESCO's capacity building work in BSE in support of the Natural Sciences Sector's upstream policy work and foresee reallocation of activities in line with the comparative advantages in the UNESCO family

4.1.3 A clear relevance to UNESCO's global priorities remains difficult to ascertain

59. Africa and Gender Equality are the two global priorities of UNESCO's agenda for 2014-2021. For each global priority, a specific strategy has been developed to complement UNESCO's Medium-term Strategy: UNESCO Operational Strategy for Priority Africa and UNESCO Priority Gender Equality Action Plan.

4.1.3.1 Priority Africa

60. UNESCO Operational Strategy for Priority Africa has defined six flagship programmes among which one is relevant to the Theory of Change of UNESCO's work in Capacity Building for BSE: harnessing STI and knowledge for the sustainable socio-economic development of Africa.

61. Table 4 presents the related objectives and main actions of this flagship programme that fall within the framework of UNESCO's work in Capacity Building for BSE.

Table 4 Relevant flagship programme in UNESCO Operational Strategy for Priority Africa

Flagship programme	**Harnessing STI and knowledge for the sustainable socio-economic development of Africa**
Objectives relevant to BSE	• Increase institutional and human capacity to produce and disseminate knowledge; • Encourage the participation of youth and especially women in ICTs as regards their use and application in the context of socio-economic development and STI activities and research and development; and to strengthen commercialization of the results of research and links between academia and industry.
Main actions relevant to BSE	• Support and mobilize existing African think-tanks both at regional and sub-regional level, for decision- making and STI development; • Strengthen African higher education and research institutions, research, and research, development and innovation (RDI) capacity; • Promote the twinning of institutions and exchanges of STI experts through North-South, South-South and South-North-South cooperation; • Ensure that more youth and especially young women participate in science, technology, engineering and mathematics (STEM) education and careers.

Source: UNESCO Operational Strategy for Priority Africa 2014-2021

62. The objectives and main actions presented in Table 4 demonstrate that the Theory of Change for UNESCO's work in Capacity Building for BSE helps to address the needs and priorities of African countries.

63. As confirmed by several stakeholders, Africa's goals of economic growth, sustainable development and social transformation cannot be achieved without strong research and education capacities in BSE.

64. The 2015 edition of the UNESCO Science Report highlights important scientific gaps between countries and a situation that remains critical in Sub-Saharan Africa:

- In 2013 only 7.7% of the world's researchers were located in lower-middle income economies or low-income economies and only 1% in Sub-Saharan Africa (while it has around 14% of the world's population).
- In 2014 only 7.4% of the world's scientific publications were produced in lower-middle income economies or low-income economies and only 1.4% in Sub-Saharan Africa.
- In 2013 only 1.3% of the world's patents were produced in lower-middle income economies or low-income economies and only 0.08% in Sub-Saharan Africa.

65. Interviewed stakeholders in Cairo and Yaoundé and Permanent Delegations from Sub-Saharan Africa and Arab States in Africa mentioned several needs for the region and in particular the need for :

- Awareness raising on the leverage effect of investments in research and development for governments and the private sector
- Training of trainers/teachers for quality STEM education
- Strengthening of research capacities
- Initiatives supporting the uptake and use of new scientific knowledge and technologies

66. Capacity building for policy making in STI, in particular technical assistance for the definition of national research and innovation strategies was also mentioned as a need for the region[18]. Several stakeholders also mentioned the need to regionalise the priorities as these can be significantly different from one region to another.

67. The strengthening of science technology and innovation systems in Africa is a major challenge that impacts all of the SDGs defined in the 2030 Agenda. Nevertheless ER2 "Capacity building in research and education in the natural sciences enhanced, including through the use of ICT (37 C/4)" and ER3 "Interdisciplinary engineering research and education for sustainable development advanced and applied (37 C/4)" were defined as a low funding priority by UNESCO's Member States during the prioritisation exercise[19] conducted in 2013 after the budgetary crisis following the withdrawal of the United States' contribution to UNESCO's regular budget.[20]

68. The evaluation considers that UNESCO was not given the necessary resources to give a priority to African challenges and in line with the needs for Capacity Building in BSE. This view was also strongly expressed by interviewees from African countries. The situation of UNESCO's Regional Office for Central Africa in Yaoundé and UNESCO's Regional Office for the Arab States in Cairo are particularly striking.

69. UNESCO's Regional Office for Central Africa covers 10 countries and expenditure figures extracted from SISTER show that it worked with US$ 45 189 from regular budget and US$29 310 from extrabudgetary sources in 2012-2017. This represents a total expenditure of less than US$15 000 per year for activities related to Capacity Building in BSE.

70. The UNESCO Office in Cairo serves as a regional UNESCO office for Science & Technology in Arab States and a cluster office for Egypt, Sudan and Libya. It covers a total of 17 countries and operates with an average regular budget allocation of US$30 000 per year for BSE.

71. Both offices in Cairo and Yaoundé have only one Programme Specialist dedicated to activities in Capacity Building for BSE. The one specialist in Yaoundé covers 10 countries, many of which are poor countries with low level of internal capacity, meaning that demand from governments (even for basic communication and participation in key events) chronically outstrips the available capacity. This situation leads to a continuous disappointment for Member States on the level of support UNESCO (even non-financial) can give.

« Priority Africa is only a slogan. We don't see it on the field. Field offices should be doing more. Sustainable Capacity Building cannot be achieved without adequate resources. » Permanent Delegation

72. The Evaluation of UNESCO Priority Africa[21] published in 2012 highlighted that the mechanisms which are meant to provide impulse and substance to Priority Africa have had very limited success. The framework for Priority Africa has neither triggered a significant increase in decentralisation of human and financial resources to the region, nor has it translated into improved results.

Recommendation : Strengthen the SC Sector's engagement in Africa.

4.1.3.2 Gender equality

73. Gender Equality is given specific consideration in UNESCO's capacity building work for BSE. This is illustrated by a specific Expected result in UNESCO's Priority Gender Equality Action Plan and

[18] However this is not in the scope of our evaluation; it is dealt with by the Science Policy and Partnerships Section.

[19] see 5X/EX/2.INF : Report of the working group established by 191 EX/DECISION 15 (II)

[20] The work undertaken by the Science Policy and Partnerships Section to strengthen STI policies was ranked B or medium priority.

[21] http://unesdoc.unesco.org/images/0021/002177/217790E.pdf

by several initiatives that have been designed and implemented with a specific Gender equality perspective. Furthermore, several interviewed Permanent Delegations have expressed the need for UNESCO to continue to focus on supporting women in STEM as they are still underrepresented in science and technology.

74. UNESCO Priority Gender Equality Action Plan has defined the following among its expected results for SC: Women's capacities in UNESCO's scientific domains strengthened including through women scientists as role models and mentors to female students and young scientists promoted (ER 1).

75. UNESCO has also been implementing several activities promoting women in science and women scientists as role models and mentors.

76. The most frequently cited initiative underlined by partner organizations and interviewed staff at UNESCO is the L'Oréal-UNESCO for Women in Science partnership.[22] It aims to support and recognize women researchers, and to encourage more young women to enter the profession. The initiative offers 48 fellowship programs covering 115 countries and granting each year fellowships to 275 talented women scientists to pursue promising research; besides it recognises each year, five Awards Laureates for their contributions to the advancement of science, in Life or Physical Sciences in alternating years.[23]

77. Since 1998 over 97 women scientists from 30 countries received the L'Oréal-UNESCO award for women in sciences and among them, two have received the Nobel Prize.[24] Some interviewees among UNESCO staff have expressed the fear that the programme is less embedded in UNESCO now because of the decreasing capacities. The risks are that UNESCO is less visible but also that UNESCO's priorities are less present in the initiative.

78. Other successful initiatives mentioned by interviewees from partner organizations are the activities of the OWSD and its GenderInSITE (GIS) programme.

79. GIS is a partner programme of OWSD and is an international campaign to promote the role of women in science, innovation, technology and engineering (SITE). Through workshops, data collection, surveys and reports, as well as targeted media coverage, GIS advocates for women to be involved at all levels of scientific research design and implementation, as well as ensuring that women too are equal beneficiaries and users of new technologies.

80. According to the evaluation of the Swedish International Development Cooperation Agency's (SIDA) "SIDA's support to TWAS, OWSD and GIS" published in July 2016, OWSD and GIS have successfully placed science and gender for development as a priority on the agenda in priority countries and international fora.

81. UNESCO supports and promotes other networks of women scientists such as the African Women in Mathematics Association (AWMA), the African Association of Women in Geosciences and the International Network of Women Engineers and Scientists (INWES).

82. However, during field visits in Cairo and Yaoundé, the evaluators observed that few of the current implemented activities are gender specific. UNESCO's Regional Office for the Arab States has funded "Camps of Excellence for Girls in Science" in the region but these activities were cut down after the restructuring of the Organization. In Egypt, UNESCO has a Chair on women empowerment in STI involved in awareness raising activities on the use of ICT to empower women in their daily life through science and technology. In Cameroon, the national government has a prize for women in science, which UNESCO endorses. Interestingly, many of the general activities such as the 'Science Day' project in Douala, where students prepare for a science fair over the course of a month, is more popular with girls, who are increasingly present and often now form majorities in basic sciences initiatives.

[22] The management of the l'Oréal UNESCO for women in science initiative has recently been transferred to the Science Policy and Partnerships Section

[23] http://www.forwomeninscience.com

[24] http://www.unesco.org/new/en/natural-sciences/priority-areas/gender-and-science/for-women-in-science-programme/

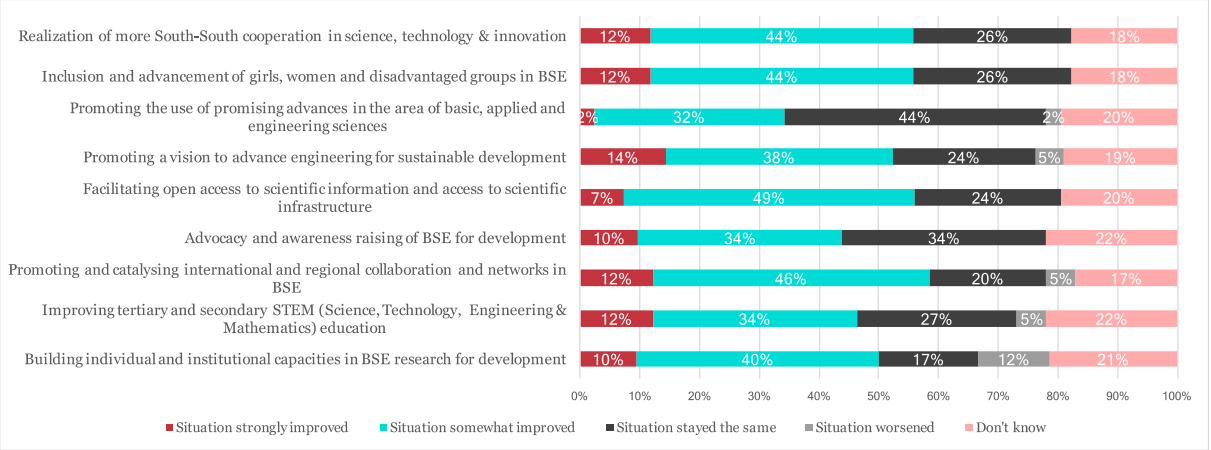
4.2 UNESCO's performance, achievements and challenges in Capacity Building for BSE

4.2.1 General perception of effectiveness

83. As indicated in the limitations, the evaluation found that for most activities of UNESCO's capacity building work for BSE little or no resources are dedicated to the follow up and/or for establishing the outcomes and impacts of the initiatives over a medium and longer term time frame. The findings in this evaluation are therefore mainly deducted from the interviews and from the evaluation survey and thus rely on the perceptions of the respective stakeholders.

84. In terms of the general assessment of the extent to which UNESCO's main goals have made a change on the ground, results from the survey show that key stakeholders clearly present a mixed perspective (see figure below). In general, very few stakeholders stated that the situation has 'strongly improved', but a majority generally see some positive change. However, a substantial minority (25-40%) sees no change or even a deterioration of the situation. The differences between the different objectives are relatively minor, although the situation has somewhat improved for the open access to scientific information and access to scientific infrastructure (49%) and the promotion of international and regional collaboration and networks in BSE (46%).

Figure 8 To what extent have the following objectives been effectively achieved in your country?



85. Key impacts that were the direct result of UNESCO's interventions, as recurrently mentioned by UNESCO stakeholders in the online survey, included:

- More attention for women in science
- Higher visibility of basic sciences at the national level
- Support of the creation of a UNESCO Cat 2 centre in the country

86. The evaluation of UNESCO's Strategic Programme Objective 4 published in March 2010 had highlighted among major achievements in UNESCO's work in Capacity Building for BSE the SESAME project - Strengthening Capacity Building in natural sciences and peaceful cooperation in science in the Middle East; the "Global Microscience Programme" now largely implemented in hundreds of schools to promote grass-root science education in the Member States; the International Centre for Genetic Engineering and Biotechnology (ICGEB)/TWAS/UNESCO collaboration and Capacity Building in molecular biology for agricultural applications and the UNESCO/CERN collaboration for the creation of electronic libraries.

87. In the framework of the present evaluation the effectiveness of SESAME and the successful collaboration between UNESCO and TWAS, ICGEB and CERN was confirmed through positive feedback in interviews with partner organizations and with UNESCO staff. Microscience kits are considered as very relevant in particular in Africa, however several interviewees have mentioned that UNESCO's value

added is not in this type of initiatives that can easily be transferred to NGOs, but is rather seen at the policy level.

88. The present evaluation focused its analysis on the achievements of five other UNESCO initiatives illustrating UNESCO's efforts and challenges in Capacity Building for BSE in engineering, physics, biological sciences and renewable energy:

- the International Basic Sciences Programme
- Microscience & Renewable energy with the Centre d'Excellence en Microsciences in Cameroon
- the UNESCO Intel collaboration for engineering
- the UNESCO International Union of Crystallography (IUCr) Open labs in crystallography
- the Human Variome Project

4.2.2 The International Basic Sciences Programme (IBSP)

89. The IBSP originated from the World Conference of Science (Budapest, 1999), which in its final document "Science Agenda – Framework for Action" called for strengthening of the basic sciences as a lever for development. Operational since 2005, this instrument was established with three main purposes[25]:

- Building national capacities for basic research, training, science education and popularisation of science through international and regional cooperation in development-oriented areas of national priority
- Transfer and sharing of scientific information and excellence in science through North-South and South-South cooperation
- Provision of scientific expertise for and advice to policy- and decision-makers, and increasing public awareness of ethical issues that progress in science entails.[26]

90. In its Scientific Board meeting in January 2017, a new strategy was presented with two main goals:

- To contribute to the creation of a sufficient number of qualified STEM graduates;
- To equip students, in addition to the general public, with STEM skills required to meet the challenges set out in the Agenda 2030.

91. The supporting intervention logic or implementation plan for the strategy was not shared with the Scientific Board and the evaluators, neither were the related indicators and baselines that would help measure progress towards achievements.

92. The IBSP Scientific Board was established to monitor IBSP and to advise the Director-General thereon. By statutes, it is composed of 15 to 20 world-renowned scientific researchers representing all regions: Africa, Asia and Pacific, Arab States, Eastern and South Eastern Europe, Western Europe and North America. The Director-General appoints these members after consulting UNESCO's Electoral Groups, and the Organization's partners in the basic sciences (ICSU scientific unions, TWAS, research centres, universities, and regional and international NGOs).

93. The Scientific Board has met 10 times since 2005 with the last meeting occurring on 24 January 2017. Besides 15 board members, other groups also attended the 10th meeting of the IBSP Scientific Board: 33 partner organizations, 6 Permanent Delegations, 9 attendees from SC/PCB, 3 participants from the education sector, and 1 person from the communication and information sector. The evaluators also attended this meeting as observers.

94. Between two meetings of the Scientific Board, life of this programme is ensured by a Secretariat held by the Section for Capacity Building in Science and Engineering within the Division of Science Policy and Capacity Building and comprising in 2015:

[25] Cf Resolution 32 C/66

[26] http://unesdoc.unesco.org/images/0016/001627/162712e.pdf

- 5 permanent employees
- 4 consultants compensated through extrabudgetary resources

95. In 2017 only 2 permanent employees were actively involved in the follow up of IBSP activities.

96. During their presence at the 10th meeting of the IBSP Board in January, the evaluators observed a number of challenges listed hereafter. Most of these observations were shared by Board Members and/or partner organizations that were interviewed:

- An inefficient governance structure and decision making process. The 10th Scientific Board meeting ended with no clear views on what will be addressed to the Director General and what programme of activities could be implemented by IBSP. Suggestions were not systematically voted or discussed. Only the IBSP Board report clarified what could be implemented by the programme
- The Secretariat has not clearly defined an intervention logic to achieve the goals presented in the IBSP programme strategy nor performance indicators to measure its results beyond the high level indicators defined at the level of the Expected Result as defined in the C/5 programme and budget to which the IBSP is expected to contribute[27]
- Little clarification of the role and contribution of the ISBP networks and partners and how they could be involved in the programme's intervention logic, in particular UNESCO Chairs and Category 2 centres

97. The IBSP Scientific Board meets once a year with the objective to draft a programme of activities based on projects proposed by regional, national and international organizations as well as other partners.[28] The 10th meeting of the IBSP Scientific Board did not satisfy this objective. A large part of the agenda was dedicated to the presentation of past and current projects and activities implemented by partner organizations. Insufficient time was allowed for discussions around activities to be implemented in the future. Only a few suggestions were made for concrete proposals of collaborative activities such as an International Year of Basic Science for development and sustainability in 2020 or an IBSP Global STEM forum in 2017 funded by the EU China Municipal Development Commission (ECMDC). The evaluators and several interviewed partners attending the meeting were unsatisfied by the structure of the meeting, underlining that the objectives of the meeting were unclear. Furthermore, no concrete plan of action for follow up resulted from the meeting.

98. The meeting started with a number of recommendations from the Scientific Board members including a recommendation on the improvement of IBSP's governance. Several board members also stressed the lack of communication between Board Members and the lack of follow-up on recommendations after the meetings of the Scientific Board.

99. The need for reinforcement of IBSP's governance was also mentioned in the programme's internal audit conducted in January 2015. Among other the audit recommended strengthening the coherence of IBSP's governance.

100. Among other proposals for the improvement of the IBSP Scientific Board, three interviewees mentioned the need to revitalize the Board with a representation of different age groups. Increasing the representation of younger age groups would allow for the introduction of new ideas, new methods and better engagement in follow up of activities or fundraising for the programmes. Furthermore, several interviewees underlined the limited communication between board meetings, and the need for more regular feedback, some also considered working in small groups according to areas of interest and provide views on individual member's areas of work as an effective option.

101. The new strategy of the programme would benefit from a clearly spelled out implementation plan. Despite the affirmation of a renewed focus of the IBSP strategy on science, technology, engineering and mathematics (STEM) education, discussions during the IBSP board meeting did not reveal the

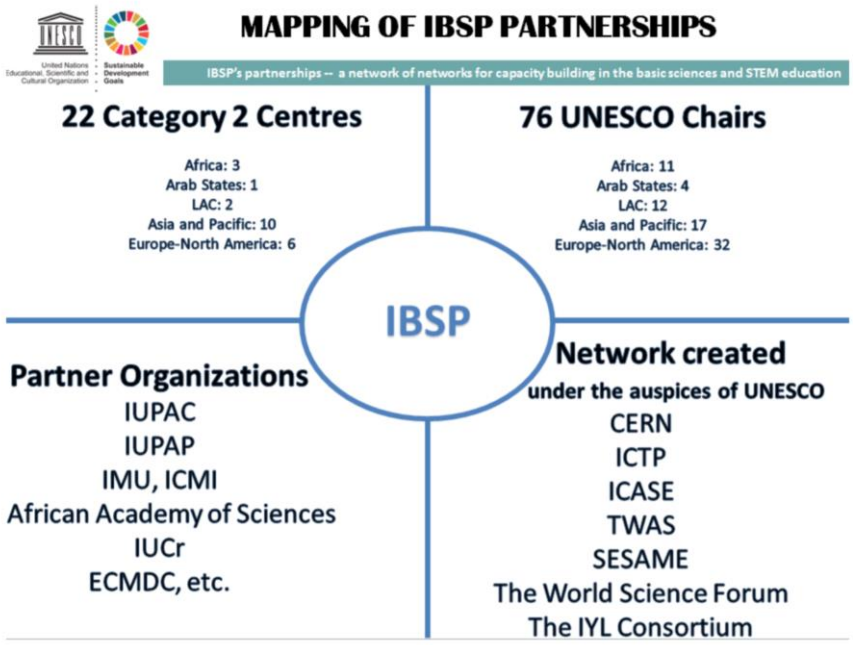
[27] see UNESCO 38 C/5 Programme and Budget 2016-2017 Major Programme II and UNESCO Draft 39 C/5 Programme and Budget 2018-2021, Volume II, Major Programme II

[28] 167 EX/Decision 3.4.2 and 169/EX/Decision 3.5.1

programme's intervention logic. It remains therefore unclear how IBSP will attain its objectives for STEM education.

102. An important element of the IBSP strategy is that the programme does not operate in isolation. It is a member of the family of international programmes of UNESCO in science, such as the International Geoscience Programme, the International Hydrological Programme, the Intergovernmental Oceanographic Commission, the Man and the Biosphere Programme and the Management of Social Transformations Programme.[29] Moreover, the strategy of IBSP furthers the development of cost-sharing partnerships with UNESCO's principal partners in science. Figure 9 presents the mapping of IBSP partnerships.

Figure 9 Mapping of IBSP partnerships



Source: UNESCO IBSP

103. The level of interaction and involvement of IBSP partners and networks is very mixed. Networks created under the auspices of UNESCO which pre-date IBSP, such as TWAS, CERN, ICTP or SESAME are very active. Several partner organizations such as the International Union of Pure and Applied Chemistry (IUPAC), the International Mathematical Union (IMU) and IUCr are also regularly involved in activities in partnership with UNESCO (see list of IBSP key results between 2010-2016 in Figure 11).

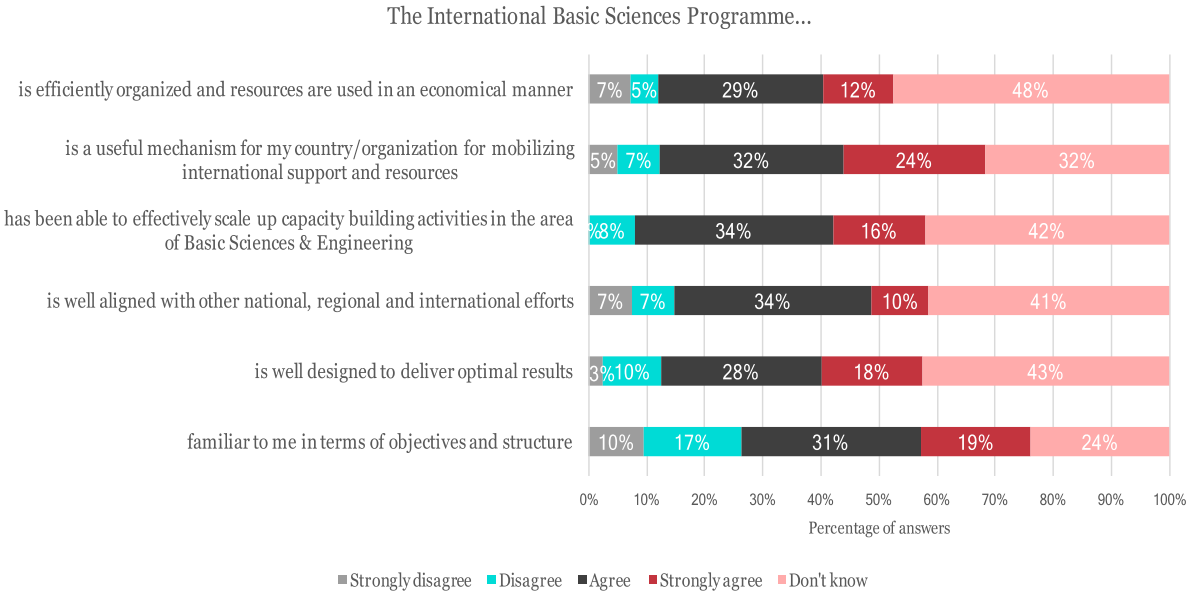
104. IBSP supported the creation of three Category 2 centres in basic and engineering sciences in Africa (Nuskka in Nigeria, the Centre of Excellence in Microscience in Cameroon, and the Institute for Fundamental Research in Rwanda). Representatives of several Category 2 centres and BSE Chairs are involved as members or observers of the IBSP Scientific Board, however key outputs resulting from IBSP between 2010 and 2017 (cf. Figure 11) show a limited involvement of UNESCO Category 2 centres and UNESCO Chairs in the programme's activities. Category 2 centres were mainly involved in the International Years, nevertheless their roles and contributions to the programme could be enhanced.

105. Results from the survey among National Commissions, UNESCO Chairs and UNESCO Category 2 centres illustrate this. Figure 10 shows that a significant share of the respondents did not know the programme well enough to express their opinions on its relevance, effectiveness and efficiency.

[29] Source : Mission Statement of the Division for Basic and Engineering Sciences (BES), March 2006

106. During field visits to regional offices and interviews with UNESCO Chairs these regretted that they could not provide feedback on the programme as they did not know enough about its activities. This demonstrates a weak involvement of field offices in IBSP and overall a lack of visibility of the programme.

Figure 10 Survey results relating to the IBSP



107. Between 2010 and 2016, the IBSP was involved in several activities described in the 38C/REP/14[30] and summary reports on programme implementation and presented in Figure 11. According to several stakeholders these demonstrate some value for money given the small resources with which the programme operates. Nevertheless the evaluators found no evidence of potential longer term results or impacts as no baseline or progress monitoring and evaluation data is collected to demonstrate what is the outcome or contribution of the key activities listed in Figure 11, for example the newly established Category 2 centres.

108. A better mobilisation of IBSP's networks and partners would certainly offer much larger opportunities for interdisciplinary collaborations at national, regional and international level.

109. Several interviewees among UNESCO staff and partners mentioned that IBSP has severely suffered due to UNESCO's cut in the human and financial resources allocated to the programme and that this has negatively impacted the functioning and the results of IBSP.

Figure 11 Key activities /outputs reported by the IBSP between 2010-2016 aiming at strengthening the CapBSE function

- Establishment in 2012 by ADG/ SC of a Cross-cutting Thematic Unit (CCTU) for Science Education (SED) established in collaboration with ICTP and the Education Sector. It gives a coordinated approach to interdisciplinary science teaching and curricula development with support of the private sector, extrabudgetary funds and funding from concerned Member States
- Contribution to the establishment of new Category 2 centres among the proposals made by the SC Sector
- PhosAgro/UNESCO/IUPAC Partnership in Green Chemistry for Life, which had its two first editions in 2014 and 2015

[30] http://unesdoc.unesco.org/images/0023/002344/234477f.pdf

- The IBSP/ICTP longstanding joint project on Active Learning in Optics and Photonics (ALOP) that seeks to introduce an innovative concept of inquiry-based science education, especially in basic and applied physics
- The Human Variome Project (HVP) encouraged by the IBSP Board from its inception
- "Microscience kits", a longstanding project stemming from IBSP collaboration with IUPAC, the RADMASTE Centre at the University of the Witwatersrand in Johannesburg (South Africa) and Somerset Educational (South Africa). It is a hands-on science education project that gives primary- and secondary-school teachers and students, as well as university students, the opportunity to conduct practical work in physics, chemistry and biology, using kits that come with booklets describing scientific experiments
- Activities in mathematics and mathematics education, developed through collaboration with the International Mathematical Union (IMU), the Commission on Mathematics Instruction (ICMI) and several mathematical organizations around the world:
    - Creation in 2015 of the "African Women Mathematics Association", in collaboration with the African Mathematical Union (AMU) and the "Centre International de Mathématiques Pures et Appliquées" (CIMPA)
    - Contribution to the African Institute for Mathematical Sciences (AIMS) Next Einstein Initiative (NEI) through its related Forum (NEF). AIMS NEI promotes mathematical sciences among talented young minds from the African continent with the aim that the next "Einstein" comes from Africa
- Longstanding IBSP/CERN collaboration:
    - CERN day at UNESCO on the occasion of the discovery of Higgs boson with the Large Hadron Collider by CERN in 2013[31]
    - co-organizing the CERN anniversary at UNESCO Headquarters in 2014
    - the "Science for Peace" workshop in Geneva, a joint session with CERN on "Science for Peace" during the 2015 World Science Forum in Budapest, etc.
    - Training teachers from developing countries in modern aspects of physics
    - International Year of Light 2015

110. Interviewed partners and Permanent Delegations that were aware of IBSP's role and achievements agree on the continued relevance of IBSP. IBSP acts as a purveyor of seed resources that help catalyse collaborative action and funds from national and other sources. Nevertheless the programme's governance and organization need improvement to allow IBSP to effectively steer and scale up capacity building activities in the field of BSE.

Recommendation : Reconsider the mandate of IBSP within UNESCO's limited resource framework, by either discontinuing IBSP, or refocusing it by scaling back its function

4.2.3 Regional Scientific Excellence, Microscience & Renewable Energy

111. The Centre d'Excellence en Microsciences (CEM) has been a leading initiative in the field of microscience in Central Africa since its opening in 2002. Microscience refers to the exposing of primary and secondary school students to actual practical experiments in their physics, chemistry and biology classes. A lack of access to such practical experiments is a large problem for education in many parts of Africa, with schools not being able to afford the required laboratories and materials. This lack of

[31] https://home.cern/topics/higgs-boson

exposure to the practical side of experiments leaves students underskilled and unmotivated for a career in the BSE fields. Together with researchers from South Africa, the CEM developed 'microkits', affordable (±25 US$) sets of laboratory kits that can be used by students in regular class settings.

112. As part of its activities, the CEM has also ventured into the questions of renewable energy. Many schools face additional challenges of providing good quality education, and practical experiments in particular, due to a lack of reliable access to electricity. This issue is particularly present in rural areas. As such, UNESCO and CEM launched a training session on renewable energy for teachers. This activity led by UNESCO Regional Office for Central Africa and aims at training teachers on the assembly and installation of photovoltaic panels. A workshop was organised for that purpose at the Centre d'Excellence de Microsciences (CEM) in March 2014 in Yaoundé. The overarching aim is to build capacity in practical experimentation in science and technology, especially when it comes to solar energy. This is particularly important for rural areas where the lack of proper electrical power systems is often a determining factor in under-enrolment in education. The workshop was organised in partnership with the CEM and gathered twenty regional and national inspectors as well as university teachers of the Ecole normale supérieure and the Ecole Nationale Supérieure Polytechnique. The Inspector General of the Ministry of Secondary Education also attended the opening ceremony of the three-day workshop.

113. In general, the CEM has a small number of key stakeholders:

- The Ministry of Secondary Education
- The Ministry of Basic Education
- The Ecole Normale Supérieure (teacher education)
- The Ecole Nationale Supérieure Polytechnique
- The UNESCO Multisectoral Regional Office
- National UNESCO Commission

114. Microkits are a major achievement of the CEM:

- These microkits, based on a model long supported by UNESCO, have been increasingly used in Cameroon, with now 400 primary schools (out of 4000) and 60% of lycées (secondary schools) already using the kits.
- A wide range of documentation and guides for teachers have been developed.
- CEM has been recognized for its excellence by UNESCO as a Category 2 center, although this still needs to receive final ministerial approval. The Regional Office of UNESCO has been a driving factor in receiving this recognition;
- Increasingly there is interest from other countries, including Chad and Burundi, to implement the microkit model in their countries also. Some teachers from these countries have already been trained
- The Centre has started exploring the possibility of locally sourcing the microkits, using local materials (e.g. wood) in order to further lower costs and further develop the local ecosystem around microsciences

115. Qualitatively, leaders at the CEM indicate that they have seen the interest in BSE increasing among students that have worked with the microkits, with students being enthusiastic and more motivated to pursue further studies in these fields.

116. The renewable energy workshop produced several results:

- Knowledge transfer through a day of lectures, aimed at training school inspectors for physical sciences as well as students at the Ecole Normale Supérieure et Ecole Nationale Supérieure Polytechnique on how to install and operate a solar panel
- Capacity building in assessing the needs of an institution or a community: determining the proper size of installation and developing a summary diagram based on specific needs and readings from measuring devices used in maintaining on-site installations

- Installation of two solar photovoltaic panels by trainers on the site of CEM
- Statement by the Ministry of Secondary Education that practical experience of installing solar technology should be introduced in the high school curriculum for terminal classes C, D, as well as technological fields.

117. Although there are ambitions to further scale up the use of solar panels in secondary education, and some schools may have introduced this on their own, there is no dedicated policy or funding as of yet.

118. The CEM centre is also dealing with a number of challenges:

- Lack of funding to scale up the microkit activities. Despite huge interest from schools, including across the region, governments are not capable or willing at the moment to invest themselves in these microkits. The CEM finds it difficult to identify and access other potential sources of funding, and would appreciate if UNESCO could play a referral role here
- While CEM has been approved as a Category 2 Centre in 2015, its full registration is still pending due to governance issues. The Cameroonian government is still to decide if the CEM administratively falls under the Ministry of Basic Education or the Ministry of Secondary Education. Such governance issues slow down the further consolidation and growth of the Centre
- There are very few means and capacity to do monitoring, evaluation or impact assessment of the CEM activities

4.2.4 Intel and UNESCO collaboration in Capacity Building for engineering

119. The first Memorandum of Understanding between UNESCO and Intel, signed in 2004, detailed the promotion and use of information and communication technology in schools. Since then, Intel and UNESCO have expanded their partnership to work on improving and delivering learning tools on STEM for sustainable development. The partnership supports the UNESCO Engineering Initiative through engineering education projects and using ICTs in education policies. The agreement stipulates a special focus on Africa and gender equality.

120. Within this partnership UNESCO's Section for Capacity Building in Science and Engineering and Intel jointly conducted the following activities:

- The UNESCO Intel Science Competition-Arab World 2012 mirrored this partnership. Indeed, Intel and the United Arab Emirates Ministry of Education organised that pan-Arab science competition under the patronage of UNESCO. More than 120 students from 10 Arab countries participated in this event. On this occasion, the Director-General nominated Dr Hayat Sindi, from Saudi Arabia as UNESCO Goodwill Ambassador for Sciences to inspire girls to consider science careers.
- Intel was also a partner of the Africa engineering week organised in 2015 to raise awareness on engineering for sustainable development.

121. The collaboration with Intel is an example of successful partnership with the private sector. Several interviewed partners mentioned UNESCO's collaboration with Intel on STEM education for sustainable development as positive, with interesting outputs. Interviewees among UNESCO staff were satisfied with the activities implemented because they are in line with UNESCO's objectives and priorities. A number of learning tools and guidelines were developed and are available for teachers, students and policy makers. It is regrettable, as per most of UNESCO's activities in Capacity building for BSE, that no resources are dedicated to the follow up of outcomes and impacts. It would be interesting to assess if and to what extent these tools and guidelines are used and helpful to their intended beneficiaries. Not being a funding partner, UNESCO cannot require strict reporting on results, and does not have the resources to organise their collection internally.

4.2.5 UNESCO International Union of Crystallography (IUCr) Open labs in crystallography (Headquarters)

122. This initiative launched in 2014 during the International Year of Crystallography aims at promoting international cooperation and Capacity Building in the area of crystallography through the installation of labs in partner universities or research centres. This activity has three purposes depending on the level of development of the host countries. For most advanced countries in science and technology, the aim is to increase the technology base and promote crystallography among younger people. In less privileged countries, the objective is to start some crystallographic activity. In intermediate countries it encourages the purchase of advanced instrumentation. In order to achieve these aims, 4 types of labs were designed:

- OpenLab Type 1 to foster new crystallographic research centres and act as hubs hosting students and researchers from neighbouring countries (Uruguay and Senegal)
- OpenLab Type 2 based in research centres with operational crystallographic instrument. These labs host workshops, tutorials and experiments for students and young professors. It was implemented in Ghana, Algeria, Congo, Ghana, Uruguay, Argentina, Mexico, Colombia, India, Pakistan, Vietnam, Turkey, China (Hong-Kong) and Kazakhstan
- Travelling Lab, a lab travelling within a country to deliver tutorials about the use of instruments and related software. They were implemented in Morocco, Gabon, Tunisia, Cameroon, Senegal, Indonesia
- OpenFactory organising workshops open to students and professors with a background in crystallography

123. The initiative is conducted by the IUCr and UNESCO in partnership with private companies: Agilent Technologies, Bruker, PANalytical, the Cambridge Crystallographic Data Centre, Rigaku, STOE, Dectris, Xenocs, Anton Paar, Incoatec, OlexSys. These companies sponsor the OpenLabs e.g. the Bruker OpenLab in Cameroon.

124. Ever since the launch of this initiative, 25 OpenLabs were implemented with 13 in 2014, 7 in 2015, and 5 in 2016. The installation of an OpenLab Type 1 in Senegal in partnership with IUPAP and ICTP is scheduled for the end of 2017. A full list of the OpenLabs held per beneficiary country is presented in Appendix G.

125. The number of labs installed has been decreasing over the years. This is mainly due to the challenge of selecting partner countries and universities for the projects. Local authorities and universities have to sign an agreement where they commit to contribute to the project, investing in the sustainability of the labs (researchers and maintenance of the equipment).

126. As a partner, UNESCO has helped IUCr to get in touch with Permanent Delegations and National Commissions, while field offices contributed to the identification of active research groups in the field of crystallography. IUCr is very positive about the collaboration and the value added of UNESCO in the project. Without UNESCO access to Member States would have been more difficult for IUCr and therefore signature of agreements prior to implementation of activities. An outcome of the International Year of Crystallography and the Open labs initiative is the application of 10 new countries to become members of the International Union of Crystallography.

4.2.6 The Human Variome Project

127. The Human Variome Project's (HVP) purpose is to collect and share data, and investigate human genetic variation and its impact on human health. It is an international consortium of scientists and health-care professionals that has the status of an NGO that has operational relations with UNESCO, and collaborates with the World Health Organization. The HVP aims at a significant reduction in the burden of genetic diseases on the world's population. The Project itself is not directly involved in the development and operation of physical data storage and sharing infrastructure; that is the responsibility of international disease groups, national consortia/health systems and individual members. Rather, the Project exists to assist these groups by:

- Collaboratively developing technical standards and harmonised, approaches so that data from different sources can be easily shared in an ethical, legal and social way
- Coordinating an international platform to facilitate discussion of genomics in global health with the aim to foster necessary professional interaction and debate in the area of genomics, global health, service delivery, and safety
- Linking world leading professionals and institutions with genomics professionals, researchers, and academics
- Establishing a global evidence base for knowledge sharing in medical genetics and genomics and bringing relevant issues to the attention of Ministries of Health, Science and Technology, and Education.

128. HVP is an active and growing consortium of over 1,300 individual researchers, healthcare professionals, policy makers, and organizations from 81 countries. UNESCO is using its networks of Category 2 Centres in the basic and applied sciences and other partners in the scientific community and industry to foster this collaborative project. The IBSP is facilitating the involvement of Member States, scientific unions and research centres in this to develop national and regional networks to promote transfer and sharing of scientific information and build capacity for management and use of human genetic data.

129. UNESCO and HVP jointly produced different outputs between 2010 and 2016:

- The third Human Variome Project meeting was co-organized by UNESCO in 2011
- The HVP Conference hosted by UNESCO in June 2012 adopted a new Roadmap setting up strategic direction and objectives of the Human Variome Project (HVP) for 2012-2016. Topics included the role of a HVP Ethics Committee, initiatives in education and skills development through inter-institutional exchange and triangular N-S-S collaboration.
- In 2015, IBSP/HVP cooperation resulted in the Conference "Breast Cancer Challenge" held at UNESCO Headquarters in June 2015, which gathered scientists, policy- and decision-makers, and a wide range of stakeholders in science concerned with the genetics of breast cancer. The meeting was a landmark event that uncovered new opportunities for action within the HVP project conducive to benefits for healthcare and the understanding of the biological diversity of the human genome.

130. UNESCO has a long tradition of collaboration with NGOs, the HVP is an example of the benefits of such partnerships, in particular with a view to providing access and promoting sharing of scientific data and addressing related ethical issues.

131. UNESCO advocated for the HVP to develop links with LMICs for the benefit of all. It has approached permanent delegates with partners from the HVP to promote awareness on the project. Involvement of new countries is key to the success of the project, support from member states was challenging to obtain and UNESCO had to explore other routes through identification of scientists locally. UNESCO has also helped to host the biennium meetings at its Headquarters.

Recommendation: Improve the monitoring and evaluation of UNESCO's work in Capacity Building for BSE

4.3 Partnerships and Cooperation

4.3.1 Challenges of intersectoral programming

132. Intersectoral programming allows for a more holistic approach to Capacity Building and it also allows to establish enabling conditions for the achievement of progress towards the SDGs for 2030, as was identified as one of UNESCO's comparative advantages in contributing to the 2030 Agenda.

133. STEM education is a domain at UNESCO that requires collaboration and discussion between the Education sector and SC. At the moment it is not clear who leads on this subject within UNESCO. Interviewees at UNESCO Headquarters have mentioned a possible share of activities where the Education sector would lead on primary and secondary science education and SC on tertiary STEM education. However interactions would still be required to coordinate actions on subjects such as girls' STEM education or Inquiry-Based Science and technology Education (IBSE).

134. UNESCO staff in Headquarters indicated that the relationship and communication between the Education Sector and SC are good. The same held true at the regional offices, where the collaboration between both Sectors is often quite close.

135. Challenges arise when it comes to decision making on subjects where the lead was not clearly defined. External partners engaged in UNESCO's activities to promote IBSE have particularly stressed this and urged the Organization to improve and strengthen intersectoral coordination in science education, in particular in view of the potential comparative advantage the Organization can realize from a more coordinated approach. Several stakeholders considered that there could be an advantage with the Education sector taking the overall lead with SC providing support where needed, given the longstanding experience of the ED sector in improving the quality of education at all educational levels.

136. Expanding the Organization's cross-sectorial activities in UNESCO's programme and budget would help with scaling up intersectorial programming. According to interviewees at UNESCO's Headquarters the engineering programme was a cross-sectorial activity in the past and that had allowed the implementation of collaborative projects within the SC and with the Education sector. Such an arrangement was more likely to contribute to the "interdisciplinary engineering research and education" stated in ER3.

137. In view of UNESCO's Education Sector absorbing the majority of UNESCO's budget, several stakeholders, among which a Permanent Delegation representative, pointed to the importance of intersectoral programming for strengthening investments in science capacity building.

Recommendation: Clarify leadership on science education within UNESCO

4.3.2 On-going decentralisation efforts

138. UNESCO has to date no presence in many developing countries and many of its regional, liaison and national field offices are lacking a critical mass of SC capacity and therefore implement very few activities in capacity building for BSE.

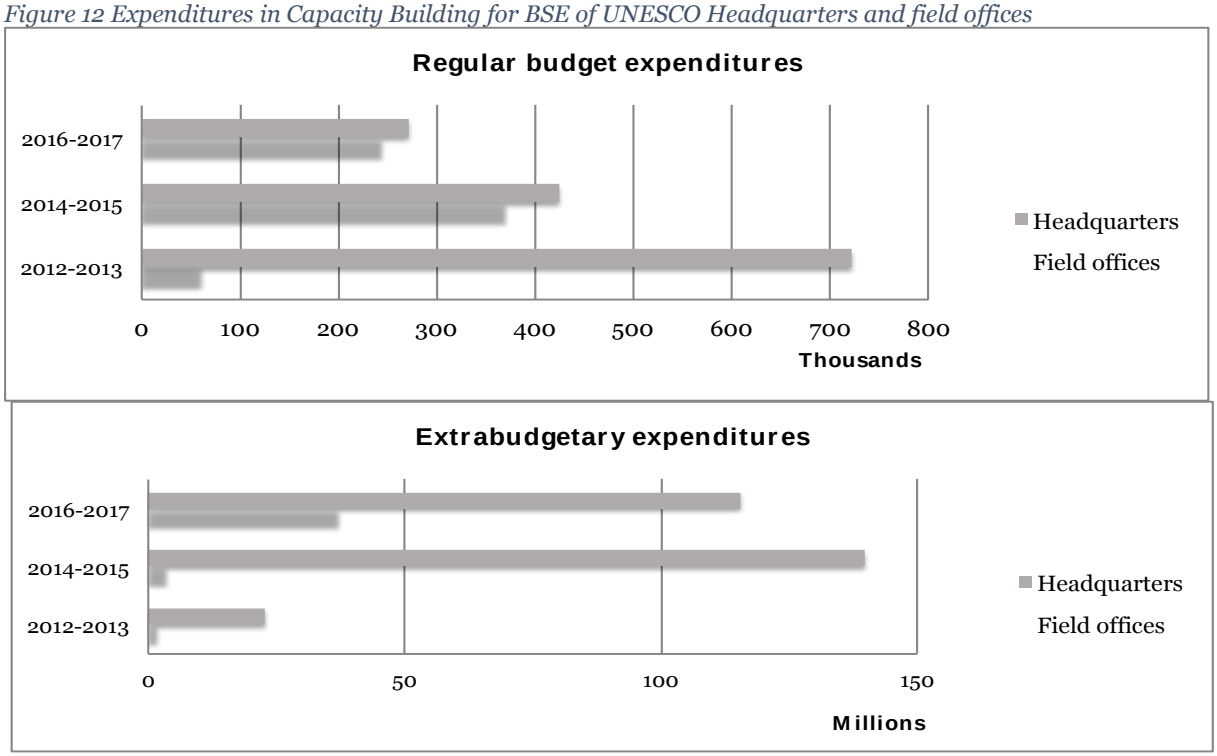
139. Several audits and evaluations have mentioned that overall the staff capacity in the field is weak. The evaluation of UNESCO priority Africa in 2012 also underlined the *limited progress in decentralisation of authority and resources to the field*.

140. In the recent years programme sectors increased their efforts to further decentralize financial resources to the field, with Africa given priority. An analysis of the Regular Programme resources by Region and Headquarters (staff and operational budget) show that still about 60.5% of allocated resources in Natural Sciences go to the Headquarters. The rest goes to the field with about 14.1%

dedicated to Africa.[32] Nonetheless, there is a trend towards increased decentralisation that can be observed for capacity building in BSE activities.

141. Figure 12 shows a sizeable shift between 2012-2013 and 2016-2017 as for the allocation of resources dedicated to Capacity Building for BSE between Headquarters and field offices. While Headquarters implemented nearly 90% of the resources at the beginning of that period, there has been a rebalance over the years with a sharp increase in the budget handled by field offices. A similar but smaller increase can also be observed by looking at extrabudgetary resources.

Figure 12 Expenditures in Capacity Building for BSE of UNESCO Headquarters and field offices



Source: SISTER database

142. Figure 12 also shows that potential for additional resources for the field is likely to be coming from extrabudgetary funding rather than the regular budget. In this regard UNESCO's Headquarters will need to support its field by training staff in fundraising but also to allot extrabudgetary funding raised by Headquarters in projects implemented by the field or jointly.

143. During the field visits to the regional offices in Cairo and Yaoundé, the evaluators observed a very small number of collaborative projects between field offices and Headquarters. The Cairo Office manages a set of activities and projects that are specific to the Region and have no connection with projects administered by UNESCO Headquarters. Given the very small budget allocated to Capacity Building activities for BSE, the office is struggling to engage in meaningful activities that can make a difference. The situation is highly similar for the Central African region in the Regional Office in Yaoundé. While contacts on a personal level between the regional science specialist and Headquarters are good, there is very little concrete collaboration on specific projects. For instance, engagement in the IBSP from the Yaoundé Office is minimal, and the Regional Office feels a lack of support in scaling up successful local pilot initiatives. In many cases, the situation is compounded by the fact that very few Central African national UNESCO offices have science specialists, meaning that there is no direct local counterpart for the science specialist to work with. This makes program development & implementation, as well as communication with national stakeholders, more difficult.

[32] 38 C/5 approved programme and budget 2016-2017

144. The evaluators consider that more synergies between activities implemented at Headquarter and field level could help rationalise UNESCO's portfolio of projects, increase the adequacy of the geographical spread of activities and critical mass of resources and the efficiency and effectiveness of UNESCO's activities in Capacity Building.

4.3.3 Coordination with UNESCO's networks and external partners

145. UNESCO's work in Capacity Building for BSE benefits from a global network of networks and partners.

146. The Abdus Salam International Centre for Theoretical Physics (ICTP) in Trieste, Italy, although operating with significant autonomy, is legally an integral part of the Natural Sciences Sector and works in close collaboration with the Section for Capacity Building in Science and Engineering. Founded in 1964 by Abdus Salam under a tripartite agreement between the Italian government, UNESCO and the International Atomic Energy Agency (IAEA), this Category 1 centre is responsible for advancing expertise in mathematics and physics in the developing countries through continuing education and research. ICTP's primary funder is the Italian Government (77% on average from 2007 to 2010) followed by IAEA (10%) and UNESCO (2%).[33] The evaluation of ICTP in 2011 highlighted *an underutilisation of ICTP by UNESCO and vice versa*. The number of collaborations has improved in the recent years. ICTP's collaboration with UNESCO takes the form of sharing resources, contacts and information as well as organizing joint activities. For instance, ICTP organized training courses in support of the SC sector's project SESAME. It will be responsible for the planned implementation of the national high and mid-level staff training plan designed for the government of Angola with UNESCO's technical assistance. The Institute organised the International Year of Light with support from IBSP. It also regularly collaborates with UNESCO in the organization of capacity-building workshops and seminars in developing countries.

147. Interviewees at UNESCO Headquarters consider that there is significant scope for further partnering of UNESCO with ICTP and of ICTP with UNESCO's network of Category 2 centres.

148. Category 2 centres are also within the scope of this evaluation. These autonomous centres are proposed and funded by Member States and are thus not legally part of UNESCO. In Capacity Building in Sciences, 22 centres are intended to help in the implementation of UNESCO's agenda: 3 centres in Africa, 10 in the Asia/Pacific, 2 in Latin America, 1 in Arab States and 6 in Europe. As a UNESCO Category 2 centre they are bound to contribute to the implementation of the Section's mandate and objectives, thanks to their own specialization in Science Policy and Capacity Building. The objectives, governance, and mandate of each centre are discussed in a contractual agreement, between UNESCO and the hosting member state.

149. Directors of all Category 2 centres are required to submit to UNESCO a biennial report with information on the contribution of the activities of the centres to UNESCO's strategic programme objectives, global and sector priorities as well as sectoral expected results, performed under the scope of the agreement including those in collaboration with field offices in whose geographical area they are active as well as with National Commissions for UNESCO. The status of Category 2 centres is subject to renewal every 6 years based on submitted information.

150. Interviewees at UNESCO's Headquarters have expressed concern regarding the increasing number of Category 2 centres given UNESCO's limited capacities to monitor their activities and expected results.

151. 170 science Chairs spread throughout the world complete this network. They serve as think tanks and build bridges between academia, civil society, research, and government policy. The UNITWIN/UNESCO Chairs Programme also covers training, research and exchange of academics. UNESCO provides a commitment for collaboration as well as image and prestige to the Chairs but is not a donor of this programme and rather encourages these institutions to mobilize other financial partners: local authorities, NGOs, international organizations, private companies and foundations. Among these science Chairs, 75 are active in Capacity Building and are somewhat mobilised in joint activities such as workshops or conferences.

[33] Evaluation of the Abdus Salam International Centre for Theoretical Physics, September 2011 IOS/EVS/PI/111 REV

152. UNESCO Headquarters and more particularly IBSP has a facilitation role to play to manage its network of networks, create synergies and scale up opportunities for collaboration.

153. A significant role in promoting North-South and South-South cooperation in science has always been played by international non-governmental organizations (NGOs). A traditional, strategic partner of UNESCO/SC is ICSU, recently complemented by other umbrella organizations like Inter-Academy Panel (IAP), Inter-American Network of Academies of Sciences (IANAS) or CARISCIENCE. Also, an important role in cooperation with UNESCO has always been played by scientific unions, such as the International Mathematical Union (IMU), the International Union for Pure and Applied Physics (IUPAP), the International Union for Pure and Applied Chemistry (IUPAC), the International Union for Biochemistry and Molecular Biology (IUBMB), the International Union for Crystallography (IUCr) and others. These networks and partners are very active within IBSP and regularly collaborate with UNESCO on Capacity Building initiatives, such as activities in mathematics education with IMU, or the Partnership in Green Chemistry for Life with IUPAC.

154. Global partnerships with the private sector have also been growing in the past years with an increasing number of collaborations with large companies or foundations such as l'Oréal, Intel, Airbus or small and medium sized companies such as the ones involved in the UNESCO-IUCr open lab initiative.

155. At country level partnerships with NGOs and the private sector were not observed. In Egypt a growing number of NGOs are active in the field of sciences such as the Arab Science and Technology Foundation or Misr el kheir. The Cairo Office is exploring opportunities for collaborations within its missions and mandate.

156. At field level UNESCO has found it difficult to engage with the private sector. Discussion during the field missions confirmed that there may be potential interest, but there is a lack of capacity and competences to access private sector funding, even for highly successful pilot projects. While this is clearly an ambition for staff in field offices, the reality has been that so far there has been no substantial private (co-)funding of UNESCO activities in the Central Africa Multisectoral Regional Office and the Regional Bureau for Sciences in the Arab States.

4.4 Sustainability of UNESCO's efforts for Capacity Building in BSE

4.4.1 Sustainability of human capacity and financial resources

157. Resources allocated to UNESCO's work in Capacity Building for BSE are very insufficient given what the Organization attempts to undertake. As described in Chapter 3 of this report, human and financial resources allocated to UNESCO's work for Capacity Building in BSE have been constantly declining in recent and historical context.

158. Human resource capacity is about ensuring that an organization has enough people with the necessary skills to achieve its objectives.

159. UNESCO staff interviewed for this evaluation has emphasised that the restructuring of the Organization has been very damaging to all of UNESCO. The reorganization involved a freeze in the recruitments of staff and several positions in the Division for Capacity Building in Basic Sciences and Engineering were not replaced after retirement of staff. Senior staff at UNESCO's Headquarters estimate a reduction of 20-25% of staff across the Organization involved in Capacity Building activities for BSE in the last 6 years.

160. Within the Natural Sciences sector, the Division of Science Policy and Capacity Building is responsible for the achievement of SO4, "Strengthening science, technology and innovation systems and policies – nationally, regionally and globally". In 2017, its Section for Capacity Building in Science and Engineering (SC/PCB/ICB), is staffed with 6 people (3 P3 and 2 P2 for ER2 and 1 P2 for ER3) in the Headquarters in Paris, under the supervision of DIR/SC/PCB.

161. Several interviewees at UNESCO Headquarters underlined the challenge of having only one Assistant Programme Specialist (P2) responsible for all engineering activities (ER3). In 2011 the Senior Programme Specialist (P5) in charge of engineering retired and the post was eliminated. From the early

1960s until the mid-1980s the engineering programme was a large activity in the Natural Sciences in terms of budget and personnel; its activities and expenditure budget were drastically reduced (cf. Figure 3 and Figure 4). According to UNESCO's 38 C/5, engineering programme activities include; Capacity Building in Member states on engineering education and hands-on engineering activities and encouraging women in engineering and identifying role models. The engineering programme is clearly under resourced. This is true for the entire unit when considering its ambitions and the large portfolio of projects and activities implemented.

162. Besides the staff in Headquarters, UNESCO can also count on a network of over 50 field offices around the world. Field offices count about 44 professionals working in the natural sciences sector. However only a few of them are actively involved in Capacity Building for BSE (cf. Table 3). The Cairo Office has a Senior Programme Specialist working on Capacity building in BSE. The Yaoundé Office has a Science Programme Specialist, and the government of Cameroon has seconded an experienced science specialist to support the work of UNESCO in the area. Most other field offices have generalists and lower grades working on SC and Capacity building for BSE.

163. Several external partners and senior staff at UNESCO Headquarters have voiced concern of the loss of much of UNESCO's expertise in the BSE. In the past, the Organization benefited from programme specialists who were internationally recognised scientists in its different areas of focus: physics, chemistry, mathematics, engineering and life sciences. These resources were in a good leadership position to provide sound advice. This loss of expertise is particularly disconcerting in Africa where the needs are major; the Nairobi Office has recently lost it programme specialist in BSE. After their retirement many UNESCO staff have not been replaced. Interviewees have also expressed the danger of having staff recruited for "political" reasons rather that purely based on their experience and competencies.

164. Inadequate staffing and lack of senior expertise increases the risk of poor performance. Human resources are often not sufficient to effectively engage in partnerships, secure extra-budgetary funds and follow up on programme outcomes and impacts.

165. The evaluation has also observed other negative impacts of the restructuring of UNESCO affecting the Organization's work environment. Interviewed staff at UNESCO Headquarters expressed the fear of loss of funding for their projects and sometimes the loss of their position. They have acknowledged that the currently challenging work environment does not favour trust, collaboration, creativity and risk taking. Besides, interviewed partners mentioned strong barriers with some of UNESCO's support sectors when introducing innovative outreach approaches or crowd funding initiatives. These barriers are partly due to the heavy bureaucracy of the Organization but also to the "fear of making a mistake", or "the fear of being redundant".

166. In this context, weak leadership is another serious risk. If there is limited ability to provide direction, coaching, training and motivation for staff within the Capacity Building in BSE unit, there may be further consequences in terms of eroding the organizational culture and morale.

167. All interviewees at UNESCO Headquarters and in field and regional offices that were consulted agreed that the Organization is constantly struggling to do too much with too little financial and human resources and that it needs a strategic orientation that can allow greater focus.

168. A number of strategies to increase UNESCO's financial sustainability were discussed with interviewees, these include:

- Reducing the number of activities supported
- Focusing more on fund-raising
- Strategically delegating work to partners and NGOs
- Focusing more on public-private partnerships
- Making a more structured use of its network of Cat 1 and 2 institutes and centres, UNESCO Chairs and field offices

169. Some results of institutional capacity building were observed at country level. Interviewed beneficiaries such as the Microbiological Resource Centre in Cairo (Cairo MIRCEN) highlighted the

numerous benefits of UNESCO's support for the Organization of an annual 5-day training workshop for young scientists. This enabled young researchers to benefit from up-to date information and methodologies in their field of research. The implication of UNESCO enabled the mobilisation of high-level instructors from all over the region and beyond. UNESCO has stopped funding this activity in 2011. MIRCEN affirms this has negatively impacted the recognition of the Organization that was well known for the mobilisation of highly recognised scientists and the introduction of advanced topics and methods. Its Director affirms that without UNESCO it is not easy to mobilise these scientists and on the long-term this impacts the dynamic of the centre and its international exposure.

170. Reducing the number of activities supported, in particular the number of dispersed small Capacity Building activities, would help to enhance UNESCO's efficiency. These activities require allocation of time for project management and reporting but have very limited medium and long term-effects. This strategy has already started within the restructuring of the Organization. Many activities implemented at field level were stopped. For example the "Camps of Excellence for Girls in Science" or the "yearly International Solar Energy Conference & Exposition in the MENA Region" (MENASOL series) bringing together public and private actors to discuss opportunities for the adoption and implementation of renewable energy. The evaluation found no evidence that these financial cuts were based on a clear strategic vision or were aiming to focus on particular domains of change of UNESCO's work in capacity building for BSE. Several internal and external interviewees have stated the clear need of a more strategic focus guiding their work. On the other hand, regional and national specialists stress that UNESCO should also be able to respond to specific local demands, and that pilot projects can be a good way for UNESCO to demonstrate the added value of Capacity Building in BSE, as long as it also offers perspective for access to future funding through governments or donors.

171. Focusing more on fund-raising, the share of regular budget allocated to Capacity Building in BSE is unlikely to increase given the Organization's continuing critical financial situation. An increase in financial resources can only come from extrabudgetary support.

172. The Natural Science Sector has set up a fundraising strategy working group that has addressed a number of recommendations to ADG/SC in 2016. The Terms of Reference for the working group were to verify and adapt the proposed SC Fundraising Strategy to ensure improved fundraising capacity for the Sector, with recommendations on any changes that would ensure increased efficiency, quality and ultimately amount of resources mobilised. Regional workshops are currently taking place with the aim to complete the SC Fundraising Strategy. A meeting to guide the final strategy is planned in July 2017.

173. Despite having a strategy, its implementation will remain difficult as programme specialists, due to lack of time, do not see it as their priority to draft proposals. Only a few proposals were drafted at Headquarters. UNESCO's office in Cairo has just recruited a member of staff entirely dedicated to fundraising activities including for BSE.

174. Only a limited number of donors have prioritised science in their programmes. Nevertheless opportunities for fund raising exist with organizations such as the European Commission, national and regional NGOs, and member states. Libya has self-funded Capacity Building programmes for BSE. In addition, the regional bureau in Yaoundé supported the PETU initiative (Central African Centres of Excellence Programme), which resulted in the African Development Bank allocating US$ 2.5m for a feasibility study. This shows that there is clear interest from donors and development partners, but that such fund-raising requires dedicated time and expertise. The regional office needs more support from Headquarters to access funding, not just for UNESCO initiatives but also to refer governments, educational organizations or other bodies to relevant funders when they have a good initiative that UNESCO cannot financially support itself.

Recommendation : Dedicate some regular programme resources and define targets to fundraising activities within a global resource mobilisation strategy to increase UNESCO's extrabudgetary resources dedicated for capacity building interventions in the BSE

175. By delegating work to partners, some of UNESCO's programme delivery mechanisms can offer great value with a limited budget. International Years have proven to be a good example how much UNESCO can achieve with small financial support of projects. International years, weeks or days bring communities together around a theme. UNESCO offers its brand but most of the work is delegated to partners.

"UNESCO is the only organization that can gather all international organizations to make the international years most effective". _ Permanent Delegation

"*When we organised the international year, there was almost no budget. We started with a website and all the organizations at local level joined and put their resources to organise activities in their countries.*" - External partner

176. Partnerships with scientific unions and NGOs confirm that UNESCO can add value to a project despite the fact that it does not fund it. Interviewees from partner organizations underlined many comparative advantages of UNESCO among which:

- Its global mandate that allows partners to expand the reach of their activities
- Its ability to catalyse global scientific cooperation
- Its ability to mobilise member states because it is a neutral, trusted and respected organization
- Its label, one of the world's most powerful brands, gives credibility to projects, helps for fundraising, and mobilisation of stakeholders

177. A minimum of resources remains necessary to operationalize such activities. Field offices claim they do not have sufficient resources to be an effective "catalyst", i.e. to determine interesting opportunities, act as a facilitator and delegate the work to national or regional public sector partners or NGOs.

178. Focusing more on public-private partnerships, UNESCO has a number of successful partnerships with the private sector including the L'Oréal-UNESCO For Women in Science partnership, the Airbus fly your ideas competition or the Intel-UNESCO collaboration in engineering.

179. These partnerships also offer a good value for money to the Organization. UNESCO does not contribute financially to the projects; its main value added for its partners is the use of its logo. UNESCO's patronage offers credibility and visibility to their initiatives. However as a non-financial partner UNESCO has less control on the activities and direction.

180. It is a good way for UNESCO to support its goals with limited resources but here again a minimum of resources is required to follow up on activities and insure that outputs and outcomes are aligned with UNESCO's priorities. Current human capacities at Headquarters only allow a follow up at output level.

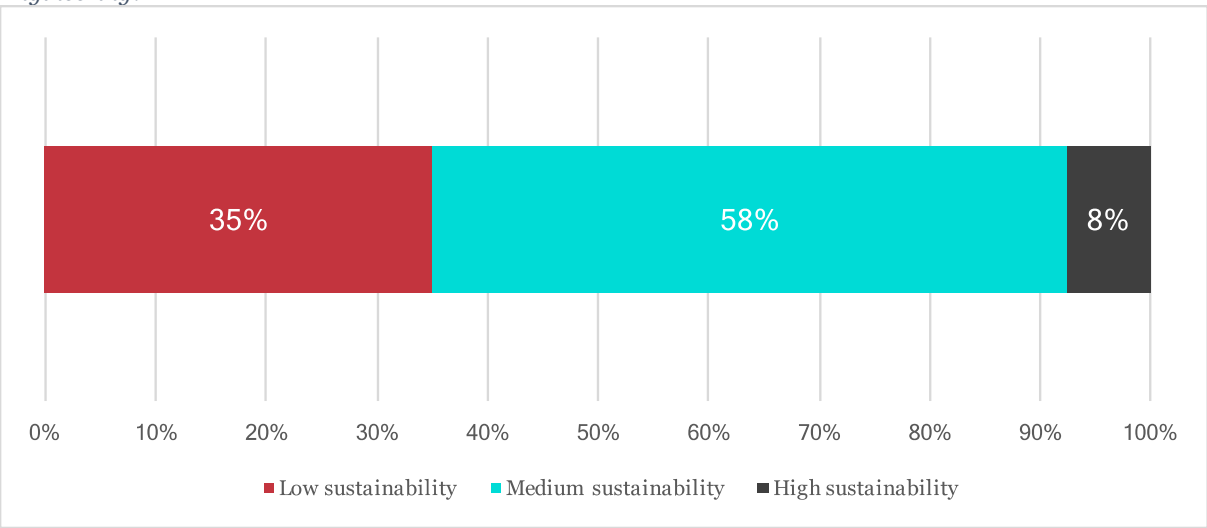
4.4.2 Making a better use of its network of Category 1 and 2 centres, Chairs

181. Interviewed staff at Headquarters and in the field agree that UNESCO should shift towards a larger delegation of its work through a better use of its network of Category 2 centres and its network of science Chairs.

4.5 Sustainability of medium-term outcomes and impact

182. The figure below shows the results of UNESCO stakeholders' assessment of the sustainability of UNESCO efforts in the field of Capacity Building in the BSE. Very few stakeholders see UNESCO's efforts as highly sustainable (meaning that no significant further UNESCO support is needed; that alternative funds are identified and available). Most fall in the category of medium sustainability, meaning that substantial support of UNESCO will be required to remain at the level of current activity. A significant number of stakeholders indicates that they see UNESCO activities in their countries of low sustainability, meaning that these programs or projects have very little prospects of continuation or follow up once UNESCO's support runs out.

Figure 13 How sustainable are UNESCO's efforts in the field of Capacity Building in the Basic Sciences and Engineering?



183. Results from the review of UNESCO's Capacity Building function published in 2007 highlighted that most UNESCO staff members interviewed recognized that Capacity Building needs to get beyond conventional inputs such as training and technical assistance in order to bring about sustainable change within institutions. However most of UNESCO's programming begins and ends there. Interviewees in particular from the field indicated often a lack of follow-up from UNESCO's side after projects have ended.

184. These findings were found to be relevant to UNESCO's current work in capacity building for the BSE. The Organization deploys significant efforts on short-term projects and activities such as competitions, prizes, workshops, conferences, etc., but in many cases very little or no effort is made to closely follow up on the immediate results, with the aim to strengthen longer term effects.

185. Beyond the provision of education and training of scientists, UNESCO aims to build institutional capacities. It aims to enhance the capacity of governments, research organizations, higher education institutions, non-governmental groups, businesses and communities to efficiently and effectively support BSE for development. This implies addressing Capacity Building on a long-term strategic level. Institutional Capacity Building must come to grips with the human, political, cultural and even psychological dimensions of organizational behaviour. Concepts such as leadership, awareness, and constituency building are part of institution building.

186. The Theory of Change for UNESCO's work in Capacity Building for BSE shows that UNESCO has the ambition to build institutional capacities for sciences and engineering and its intervention logic is built on a multi-dimensional framework with 6 domains of change including: human Capacity Building, awareness raising, creation and strengthening of networks, knowledge sharing, popularisation of science and engineering, etc. Nevertheless implemented initiatives generally have small resources and are short-term responses to one or two domains of change.

187. Interviewees expressed the constraint of working with a two-year programming cycle that gears towards short-term projects and results. An evaluation of UNESCO support to national planning for Education for All concluded that UNESCO was most successful in Capacity Building in larger extrabudgetary funded projects that have the time and resources to assess and address capacity development needs more holistically.

188. Progress reports contain no or marginal information on medium-term outcomes and impacts, in particular long-term effects on individuals, organizations or policies. UNESCO programme specialists collect data reporting on completion of activities and delivery of outputs but very little resources are allocated to the follow up of results from past programmes and projects. This weakness has frequently been reported in UNESCO's evaluations. UNESCO's shift from financial to non-financial support of projects does not allow allocation of sufficient resources for the follow-up of outcomes and impacts.

189. An additional challenge to the success of building institutional capacities in science and engineering is that UNESCO's interventions are worldwide and cover countries with different needs, institutional contexts and commitments to change.

190. Despite these difficulties, evaluators found a few examples of short-term initiatives that, under particular circumstances, have led or have the potential to lead to larger initiatives that make significant and sustained contributions to strengthening capacities in science and engineering.

191. The international year of crystallography has led to the IUCr-UNESCO open labs initiative that fosters crystallography research activities in developing countries, the first pan-African conference on Crystallography and the creation of the African Crystallography Association

192. The use of ICT offers the possibility to expand reach and impacts of UNESCO's efforts in Capacity Building for BSE. Several initiatives are implemented using open source software and libraries. UNESCO's Regional Office for Sciences in the Arab States has puts efforts into the development of a software for education in BSE targeting pre-college students. A pilot school is about to launch the project and if it is successful the project can be replicated at a larger scale and contribute to the popularisation of sciences in Egypt

193. Other examples from the field visit in UNESCO's Cairo Office show that some promising projects can fail to reach outcomes and impacts because of the lack of continuity in funding or because social and political instabilities that have been a barrier to institutional change. The lack of continuity of funding, and the lack of match-making to secondary funders also hampers sustainability in the Central African region, as was found during a field visit.

194. UNESCO's Regional Office for Sciences in the Arab States launched a science and technology initiative in 2011 calling for the creation of a Network for Expansion of Converging technologies[34] in the Arab Region: UNESCO-NECTAR. The programme aimed to strengthen national innovation systems through the creation of partnerships between academic institutions, research institutions and the private sectors in the field of education and research. A series of consultation meetings were held in 2012-2013 with policy makers, scientists and presidents of universities to assess the needs and opportunities for collaboration. The initiative was meant to start with the appointment of focal points in technological advancement and innovation centres that would be responsible for the setting up of a one-year post-graduate technical diploma programme followed by a rigorous practical training programme to fully connect the graduates to relevant industries. The Arab springs were followed by severe political instabilities that have put priorities and interests in other areas. Egypt has made over five ministerial changes between 2011 and 2017 making it difficult to progress on UNESCO's initiatives including the UNESCO NECTAR project.

195. Key requisites for long lasting effects and impacts of UNESCO's intervention include:

- A holistic programming that deals with the social, cultural, political and technical needs affecting institutional Capacity Building
- Engaging beneficiaries in the co-design of initiatives to ensure local ownership and continuation
- Local commitment to change through coherency of policy, sustainability of support and continuity
- Political commitment and stability

Recommendation: Focus on ensuring longer-term perspectives to capacity building initiatives in BSE to allow yielding higher level outcomes and impacts more likely

[34] Nanotechnologies, biotechnologies, ICTs and cognitive science

5 SWOT analysis

196. The table below lists the strengths and weaknesses of UNESCO's work in Capacity Building for BSE and opportunities and threats regarding the future as identified during the evaluation. This overview is based on analysis of documentation, the interviews conducted (both with internal and external stakeholders), the evaluation survey, the field visits and reflects the interpretations by the evaluation team members.

Table 5 SWOT analysis of UNESCO's work in Capacity Building for BSE

Strengths	**Weaknesses**
- As the only UN agency with a mandate in Sciences, UNESCO is uniquely positioned to deliver institutional Capacity Building in the basic sciences and engineering: - UNESCO has a global mandate and a network of field offices and partners that can deploy its global vision locally - UNESCO is seen as a special entry point to be trusted and listened to by member states - UNESCO is seen as a neutral platform which is ideal for its role as a facilitator or catalyser for global cooperation - It brings together national, regional and international scientific organizations and networks - UNESCO has one of the world's most powerful brand/logo offering credibility and visibility to programmes - It supports organizations that are highly recognised for their effectiveness such as ICTP, TWAS and SESAME - It has a unique network of media partners around the world that can increase the impact through outreach activities	- The Organization's restructuring has been very damaging to the portfolio of activities and moreover to the financial and human resources capacity with some key activities entirely dependent upon retired, but still active staff. - UNESCO has overambitious expectations and scope compared to the limited resources allocated - Engineering has particularly suffered from lack of resources and is not currently in a position to achieve meaningful results or impacts - Centralisation remains strong - Bureaucracy slows progress of activities and affects the efficiency of UNESCO - A post restructuring environment that does not allow space for creativity and personal initiative but rather competition and lack of collaboration - No leading sector for Science education - Weak monitoring and evaluation of outcomes and impacts - Inadequate focus on advocacy given that only a limited number of Member states and key donors are interested in funding activities for capacity building in BSE - Challenges in the governance and mandate of the IBSP - Within the overall constrained resource framework Priority Africa was not given the necessary resources to attain its ambitions
Opportunities	**Threats**
• The planning for the next Programme and Budget for the period 2018-2021 is an opportunity to define a realistic and better focused strategy for Capacity building in BSE in line with UNESCO's current resources and with UNESCO's strengths and comparative advantages	• Lack of focus, risking that with too many strands of activities resources are further diluted and consequently, inability to ensure a critical mass of resources and capacities to go on scale for fewer activities • Insufficient financial resources lead to achievement of small scale projects with no

• Consolidating the link between science policy development and capacity building in BSE to support upstream policy work as they represent the foundation on which other programmes can be developed • The role of Science and Innovation is increasingly present in development agendas, and particularly highlighted by the transition from MDGs to SDGs, UNESCO needs to clearly define its role and contribution to capacity building in the BSE to the SDG agenda • There is room for making better use of UNESCO's Category 2 centres and UNESCO's Chairs in explicitly contributing to the Organization's mandate • Dedicating adequate resources responsible for the implementation of the SC fundraising strategy at Headquarter and field levels to strengthen advocacy for investing in Sciences and Innovation: • in particular as emerging countries are increasingly capable of bringing their own funds to the table for investments in BSE • as there is increasing interest from bilateral donors to fund BSE • Field offices can be better able to raise funds at country level (EU and bilateral donors implementing directly in the Field) • Exploring opportunities for partnerships with the private sector with a view to the increasing interest in Sustainable Development • Exploring better synergies and complementarity between activities implemented at Headquarter and field level • Member states from LMICs have expressed interest in UNESCO offering benchmarking for science education • To focus on science-lagging developing countries in one or maximum two geographic regions.	prospect of long-term effects and risks dispersion • Working without focus on achieving policy level impact • Inadequate staffing and lack of expertise lead to suboptimal performance • Lack of trust in the work environment • Too limited human capacities for fundraising • Untrammelled growth of number of UNESCO Category 2 Centres threatens UNESCO's capacity to follow up on performance of these centres • Some member states will remain weak and fragile with limited capacity, requiring more UNESCO support than available. • Key positions not being filled and frequent staff turnover can have negative effects on the leadership of the unit

6 Conclusions

197. Given that BSE lost its role as a key strand of work in the Natural Sciences Sector following the financial crisis at UNESCO when Member States rated it as a low funding priority, the evaluation concludes that within a context of continued financial restrictions there is an urgent need to rethink UNESCO's capacity building work in the Basic Sciences and Engineering. There are opportunities for more clearly positioning UNESCO's contribution in this area to the Agenda 2030 but this can be only done with the help of its networks and partners. Furthermore, current challenges cannot easily be overcome within the context of a constantly reducing resource framework. The UNESCO SC sector therefore needs to develop a focused and realistic strategy considering how to best invest the available resources and, while pursuing a targeted fundraising strategy delegate and reallocate activities in line with the comparative advantages in the UNESCO family and the needs of Member states in particular in Africa. Capacity building in the BSE should not be considered a separate function but as an integral part of the SC sector mandate, and the SC sector should explore on how the capacity building function can best support and complement the upstream policy work of the sector in order to achieve longer-term and sustainable impact.

6.1 Relevance

UNESCO is uniquely positioned to deliver institutional capacity building in the BSE at a global level, in particular by positioning itself for highlighting the importance of science across the sustainable development agenda and by drawing attention to women in science.

198. Other international organizations such as the African Union, the NEPAD, the World Bank or the Bill and Melinda Gates Foundations contribute to strengthening Capacity Building in science but they generally focus on a specific thematic and/or region. No other players in science and development target institutional Capacity Building in basic sciences and engineering at a global scale, or promote women in science. UNESCO can impartially help narrow the scientific gap and support member states from LMIC to compensate their deficiencies in BSE.

199. While BSE are considered key to all sustainable development aspects, capacity building for BSE contributes in particular to SDG 4 (on quality education), SDG 9 (on industry, innovation and infrastructure) and SDG 17 (on partnerships for the goals. UNESCO also facilitates global cooperation, while the focus on local ownership of interventions strengthens their national relevance

200. Furthermore, UNESCO disposes of substantial comparative advantages:

- UNESCO has strong credibility. It is seen as a special entry point to be listened to by member states
- UNESCO has a network of field offices and partners that can deploy its vision locally
- UNESCO is a neutral broker and facilitator. It is seen as an impartial platform that brings together national and international scientific organizations, researchers and networks
- UNESCO has one of the world's most powerful brands/logos offering credibility and visibility to programmes displaying it

201. Interventions at national level are generally very relevant to the needs and priorities of beneficiary countries as these are built in collaboration with UNESCO National Commissions and relevant ministries in the countries. Very often other stakeholders are also involved in the design of the interventions at national level such as researchers, inspectors, teachers, etc. There is a need however to better embed national level interventions in the organizational strategy and identify to what extent they contribute to the expected results at organizational level.

Given the overall limited and continuously decreasing human and financial resources, the expectations for UNESCO's capacity building work in BSE is overambitious and resources dispersed, while a targeted complementary fundraising strategy is still lacking.

202. UNESCO's capacity building work in BSE is composed of a variety of thematic subject areas and multiple strands of work leading to dispersion of already limited human and financial resources. Activities are as diverse as workshops, training, seminars, research fellowships, development of e-learning tools, summer camps, creation/support of networks and partnerships, publications, open access resources, policy guidelines, competitions, exhibitions, international days and years. Frequent restructuring has led to loss of expertise and discontinuation of some strands of work. For example, engineering and renewable energy are areas that have particularly suffered from lack of resources and are no longer in a position to achieve meaningful impacts.

203. The evaluation therefore calls for a focused and clearly articulated strategy that lays out what realistically can be achieved and that can guide UNESCO's capacity building work in BSE by prioritising thematic areas, delivery mechanisms and geographical scope. Identifying areas where UNESCO can delegate or work though its partners and networks, or where it is to be complemented by extrabudgetary resources, should be part of a targeted fundraising strategy.

Issues relating to inclusion of youth, UNESCO's priorities on Africa and gender equality have been fairly reflected in the Capacity Building work in BSE. Resources allocated to Priority Africa are however insufficient considering the needs for the African region and for meaningfully contributing to UNESCO's Operational Strategy for Priority Africa.

204. Despite a very high relevance of Capacity Building in BSE to African needs this area was given a low funding priority by UNESCO's member states during the prioritisation exercise conducted in 2013

205. Regional offices in Africa operate with very low levels of human and financial resources (US$15-30k per year)

206. Despite urgent needs many African countries have not benefited from UNESCO's interventions in Capacity Building in BSE for years

6.2 Effectiveness and impacts

The current programming, implementation and reporting provides mainly short-term perspectives while capacity development work would suggest a more holistic vision aiming at achieving and measuring results at the medium- and longer-term outcome levels.

207. Measuring, monitoring and evaluating outcomes and impacts of UNESCO's work beyond the output level remains challenging, in particular in the absence of an adequate monitoring framework and in a context of scarce resources. Demonstrating longer-term achievements of UNESCO's capacity building work in BSE could provide convincing evidence for investing in sciences.

208. UNESCO has implemented over 104 activities in the field of Capacity Building for BSE between 2011 and 2017 with a wide range of outputs including trainings, workshops, seminars, research fellowships, development of e-learning tools, summer camps, creation/support of networks and partnerships, publications, open access resources, policy guidelines, competitions, exhibitions, etc. In line with the reconstructed Theory of Change these interventions have to some extent led to outcomes in terms of increased capacities in research and education at individual and organizational levels, but it is not articulated how these are feeding into an overall and longer-term perspective towards increased institutional capacities.

209. Reporting is mainly on outputs but once a project is finished no resources are allocated to collection of data on longer-term outcomes and impacts. Collecting data on outcomes and impacts has a cost, it requires data collection among programme beneficiaries (policy makers, researchers, teachers, students, parents, etc.) The budget and time allocated for this evaluation also limited a more

comprehensive collection of robust data on the outcomes in all aspects of UNESCO's work in capacity building in BSE. However the desk research, field visits and interviews conducted bring some insights on the results at country level, but lack of continuation and follow up has in some cases limited the longer-term and sustainable results[35] .

210. Activities are generally implemented as planned and outputs achieved. However UNESCO works with a number of challenges for example high political instability in some countries, or cultural and political barriers to change, that further put obstacles to also achieving higher level results. [36]

211. Some UNESCO delivery mechanisms such as international years are extremely effective to scale up activities geographically and give rise to new initiatives such as the UNESCO IUCr Open labs in crystallography. The success of international years is largely attributable to UNESCO's role as a facilitator or catalyst for global cooperation.

Despite its confirmed high relevance, the IBSP has not reached its full potential, not least due to the heavily restricted resources, the lack of a clearly articulated implementation plan for its new strategy, currently inefficient governance structures and the absence of a functioning accountability mechanism.

212. Despite constantly decreasing resources, the IBSP has to some extent played a catalytic and facilitator role and provided a global forum for exchange on science topics. Although its results have been found as below the expectations, it contributed to several significant initiatives such as the establishment of new Category 1 and Category 2 centres, the creation of the African Women Mathematics Association, as well as the initiation of the International Day of Light or the International Years on Chemistry or Crystallography.

213. Despite the agreement on its high relevance, the IBSP was found less successful in reaching its potential. Despite the affirmation of a renewed focus of the IBSP strategy on science, technology, engineering and mathematics (STEM) education, the programme does not have a clear intervention logic and action plan that can demonstrate how its objectives will be achieved and how it intends to mobilise its network of partners, in particular Category 2 centres and UNESCO Chairs. The governance structure of the programme is considered inefficient. Its Scientific Board functions as an advisory body to the Director General, it does not take decisions that can be directly implemented by UNESCO. Furthermore, unless the programme is resourced properly, it will be unlikely that IBSP can deliver on its expected results.

214. Inefficiency of the current governance structure is mainly explained by:

- a strategy with no intervention logic and no monitoring and evaluation framework
- the size and format of the Scientific Board is not adequate for decision making: the 10th Scientific Board meeting led to a small number of concrete collaboration proposals that were not fully discussed during the meeting
- expectations from IBSP networks and partners are unclear : among interviewed partners some have stressed that they are unaware of how they can contribute to the programme and what will happen after the Scientific Board meeting
- the resources allocated to the Secretariat for the follow up on actions and recommendations are limited : participants to the 10th Scientific Board meeting emphasised the absence of follow-up on recommendations from the 9th Scientific Board meeting

[35] an example is the discontinuation of funding for capacity building at the Microbiological Resource Centre in Cairo (Cairo MIRCEN)

[36] This was the case for example of the UNESCO NECTAR programme in the Arab region that was launched in 2011. Even when the government is committed and involved in the design and funding of a project, progress in implementing can be very slow because of inefficient governance.

215. IBSP has contributed to a number of initiatives, nonetheless its insufficient resources and inefficient governance has not allowed the programme to make a significant demonstrable difference in terms of coherence, effectiveness and scale of UNESCO's Capacity Building work. A more active mobilization of IBSP's networks and partners would certainly offer much larger opportunities for interdisciplinary collaborations at national, regional and international level. For example, several regional field offices did not know about the programme and its activities.

6.3 Utility and sustainability

If not addressed on a longer-term, holistic and strategic level and through providing input that goes beyond conventional one-time delivery mechanisms such as training and technical assistance, it will remain unlikely that UNESCO's efforts in capacity building in BSE bring about sustainable change within institutions.

216. Despite the overall appreciation of UNESCO's capacity building initiatives and the expected high likelihood of increased capacities in research and education at individual, or organizational levels resulting therein, sustainability of UNESCO's capacity building interventions in BSE at the institutional level is rated low.

217. Beyond the provision of education and training of scientists, UNESCO aims to build institutional capacities. It aims to enhance the capacity of governments, research organizations, higher education institutions, non-governmental groups, businesses and communities to efficiently and effectively support BSE for development. This implies addressing Capacity Building on a long-term strategic level. Yet implemented initiatives generally have small resources and are short-term responses to one or two domains of change. UNESCO's Capacity Building work in BSE is therefore unlikely to contribute to build institutional capacities and effects on individual and organizations are unlikely to be sustained after UNESCO's intervention.

218. An additional challenge to the success of building institutional capacities in science and engineering is that UNESCO's interventions are worldwide and cover countries with different needs, institutional contexts and commitments to change.

219. Despite these difficulties, evaluators found a few examples of short-term initiatives that, under particular circumstances, have lead or have the potential to lead to larger initiatives. For example the International Year of Crystallography has led to several other initiatives such as the Open labs in crystallography, the creation of the African crystallography Association or the new membership of 10 countries to the International Union of Crystallography (IUCr).

220. Pre-or enabling conditions for long lasting effects and impacts of UNESCO's intervention include:

- A holistic programming that deals with the social, cultural, political and technical needs affecting institutional Capacity Building
- Engage beneficiaries in the co-design of initiatives to ensure local ownership
- Local commitment to change through coherency of policy, sustainability of support and continuity of funding
- Political stability

6.4 Partnerships and Cooperation

UNESCO's various efforts to strengthen synergies and better utilising its partnerships and cooperation with the multitude of networks and partners could be better coordinated and more clearly positioned within the overall strategy of its capacity building work in BSE.

221. Networks of entities such as TWAS, CERN, ICTP or SESAME are very active, whereas their interaction with and involvement of UNESCO field offices, science Chairs and UNESCO Category 1 and

Category 2 centres is less evident. UNESCO's partnerships with the private sector have also been growing in the past years with an increasing number of fruitful collaborations with large companies such as Intel, Airbus or small and medium sized companies at Headquarters level. Nonetheless, there seems little overall coordination among the different initiatives.

222. UNESCO's effort to establish partnerships and synergies in Capacity Building for BSE have been successful as demonstrated by numerous examples. Conferences, events and consultations organised by Headquarters and by field offices mobilised high-level scientists, teachers, research organizations, and private sector companies from the regions and beyond. [37]

223. UNESCO plays an important role in the development of numerous networks[38], as it has the political legitimacy and the practical capability to support such initiatives, especially in low-capacity settings such as Central Africa.

Effective intersectoral programming and clear leadership roles in science education are yet to be achieved.

224. Science education is a domain at UNESCO that requires collaboration and coordination between the Education and Natural Sciences sectors. Despite the good relationships and close cooperation between the two sectors at the operational level, it is currently not clear who leads on this subject within UNESCO. This becomes a particular challenge when third partners are involved or when decisions are required. While a shared overall responsibility and cooperation on crosscutting topics such as girls and Science, Technology, Engineering and Mathematics (STEM) education or Inquiry-Based Science and Technology Education (IBSE) is necessary, overall leadership in science education could be transferred to the Education Sector. Effective intersectoral programming in this field establishes a comparative advantage for UNESCO in particular in the context of the cross sectoral and holistic nature of the SDG 2030 Agenda.

6.5 Efficiency

The human and financial resources invested in UNESCO's work in Capacity Building for BSE are inadequate considering UNESCO's ambitions and Theory of Change. More synergies between activities implemented at Headquarter and field level could help rationalise UNESCO's portfolio of projects and increase the adequacy of the geographical spread of activities and resources.

225. Many regional and field offices are not active in Capacity Building for BSE including in regions where needs for support exits such as sub-Saharan Africa.

226. Regional offices in Cairo and Yaoundé have only one programme specialist covering up to 10 countries in the region with an annual budget of US$ 15 000 to US$ 30 000.

[37] These include the Network for Expansion of Converging Technologies (NECTAR) initiative organised a consultation gathering research organizations, academics and policy makers from countries in the Arab region. The programme aims to foster South-South and North-South networks of universities and technological innovation centres. Several other programmes and initiatives conducted by the Cairo Regional Bureau for Sciences in the Arab States promote South-South cooperation: i) the series of MENASOL conferences and exhibitions for the promotion of solar energy gathered partners from the public and private sectors from North Africa, the Middle East. They also gathered numerous private companies such as SIEMENS, Alstom, Total, HUIYIN-Group, Sunpower, etc.

[38] For instance, the Multisectoral Regional Office in Yaoundé was key in facilitating a number of South-South networks, for scientists, education leaders as well as policy makers. In terms of promoting South-South collaboration in research, UNESCO is supporting the creation of a network of researchers that focus on the cross-border challenges around Lake Chad. In addition, UNESCO supported the organization of the first pan-African conference on crystallography on 6 October 2016 in Cameroon. At the level of education leaders, UNESCO has supported the development of a Central-African network of leading polytechnical universities that are now in the process of setting up Centres of Excellence. At the level of policy making, the regional bureau in Yaoundé has facilitated a high-level policy dialogue on the role of innovation and science for sustainable development, and supported policy monitoring through organising regional Capacity Building workshops of the African Observatory for Science, Technology and Innovation (AOSTI).

227. The restructuring has put high pressure on existing staff in the Capacity Building in BSE unit and in the entire organization:

- Freeze in recruitments and elimination of posts resulted in:
    i. only one Assistant Programme Specialist (P2) responsible for all engineering activities (ER3)
    ii. transfer of tasks and responsibilities to existing staff
    iii. fear of redundancy leading to a negative working environment (competition, lack of confidence and personal initiative, demotivation)
- Loss of UNESCO's expertise in the BSE at Headquarters and in the field:
    i. Some of UNESCO's retired staff that were not replaced were internationally recognised scientists in a good position to provide sound advice in physics, chemistry, mathematics, engineering and life sciences
    ii. "Political" recruitments are significantly harmful to the organization in the context of scarce resources
- UNESCO does not have the necessary resources to implement a fundraising strategy for BSE. The current extrabudgetary portfolio for Capacity Building in BSR covers only a small part of its intervention logic
- An inability to provide clear direction, coaching, training and motivation for staff within the Capacity Building in BSE unit can harm the organizational culture and morale

228. Despite these difficulties the Organization has managed to undertake over 104 activities since 2011. UNESCO's support to organizations such as ICTP and TWAS brings significant value to the Organization with limited resources. These organizations undertake activities that highly contribute to the UNESCO's Theory of Change in particular in the domains of research and science education.

229. Given the current resource situation UNESCO staff and external stakeholders and partners all agree that UNESCO's efforts in Capacity Building in the BSE should focus on specific types of interventions within two or three major priorities.

230. The current fundraising strategy and extrabudgetary portfolio is still inadequate to effectively support UNESCO's comparative advantages in BSE Capacity Building to contributing to the 2030 Agenda. It comprises donations from members for selected programmes or organizations and self-funding programmes. The portfolio is not large enough to cover all of UNESCO's targeted domains of change in Capacity Building for BSE. Although a limited number of donors have prioritised science in their programmes opportunities for fund raising exist with organizations such as the European Commission, national and regional NGOs, and Member States.

231. Staff at UNESCO Headquarters and in the field had so far limited human capacities and no clear mandate for fundraising activities. SC is currently defining a fundraising strategy for the Sector. It is essential that the necessary resources are invested at Headquarters and in the field to effectively deliver the strategy.

232. The recent decentralisation of regular budget should lead to increased decentralisation of extrabudgetary resources. This entails engagement of the field in raising funds locally and jointly preparing proposals between Headquarters and field offices and between different field offices.

7 Recommendations

233. Based on the above findings, the evaluation recommends for the Natural Sciences (SC) Sector to better focus its capacity building function in support of its upstream policy work and to consider a reallocation of activities in line with the comparative advantages in the UNESCO family. The development of a focused strategy could entail transferring capacity building activities to partners such as the ICTP, TWAS, UNESCO Chairs and Category 1 and Category 2 institutes. Furthermore, the mandate of the IBSP should be reconsidered and the programme either be discontinued or refocused. As far as STEM education and Inquiry-Based Science and Technology Education are concerned, the leadership for these should be clarified and could be transferred to the Education Sector with SC providing support when required.

Recommendation 1:

Define a strategy for UNESCO's capacity building work in BSE that focuses on supporting the Natural Sciences Sector's upstream policy work and reallocate activities in line with the comparative advantages in the UNESCO family

234. Possible action points for UNESCO's SC Sector, Division of Science Policy and Capacity Building (SC/PCB) and Section for Capacity Building in Science and Engineering (SC/PCB/CB) include:

- Draft a more focused strategy concentrated on two or three priorities per region identified in consultation with Member States
- Ensure the strategy has a regional focus to enhance relevance to the needs
- Focus on UNESCO's normative function and transfer downstream capacity building activities to partners such as the ICTP, TWAS, OWSD, UNESCO Chairs and Category 2 institutes.

Recommendation 2:

Strengthen the SC sector's engagement in Africa.

235. Possible action points for the SC sector include:

- Allocate a major part of the resources to Priority Africa (80%) where needs are greatest
- The SC sector should ensure that field offices have a critical mass of human resources operating in natural sciences and more specifically in Capacity Building for BSE
- Given the limited possibility for new recruitments, transfer of staff from Headquarters or other field offices to Africa, and/or other opportunities such as secondments from national governments, or specialised institutions from within its networks and partners could be considered.

Recommendation 3:

Improve the monitoring and evaluation of UNESCO's work in Capacity Building for BSE.

236. Possible action points for the SC Sector include:

- The SC Sector should strengthen its evaluation culture and practice and define a monitoring and evaluation framework for it activities in Capacity Building in BSE as part of an overall Theory of Change or intervention logic
- The SC Sector should improve its monitoring at the level of outcomes and impacts involving its partners and beneficiary countries in the data collection of a limited number of outcome indicators per project.

Recommendation 4:

Reconsider the mandate of IBSP within UNESCO's limited resource framework, by either discontinuing IBSP, or refocusing it by scaling back its function.

237. Possible action points for the SC Sector include:

- Discontinue IBSP as a programme and continue the Capacity Building function in support of the SC Sector's upstream policy work in sciences without IBSP as a framework, or
- In light of the SC Sector's limited resources and ineffective governance for IBSP that restrict its ability to achieve the very ambitious objectives in its strategy, it would be more realistic to limit the IBSP's function to an advisory body, a network or community of practice with an annual networking event and clearly defined streamlined objectives.

Recommendation 5:

Dedicate some regular programme resources and define targets to fundraising activities within a global resource mobilisation strategy to increase UNESCO's extrabudgetary resources dedicated for capacity building interventions in the BSE.

238. Possible action points for the SC Sector include:

- UNESCO should allocate dedicated resources for the implementation of the SC fundraising strategy in a coordinated manner at Headquarters and field levels:
    i. At least one person fully invested in fundraising at Headquarters
    ii. At least 1/4 FTE in regional offices
- Headquarters should provide guidance and support for fundraising at field level
- Headquarters should pursue efforts to ensure coordination and sharing of extrabudgetary funds when relevant.

Recommendation 6:

Clarify leadership on science education within UNESCO.

239. Possible action points for the UNESCO SC and Education Sectors include :

- Clearly allocating and communicating leadership on science education to external partners.
- Regarding STEM education and IBSE, the leadership for these could be transferred to the Education Sector with the SC Sector providing support when required.

Recommendation 7:

Focus on ensuring longer-term perspectives to Capacity Building initiatives in BSE to allow yielding higher level outcomes and impacts.

240. Possible action points to UNESCO's SC/PCB/CB Section:

- Focus on BSE capacity building initiatives within a longer-term perspective to allow yielding and monitoring higher-level and longer term outcomes and impacts within the overall Theory of Change. Short term initiatives should be clearly placed within and contribute to the overall Theory of Change capacity building portfolio in BSE and only be funded:
    i. as part of a larger holistic approach at country or regional level
    ii. in experimental/pilot projects where scaling up or rolling out at a larger scale is possible
    iii. where continuation or follow up can be guaranteed by UNESCO itself or through the support of its networks and partners.

Appendix A Evaluation questions

Evaluation criterion	Evaluation questions
Relevance	What are UNESCO's comparative advantages with a view to other players in science and development who are contributing to the 2030 Agenda for Sustainable Development in this field?
	What subject areas should be maintained as the priority focus in the future and in light of the 2030 Agenda?
	To what extent have outcomes and interventions at national level been relevant to the beneficiary countries' needs and priorities?
	To what extent have issues relating to inclusion of disadvantaged groups, youth and UNESCO's priorities on Africa and gender equality been reflected in the Capacity Building work in BSE?
Effectiveness and impacts	What have been the key outputs and to what extent have the interventions in this field led to outcomes in terms of increased capacities in research and education at institutional, organizational and individual levels? To what extent were activities implemented as planned and outputs achieved?
	What difference has UNESCOs Capacity Building work in BSE made at the country level overall and with a view to inclusion of disadvantaged groups, and girls and women?
	Does the current monitoring framework allow capturing the results at the different levels of intervention?
	Is the IBSP optimally geared towards contributing to delivering the expected results? What difference has the programme made in terms of coherence, effectiveness and scale of UNESCO's Capacity Building work?
Efficiency	Are the resources invested in the Capacity Building work adequate and justified by the results achieved?
	Do the results achieved by the IBSP justify its management costs? What measures could lead to increased synergies and cost efficiencies?
	Given the current resource situation what aspects of UNESCO's efforts in Capacity Building in the BSE should be given priority? Which, if any, should be discontinued?
	What are the optimal future management and operational arrangements including distribution of roles and responsibilities at Headquarters and in field offices for efficient planning, implementation and monitoring of activities?
	Does the current fundraising strategy and extrabudgetary portfolio support UNESCO's comparative advantages in contributing to the 2030 Agenda?
Utility and sustainability	Has UNESCO's Capacity Building work in BSE contributed or is likely to contribute to long-term effects for individuals, organizations and institutions?
	What are the pre-or enabling conditions that must be in place to facilitate such lasting effects? What obstacles and risks need to be taken into consideration?
Partnerships and Cooperation	To what extent have partnerships been sought and established and synergies been created in the delivery at the country level?
	What is the contribution of UNESCO's Capacity Building work in creating opportunities for South-South cooperation?

Appendix B Key documents consulted

Relevant evaluation reports:

- Evaluation of the World Academy of Sciences for the advancement of science in developing countries (TWAS) and its components (2016)

http://www.sida.se/English/publications/Publication_database/publications-by-year1/2016/september/evaluation-of-sida-support-to-twas-owsd-and-gis---final-report/

- Evaluation of the Abdus Salam International Centre for Theoretical Physics ICTP (2011)

http://unesdoc.unesco.org/images/0021/002118/211877E.pdf

- Evaluation of UNESCO's Strategic Programme Objective 4: Fostering Policies and Capacity-Building in Science, Technology and Innovation (2010)

http://unesdoc.unesco.org/images/0018/001874/187492E.pdf

- A Review of UNESCO's Capacity-Building Function, 2007

http://unesdoc.unesco.org/images/0014/001499/149993E.pdf

- Lessons from the field reform in Africa, 2015

http://unesdoc.unesco.org/images/0023/002344/234441E.pdf

- Evaluation of Priority Africa, 2012

http://unesdoc.unesco.org/images/0021/002177/217790E.pdf

Other reference documents:

- World Conference on Science – Science for the twenty-first century: a new commitment. (2000)

http://unesdoc.unesco.org/images/0012/001207/120706e.pdf

- Statutes for an IBSP Scientific Board 169 EX/13
- Rules of Procedure of the IBSP Scientific Board
- Audit of the International Basic Sciences Programme (2015)
- 39 C/REP/14, 38 C/REP/14, 37 C/REP/22, 36 C/REP/22 and 35 C/REP/22 documents for General Conferences

http://unesdoc.unesco.org/images/0023/002344/234477e.pdf

http://unesdoc.unesco.org/images/0022/002228/222867e.pdf

http://unesdoc.unesco.org/images/0021/002118/211887e.pdf

http://unesdoc.unesco.org/images/0018/001837/183749e.pdf

- Document: UNESCO's mandate for the basic sciences: Challenges and prospects (185 EX/11)

http://unesdoc.unesco.org/images/0018/001888/188836E.pdf

http://unesdoc.unesco.org/images/0018/001888/188836E.pdf

- Document: Development and outcomes of the IBSP (35 C/INF.18)

http://unesdoc.unesco.org/images/0018/001838/183823e.pdf

- Reports of the IBSP 9th and 10th Scientific Board Meetings
- UNESCO C/4 Medium Term strategies and C/5 Programmes and budgets
- EX/4 report documents
- UNESCO SC website
- Websites of TWAS, IAP, IAMP, OWSD, GenderInSITE and ICTP
- UNESCO Report on Engineering (2010)
- UNESCO Science Report: Toward 2030 (2015)
- Report on the International Year of Light (2016)
- Functional Organigram of the Natural Sciences Sector
- UNESCO Priority Gender Equality Action Plan II 2014-2021

Appendix C Mapping of UNESCO's Capacity Building activities in BSE

The UNESCO SC Sector is involved in a wide array and diversity of activities in partnership with national governments, private companies, as well as other institutions and organizations. A mapping of these actions needs to take into account the intricacy of this involvement for building human and institutional capacities in science and engineering. The following non-exhaustive lists of activities undertaken between 2010 and 2017 (Table 7 below.) are based on data sources including the Executive Board reports by the Director General on the execution of the programme adopted by the General Conference (Ex4) and Approved budgets and programmes (C5).

The reports to some extent lacked the amount of details that would allow to clearly identify the actual role of UNESCO in every of these actions or the budget and time devoted to them, however a change in the way of reporting over the previous two biennia 2014-2015 has been observed. While earlier reports mainly provided information on the section's work in terms of activities conducted, reports over the last two biennia provided more details in terms of achieved indicators. Furthermore, the theory of change workshop helped to pin-point flagship activities and the role of the involved stakeholders from the perspective of the Section for Capacity Building in Basic Science and Engineering, Division for Science Policy and Capacity Building, SC Sector. A summary of the activities discussed during the ToC workshop is provided in Table 8 below.

Table 7 Non exhaustive list on implemented key activities

Reinforcing capacity-building in the sciences and strengthening science education (2010-2011)
Science education at various levels strengthened through IBSP and its action in promoting the use of satellites for innovative science education; science education policies promoted and quality of science teaching improved, with special focus on Africa and on the participation of girls and women
• Pilot testing of a course on molecular biology in Latin America through a workshop in Chile • IBSP evaluation of proposals for an International Satellite for Science Education and Basic Sciences • Consultations with science education experts in the Jakarta Office • Cost sharing capacity-building activities between IBSP and developing countries • Workshops on Active learning in Optics and Photonics in Algeria, the Philippines and Columbia • Set up of a chair in Mathematics and Theoretical Physics in Palestine- Work with ICTP, ICMPA • Microscience workshops and consultative meetings in Chile, Kuwait and Sudan • Adaptation of materials to the Sudanese curriculum • Participation in the Palestine Science Festival • Micro science kits acquired by Tanzania. Ethiopia is planning to adapt UNESCO teaching material to its curriculum • Workshops and consultative meetings in Chile, Kuwait and Sudan • Agreement between IBSP and the International Society for Optics and Photonic
Human and institutional capacity-building in the basic sciences strengthened to foster applications for societal needs and encourage careers in science, with emphasis on Africa and on gender equality
• International School on Open Access in Rabat with IBSP and CERN • Development of activities in Category 2 centres in New Delhi and Rehovot • IBSP cooperation with CERN, ICGEB, SESAME, TWAS, ICTP, IBRO, IUBMB, and IUPACm • Free distribution of peer-reviewed journals in biotechnology in developing countries • ICGEB-TWAS-UNESCO/IBSP Joint project in Basic Molecular Biology • Work on SESAME • Training of 50 participants in a summer school in South Africa on biology • 5 neurosciences training workshops in Africa by IBSP • Co-organization of the Third Human Variome Project meeting • International Year of Chemistry

- Project to launch a Portuguese Centre for Advanced Training in the Basic Sciences

Member States supported in engineering capacity-building and innovation as well as the development of relevant policies

- Publication of the report Engineering: Issues, Challenges and opportunities for development
- Support for networks of women engineers in Africa
- ICTs to enhance engineering education in the Arab region
- Support to professional engineering networks and universities in Asia-Pacific
- Project "Innovation for Development"
- 2 projects in the Southern African Development community on engineering
- Nigerian Centre in Biotechnology at the University of Nsukka established
- Teacher training in physics in Rwanda: IBSP and CERN

ICTP

- Organization of Physware, a workshop on Entrepreneurship for physicists and engineers from developing countries
- Advising the National Assembly in Nigeria in S&T
- Co-sponsoring (with AAS) of the African Physical Review
- Development and deployment of an early warning system for disease outbreaks in Africa
- Joint project with the International Telecommunications Union to transfer low-cost wireless technology know-how to Africa
- Organization of 50 conferences and workshops, and of regional training activities, especially in Africa
- Support for 6 affiliated centres, 12 active projects and 10 networks
- Signature of new MOUS with Brazil, Argentina and Mexico
- Organization of "ICTP After 45: Science and Development for a Changing World"
- Agreement for a formal Ph.D. programme as an extension of the existing Diploma programme

Sources: 185EX4, 186EX4, 187EX4, 189 EX4,35C5

Building capacities in the basic sciences, including through the IBSP, in engineering and for the use of renewable energy (2012-2013)

Innovative interdisciplinary science and engineering curricula developed, including in such fields as renewable energy

- International Women's Day workshop on Women in Engineering organized with WFEO
- Assessment of the state of science education of some Asian Member States within the COMPETENCE project and Connect-Asia Network
- Establishment of a new curriculum in the Maldives
- UNESCO Cairo Office convinced the Future University in Khartoum to integrate new areas of science in its curriculum
- Discussion with universities in six countries to restructure engineering curriculum
- Publication of a quarterly Energy bulletin by the International Sustainable Energy Development Centre (ISEDC) - Category 2
- Organization of a workshop on African Women in Mathematics
- Organization of Summer Schools (Malaysia) with the support of COMSAT
- Consultation for an implementation of international accreditation standards for engineering education with private sector and institutions
- Collaboration with La Roche Hoffman for the World Library of Science
- Establishment of 2 UNESCO Chairs (Republic of Korea and Uruguay)
- Establishment of Category 2 centres in Denmark and China
- Hosting of the Opening Week of the Mathematics of Planet Earth 2013

Institutional research capacity strengthened through networked centres of excellence, South-South and North-South partnerships and university-industry alliances

- New strategic direction for the Human Variome Project adopted at a conference hosted by UNESCO
- Use of ICTs and mobile technology to promote sciences enhanced thanks to partnerships with the private sector
- 34 schools in Sudan use UNESCO microscience approach
- Workshops in Haiti, Congo, Cote d'Ivoire, Tunisia and Armenia
- Establishment of the SEE-PhytoChemNet.network
- Establishment of the International Centre for Advanced Training and Research in Physics in Romania
- Support to the International Mathematical Olympiads in collaboration with the Montevideo Office
- Patronage of three international events on renewable energy

Member States' capacities strengthened to develop models for enhancing student research leadership and career mentoring for young researchers, through university networks and professional societies, in particular for developing countries

- Training of physics teacher in Tunisia
- Intel Science Competion under the Patronage of UNESCO
- Creation of an engineering competition by UNESCO Engineering Initiative (UEI) and Earth Science Education in Africa initiative
- Partnership with Airbus for your Fly Your Ideas competition
- Creation of academic consortia as part of the "UNESCO Biotechnology School in Asia" project
- International Year of Water Cooperation (2013) had a water engineering aspect supervised by UEI
- Collaboration with Engineers Without Borders (EWB) to develop projects for rural areas in Africa
- Implementation of the "Active Learning in Optics and Photonics" teacher training programme in Africa, Arab States, Eastern Europe and South-East Asia
- Organization of the 5th South East Asian Summer School on Renewable Energy with support of ISESCO and COMSAT

ICTP

- Three new research priorities: Quantitative Biology, Energy and High-performance computing
- Enrolment of 6 students in the new Joint ICTP/SISSA PhD programme, 42 in the STEP programme and 51 in the Diploma programme
- Opening of the ICTP South American Institute for Fundamental Research
- Signature of agreements and partnerships with universities in Mexico, Panama, Italy, Rwanda, and Nigeria
- Call for proposals in astronomy with the Office of Astronomy for Development
- Training of scientists in Africa in Global Navigation Satellite System with the European Commission
- Contribution to the 2012 Internal Year of Sustainable Energy for All
- Preparation of edited video coverage of the Basic Diploma programme for iTunes U and ICTP.TV
- New joint programme of support for scientists from Kuwait and the Arab world with the Kuwait Foundation of Sciences (KFAS)
- Initiation of the ICTP 3D Printing Lab
- Expansion of in-house research activities and educational programmes
- Programmes on meteorology and weather forecasts in Africa
- Organization of workshops and schools in Ghana, Ethiopia and Botswana
- 100 scientists and engineers are now located in the Algerian research centre in geophysics
- Installation of a ground-based station for long term climatological observations in Ghana

Sources: 190EX4, 191EX4, 192EX4, 194c4, 36C5

Building institutional capacities in science and engineering (2014-2015)

Capacity-building in research and education in the natural sciences enhanced, including through the use of ICTs

- 24 beneficiary countries from 4 regions (Africa, Asia, Eastern Europe and LAC) have contributed to and/or promoted the sustainable use of renewable energy sources. Target: 15
- Implementation of interdisciplinary science education initiatives in 12 African countries. Target: 9
- Training of 460 PhD fellows by TWAS
- Implementation of joint activities between ICTP and IBSP such as the ALOP training programme
- Strengthening of science communication and delivery in 22 countries including 8 in Africa thanks to the IY of Crystallography and the IY of Light
- Creation of one Category 2 centre in Rwanda by ICTP and IBSP

Interdisciplinary engineering research and education for sustainable development advanced and applied

- Awareness-raising activities in South Africa, Pakistan, Egypt, Argentina, Malaysia, Zimbabwe, Kenya, Denmark, Brazil, Nigeria, Congo, Mozambique and Angola
- Engineering week activities in 15 countries in Africa
- Activities organised in Cairo, Argentina and the USA.
- Awareness to collect and thus engage in engineering data collection strengthened

Sources: 199EX4, 200EX4, 37C5

Building institutional capacities in science and engineering (2016-2017) (as reported at the time of the evaluation)

Capacity-building in research and education in the natural sciences enhanced, including through the use of ICTs",

- Organization of the ninth "Asian School on Renewable Energy" in cooperation with the National University of Malaysia
- Organization of the 32nd European Photovoltaic Solar Energy Conference and Exhibition" jointly with WIP Renewable Energies in Munich
- The OFID- and Panasonic-funded project for the solar electrification of rural schools in 5 sub-Saharan African countries
- Synergies harnessed with UNESCOs' network of partner institutions such as CERN, ICTP, TWAS, ICASE, IUPAP, IUPAC, IUCr, AMU, IMU, IBRO, AIMS, UNESCO Chairs and Category 2 Centres, as well as the International Society for Optics and Photonics (SPIE)
- Supported implementation of a regional conference in Mauritius for ensuring basic and applied sciences are accessible to all
- Fostering Innovation culture through the promotion of science education at all levels through the implementation of the Microscience programme
- Organization of the International Year of Light (IYL)
- IBSP co-organized the Africa Science Weeks (April 2016 and 2017) in the Democratic Republic of Congo, the 1st Pan-African Conference in crystallography in Cameroon (October 2016) which saw the creation of the African Crystallographic Association.
- Continuation of the Active Learning in Optics and Photonics teachers training programme continued in Nigeria (April 2016) and Namibia (October 2016)
- Support to various UNESCO partner projects, such as SESAME
- IBSP contributed to the establishment of 11 category 2 centres (Brazil, Cameroon, China, Ghana, Mexico, Russian Federation, Rwanda, Thailand, Ukraine, Vietnam).
- Partnership with the private sector led to positive results, such as the 2nd Edition of the UNESCO-Merck Africa Research Summit held in Addis Ababa to which several African Ministers of S&T participated.
- UNESCO Harare Office in partnership with the Government of Zimbabwe, Bindura University of Science Education and the Higher Life Foundation organized the 1st High Level STEM Dialogue for Stakeholders (HL-SEDS) (March 2016).
- The Jakarta Office has developed an international graduate programme in biotechnology for talented individuals from less-developed countries in Asia Pacific as
- UNESCO Mexico co-organized the International Meeting "The Right to Dark Skies" held in Mexico (Jan 2016).

Interdisciplinary engineering research and education for sustainable development advanced and applied

- 3rd edition of the Engineering week activities in 15 countries in Africa organised by UNESCO together with the Federation of African Engineering Organizations (FAEO) and the Nigerian Society of Engineers (NSE)
- Support to the World Federation of Engineering Organizations (WFEO) for the implementation of the International Engineering Conference: New Approaches for Supplying Sustainable Water and Energy, Brasilia, in July 2016.

- The International Centre on Engineering Education (ICEE) inaugurated in June 2016 and the first Governing Board meeting in May 2017, joining the International Knowledge Centre for Engineering Sciences and Technology IKCEST) in China and the Aalborg Centre for Problem Based Learning in Engineering Science and Sustainability in Denmark.
- Awareness raising activities of the need for more engineers around the world and strengthening new approaches to engineering education.
- Feasibility study for the International Mining Engineering Centre in St. Petersburg, Russia Planning and publication of the second Engineering Report together with ICEE

Sources: 201 EX4, 38C5

Table 8 Mapping of the main activities and key stakeholders involved (Theory of Change workshop)

Project	Description	Organizers
Young women in engineering in Africa acceleration program	Two-year scholarship to reward the efforts of undergraduate women studying engineering at universities in South Africa and support their innovative engineering research in one of the Category 2 centres or any other laboratory facilities in their country. Launched during Mobile Learning Week in February 2015.	• UNESCO • INTEL • Minister of Science and Technology from South Africa
Mathematics of planet earth	Started in 2013, it is an international project stemming from Christiane Rousseau, past president of the Canadian Mathematical Society. It aims at answering fundamental issues related to Planet Earth and promoting science and scientific education with a specific focus on women, Africa, and global trends and perspectives on mathematics for sustainable development.	• International Mathematical Union • 120 mathematical organizations worldwide • IBSP • UNESCO
Fly your Ideas: Airbus	Worldwide biennial competition challenging 6,000 students from 82 countries to innovate for the future of sustainable aviation since 2012.	• Airbus • UNESCO
World library of science	Free online resource for science learning with hundreds of peer-reviewed articles launched November, 10th 2014	• UNESCO • Nature Education, the educational division of Nature publishing group • Roche (philanthropy)
SESAME	The Synchrotron-light for Experimental Science and Applications in the Middle East, modelled institutionally on CERN, aims at enabling world-class research and building scientific and cultural bridges among participating countries. The first photon beam will be delivered in April 2017. Budget: $110 million including the value of the land and building.	• IBSP • UNESCO • County contributions • EU commission • Other synchrotron laboratories (SOLEIL, ALBA, Swiss Light Source, Diamond) • International Atomic Energy Agency • Lounsbery Foundation
Green Chemistry for life	Launched in 2013, it is a grant schemes giving up to $30,000 to scientists aged 35 years or less with an innovative research project in green chemistry. This project also aims at raising awareness among decision and policy-makers, industrialists and the public at large.	• PhosAgro • IBSP

Project	Description	Organizers
		• International Union of Pure and Applied Chemistry (IUPAC)
IUCr Openlabs	This initiative launched in 2014 aims at promoting international cooperation and capacity building in the area of crystallography through the installation of labs in partner universities or research centres during the International Year of Crystallography.	• International Union of Crystallography (IUCr) • UNESCO • Companies like Agilent Technologies, Oxford Cyroystems, or Dectris
International Science and engineering fair	Largest pre-college science competition with the participation of about 7 million students across the world. Besides the $3 million awards, students have the opportunity to meet with other young scientists, Nobel Prize Laureates and acclaimed professors.	• INTEL • UNESCO
African crystallography initiative	This initiative launched in 2014 aims at promoting crystallography in African countries by building capacity and running Open labs.	• IUCr • UNESCO • TWAS
Africa engineering week	Students from 100 schools across Africa met in Zimbabwe in 2015 to participate in educational activities about engineering to increase the visibility of that field in line with the SDGs.	• UNESCO • IEEE • Intel • Institution of Civil Engineers (ICE) • Federation of African Engineering Associations (FAEO)
International years of chemistry, crystallography, light	UNESCO dedicated 2011 to chemistry, 2014 to crystallography and 2015 to light in order to build capacities in each of these fields and promote innovative techniques in each of these fields	• IBSP • Light: Optical Society, SPIE, IEE Photonics Society, physics associations • Chemistry: IUPAC • Crystallography: IUCr,crystallographic organizations,
Human Variome project	International NGO based in Australia and working to build capacity in the practice of responsible genomics in order to ensure that all the information in that field are curated and shared openly.	• Richard Cotton, University of Melbourne and St. Vincent's Hospital • Individual researchers, healthcare professionals, policy makers • Organizations from 81 countries

Project	Description	Organizers
		• International organizations: WHO, UNESCO…
Microscience in PALOP	As part of the Global Micro-science experiments Project, this initiative aimed at promoting science education by providing experiments kits to primary and secondary school pupil in Portuguese-speaking African countries.	• IBSP • UNESCO • Host countries
Science mobile learning/ e-learning	This initiative consists in promoting the use of ICTs to foster distance learning.	• UNESCO • Nokia (funding, initiative Nokia Life) • More than 20 Contributing countries
Training of trainers in solar energy	This initiative aimed at enhancing the knowledge of managers, technicians, managers and trainers on the use of renewable energy technologies.	• UNESCO • ADEME • National governments
IBSP	International multidisciplinary programme aiming at reinforcing cooperation between partner organizations to strengthen national capacities in basic sciences and science education.	• UNESCO Member States • TWAS • International Council of Science (ICSU) • CERN and other science centres • IGOs and NGOs
STEM initiative in Sub-Saharan Africa	UNESCO assists Member States in West Africa to strengthen their teaching and learning of STEM in primary and secondary schools in order to improve the enrolment of youth, especially girls, in science and engineering at Higher Educational Institutions. Budget: $50,000	• UNESCO
Avicenna virtual campus	Open e-learning network in the Mediterranean launched in 2002 and in which each university is autonomous in creating its own content.	• UNESCO • European Commission through its Euro-Mediterranean information Society (EUMEDIS)
UNESCO-Libyan Funds in Trust cooperation	Launched in 2000 within the UNESCO-Libyan Funds in Trust cooperation, the project resulted in the construction of the Biotechnology Research Centre (BRTC) in Tripoli with the aim of strengthening capacity and fostering innovation (Budget: $2,466,149) as well as the Centre for Macromolecular Chemistry and Technology (CMCT- also known as the Centre for Polymer Research).	• Libya (funding) • UNESCO

Appendix D List of interviewees

D.1 List of interviews conducted during the inception visit at UNESCO Headquarters

Name	Organization	Function	Date of interview
L. Anathea BROOKS	Natural Sciences Sector Executive Office	Programme Specialist Programme Coordination and Evaluation	23/01/2017
Anne CANDAU	Natural Sciences Sector Executive Office	Chief, SC/EO	23/01/2017
Lucy HOAREAU	Natural Sciences Sector Science Policy and Partnerships (SPP)	Programme specialist (until recently in the section for Innovation and Capacity Building in Science and Engineering)	23/01/2017
Imteyaz KHODABUX	Natural Sciences Sector Division of Science Policy and Capacity Building	Programme Specialist	25/01/2017
Romain MURENZI	Natural Sciences Sector Division of Science Policy and Capacity Building	Director of the Division of Science Policy and Capacity Building	23/01/2017
Jean-Paul NGOME ABIAGA	Natural Sciences Sector Division of Science Policy and Capacity Building	Assistant Programme Specialist Coordinator of the ISBP	25/01/2017
Rovani SIGAMONEY	Natural Sciences Sector Division of Science Policy and Capacity Building	Assistant Programme Specialist	25/01/2017
Berhanu ABEGAZ MOLLA	African Academy of Sciences (AAS)	Chairperson of IBSP Executive Director of the AAS	24/01/2017
John DUDLEY	International Year of Light Consortium (IYL) Institut FEMTO-ST Université de Franche-Comté-CNRS UMR 6174	Professor of Physics at Université de Franche-Comté Head of OPTO research group President of the steering committee of the IYL	24/01/2017
Mohamed HAASSAN	TWAS (UNESCO project)	Exeuctive Director Ad Interim	24/01/2017
Charles MBERI KIMPOLO	AIMS Next Einstein Initiative (NEI)	Senior Program Manager- AIMS Industry Initiative	24/01/2017
Alexandre POKROVSKY	International Organization for Chemical Sciences in Development (IOCD)	Director of Microscience Experiments Programme of the IOCD Vice president Kazan UNESCO Associated Center on Microscience Experiments	25/01/2017
Sandro SCANDOLO	The Abdus Salam ICTP (UNESCO centre)	Head of Scientific Programme and Outreach	24/01/2017

D.2 List of interviews with UNESCO Permanent Delegations

Name	Organization	Function	Date of interview
H. E. Mr Diekumpuna SITA N'SADISI JOSE	Permanent Delegation of Angola to UNESCO	Ambassador, Permanent Delegate	03/04/2017
Emma Maria José RODRIGUEZ SIFUENTES	Permanent Delegation of Mexico to UNESCO	Minister, Chargée d'Affaires	21/03/2017
H. E. Mr Jose Manuel RODRIGUEZ CUADROS	Permanent Delegation of the Republic of Peru to UNESCO	Ambassador, Permanent Delegate	21/03/2017
H. E. Mr Abdulkadr EL MALEH	Permanent Delegation of Libya to UNESCO	Ambassador, Permanent Delegate	15/03/2017
H. E. Mr Ahmad JALALI	Permanent Delegation of the Islamic Republic of Iran to UNESCO	Ambassador Extraordinary and Plenipotentiary, Permanent Delegate	27/03/2017
H. E. Mrs Eliana ZUGAIB	Permanent Delegation of Brazil to UNESCO	Ambassador, Permanent Delegate	17/03/2017
H. E. Mr Yang SHEN	Permanent Delegation of the People's Republic of China to UNESCO	Ambassador, Permanent Delegate	22/03/2017
Akama KIDEMA	Permanent Delegation of Togo to UNESCO	Ministre Conseiller	04/04/2017
H. E. Mr Alexander KUZNETSOV	Permanent Delegation of the Russian Federatioin to UNESCO	Ambassador, Permanent Delegate	22/03/2017
Maxim POLYA-VITRY Polya-Vitry	Permanent Delegation of the United Kingdom to UNESCO	Chargé d'Affaires a.i. Third Secretary	10/04/2017

D.3 List of interviews with partner organizations

Name	Organization	Function	Date of interview
John DUDLEY	European Physical Society (EPS) Universite de Franche-Comté	Former President of the EPS Professor of Physics, Head of Optoelectronics & Photonics Research Group.	23/03/2017
Lucilla SPINI	ICSU	Head of Science Programmes (former UNESCO staff)	24/03/2017
Michelle ZEMA	International Union of Christallography, (IUCr); ICSU	Outreach Officer and Project Manager	03/04/2017
Mauro GIACCA	International Centre for Genetic Engineering and Biotechnology (ICGEB)	Director General	04/04/2017
Christiane ROUSSEAU	International Union of Mathematics (IUM)	Professor of Mathematics, University of Montreal, Coordinator of the thematic year "Mathematics of Planet Earth" under the patronage of UNESCO, Vice-President of the International Mathematical Union (IMU), Member of the IMU-ICMI initiative Klein project, Université de Montréal	31/03/2017

Heide HACKMANN	ICSU	Executive Director	03/04/2017
Rachel SCHROEDER	Airbus	Head of Employment Marketings	12/04/2017
Marwa EL WAKIL	TWAS Arab Office	Director Academic Centres	12/04/2017

D.4 List of interviews with current or former UNESCO staff

Name	Organization	Function	Date of interview
Flavia SCHLEGEL	UNESCO Natural Sciences Sector	Assistant Director-General for Natural Sciences	17/03/2017
Kristof VANDERNBERGHE	UNESCO Natural Sciences Sector	Chief, Executive Office	09/03/2017
Melody BOATENG	UNESCO Office in Accra	National Professional Officer for SC	24/03/2017
Tony MARJORAM	Former UNESCO staff (retired)	NA	11/04/2017
Peggy OTI-BOATENG	UNESCO Office in Harare	Senior Programme Specialist	13/04/2017
Julia HASSLER	Former UNESCO staff (retired)	NA	10/04/2017
Hassane BELGUENANI	UNESCO Office in Rabat	National Professional Officer	24/03/2017
Tonya BLOWERS	Organization for Women in Science for the Developing World (OWSD)	OWSD Coordinator	03/04/2017
Prof. Mustafa EL TAYEB	Future University Khartoum	President	12/04/2017
Dr. Shahbaz Khan	Regional Science Bureau for Asia and the Pacific	Director	12/04/2017

D.5 List of interviews during the Field visit in Cairo

Name	Organization	Function	Date of interview
Dr. GHAITH FARIZ	UNESCO Cairo Office	Director	28/03/2017
Dr. Nazar HASSAN	UNESCO Cairo Office	Responsible for BSE	
Dr. Abdel-Aziz ZAKI	UNESCO Cairo Office	Coordinator of the Ecology and earth science programme	
Hoda ABDEL MEGUID	UNESCO Cairo Office	Programme assistant	
Dr. Ashraf Mohamed AL-SHERRY	Zagazig University	Former Minister of Higher Education and Research	
Dr. Ahmed Mohamed Hosny ELHEWY	Minister of Higher Education and Research	Advisor to HE Prof Khaled Atef Abdel-Ghaffar	29/03/2017
Dr. Tarek HUSSEIN	Cairo University	Supervisor of the Egyptian Nanotech Center EGNC CU	
Dr. Reda HEGAZY	Ministry of Education and Vocational Teaching (MoEVT)	Head of General Education Department	
Youssry Fouad Saweris MINA	Ministry of Education and Vocational Teaching (MoEVT)	Advisor to Science education	

		General Depatment of the Science Curriculum Development	
Prof. Ali ABDEL-AZIZ	Cairo Microbiologic Resources Centre (MIRCEN)	Director of Cairo MIRCEN	30/03/2017
Prof. Mahmoud M. SAKR	Academy of Scientific Research and Technology (ASRT)	President	
Dr. Ibrahim Abdel Wahab SALEM	Tanta University	President	
Dr. Boshra Mossaad AWAD	UNESCO Chair on Women Empowerment	Chair-holder	

D.6 List of interviews during the Field visit in Yaoundé

Name	**Organization**	**Function**	**Date of interview**
Prof Mama PLEA, UNESCO Regional Bureau	UNESCO Regional Bureau	Head of Science	27/04/2017
Annie-Claude NSOM-ZAMO	UNESCO Regional Bureau	Deputy Head of Science	27/04/2017
Dr Albert MENDY	UNESCO Regional Bureau	Head of Education Section	27/04/2017
Mr Loïtéohin Félix YÉ	UNESCO Regional Bureau	Director of the Regional Multisectorial Bureau &	27/04/2017
Mabel MUWANGA,	UNESCO Regional Bureau	Head of Operations	27/04/2017
Ana Elisa de SANTANA AFONSO	UNESCO Congo Brazzaville	Office Director	28/04/2017
Dr Nazaire BIWOLE MBIOCK,	Centre' d'Excellence en Microscience (Category 2)	Directeur	28/04/2017
Madame Valerie MENGUE	National UNESCO Commission Cameroon	Head of Education Sector	28/04/2017
Monsieur Mbala	National UNESCO Commission Cameroon	Adjoint au secretaire general	28/04/2017
Madame Jeannette MOUNCHILI		Inspectrice general pour le littoral en matiere de science	28/04/2017
Prof Charles AWONO ONANA	Ecole Nationale Superieur Polytechnique	Directeur	28/04/2017
Roger Noël IROUME	Ministere de Recherche & Innovation	Conseiller	28/04/2017

Appendix E Example of interview guidelines

Evaluation of UNESCO's work in capacity building in the Basic Sciences and Engineering

Interview guidelines for representatives of Permanent Delegations to UNESCO (Available in English and in French)

Relevance and effectiveness

- To what extent does UNESCO's work in capacity building in the Basic Sciences and Engineering (BSE) respond to the context of sciences capacity building in your country?
- How relevant or critical are the following objectives for your country (very relevant/relevant/ less relevant/ not relevant)?
    - Building human and institutional capacity building in BSE
    - Improving tertiary and secondary STEM education
    - Promoting and catalysing international and regional collaboration and networks in BSE
    - Advocacy and awareness raising of BSE for development
    - Facilitating open access to scientific information and infrastructure
    - Promoting a vision to advance engineering for sustainable development
    - Promoting the use of promising advances in the area of basic, applied and engineering sciences
- Do you have examples of activities implemented by UNESCO in your country since 2011?
- To what extent have issues relating to inclusion of women, youth and disadvantaged groups been reflected in UNESCO's capacity building work in your country?
- What have been the key outputs of UNESCO's efforts in capacity building in BSE in your country? How have they led to outcomes in terms of increased capacities in research and education at institutional, organisational, and individual levels?
- What measures were applied to insure that the outputs feed into upstream policy advice or are translated into better quality STEM education? What alternative measures could strengthen this aspect?
- What lessons can be learnt from the current delivery modalities and what would be the optimal modalities of intervention to ensure a balanced development of institutional, organisational and individual capacities?

Relevance and coherence

- Who are the main other players in science and development who are contributing to capacity building in BSE in your country?
- How do you see UNESCO's comparative advantage in the field of sciences capacity building in comparison to these other players?

- Are there potential synergies/complementarities with these players that have not yet been optimally exploited?
- What difference has a programme such as the IBPS made in terms of coherence, effectiveness and scale of UNESCO's capacity building work?

Efficiency and sustainability

- What aspects of UNESCO's efforts in CAB in BSE should be given priority? Which if any should be discontinued?
- Has UNESCO's CAB work in BSE contributed or is likely to contribute to long-term effects for individuals, organisations and institutions in your country?
- What are the pre-enabling conditions that must be in place to facilitate such lasting effects? What obstacles and risks need to be taken into consideration?
- What measures would be required to better ensure ownership and facilitate further development, multiplication and scaling up of the capacities built?

SWOT

- How would you describe the main strengths of UNESCO's work in Capacity Building in the BSE?
- What are the main weaknesses?
- Given the context of limited resources what are the main risks for UNESCO's activities in Capacity Building in the BSE?
- Where are the opportunities for the future of UNESCO's work in Capacity Building in the BSE?

We have arrived at the end of our interview. Is there anything else you wished to discuss or any further recommendation you would have for the future?

Appendix F Survey results

UNESCO's Basic Sciences and Engineering: Survey Analysis

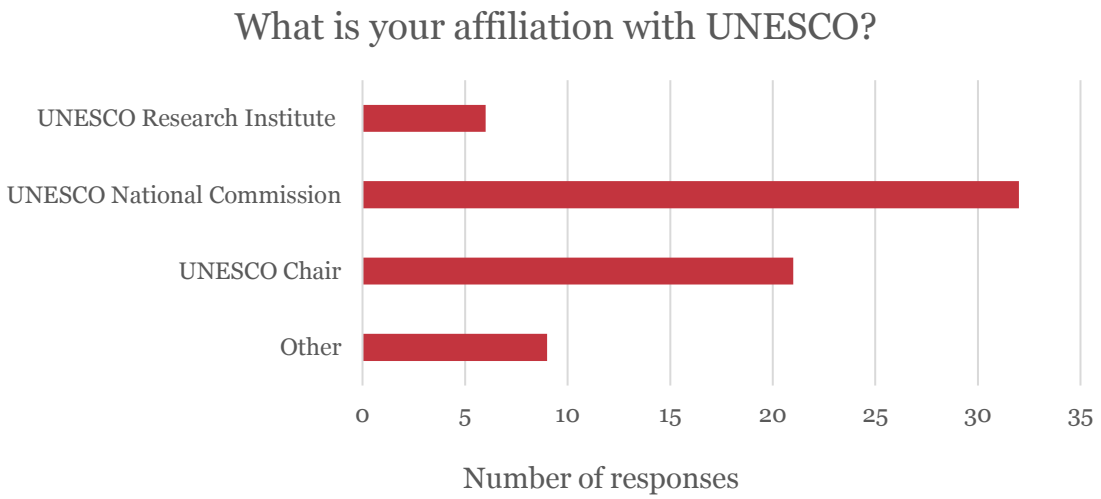
Total responses 68

These data comprise the French and English BSE surveys.

All axes represent the number of actual responses.

F.1 Q1_What is your affiliation with UNESCO?

Answer	Freq
Other	9
UNESCO Chair	21
UNESCO National Commission	32
UNESCO Research Institute	6



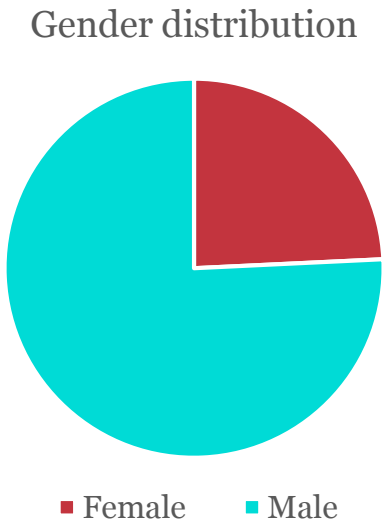
F.2 Q2_ Countries in which participants work/live:

Albania	1
Algeria	2
Armenia	2
Bahamas	1
Bahrain	2
Burundi	1
Belarus	1
Cameroon	1
East Timor	1

Equitorial Guinea	2
France	3
Germany	2
Hungary	1
Italy	2
Kenya	1
Kuwait	2
Lithuania	2
Madagascar	2
Mali	2
Malta	1
Marshall Islands	1
Mauritius	2
Mexico	1
Mongolia	1
Morocco	1
Namibia	1
Nauru	1
Nigeria	1
Nigeria	2
Pakistan	1
Philippines	1
Portugal	1
Romania	2
Russian Federation	7
South Africa	1
Spain	2
Togo	1
Trinidad & Tobago	2
Turkey	3
Uganda	1
Ukraine	2
Vietnam	1
	68

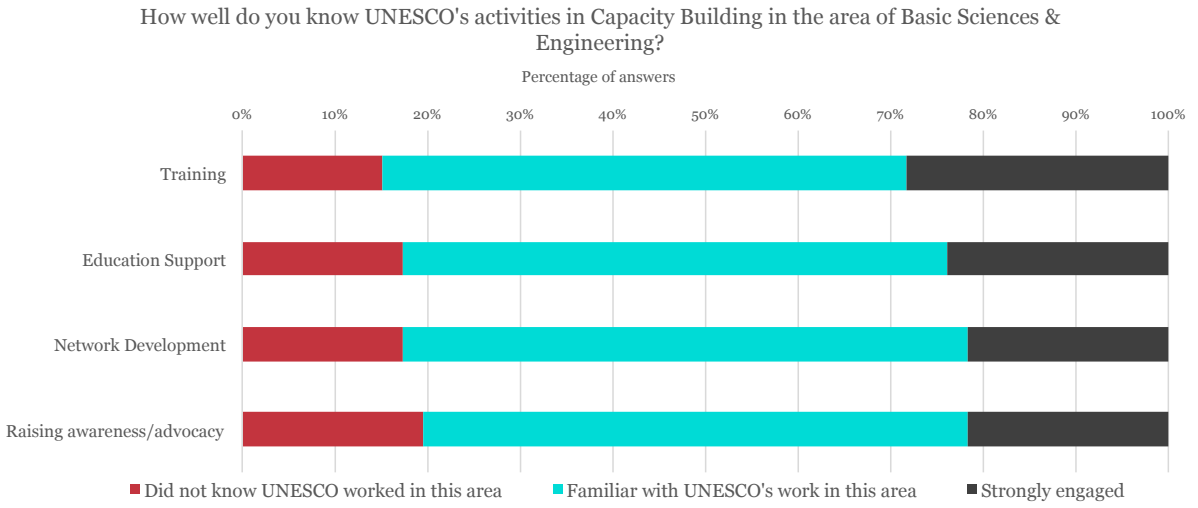
F.3 Q3_ What is your gender?

Answer	Freq
Female	16
Male	50



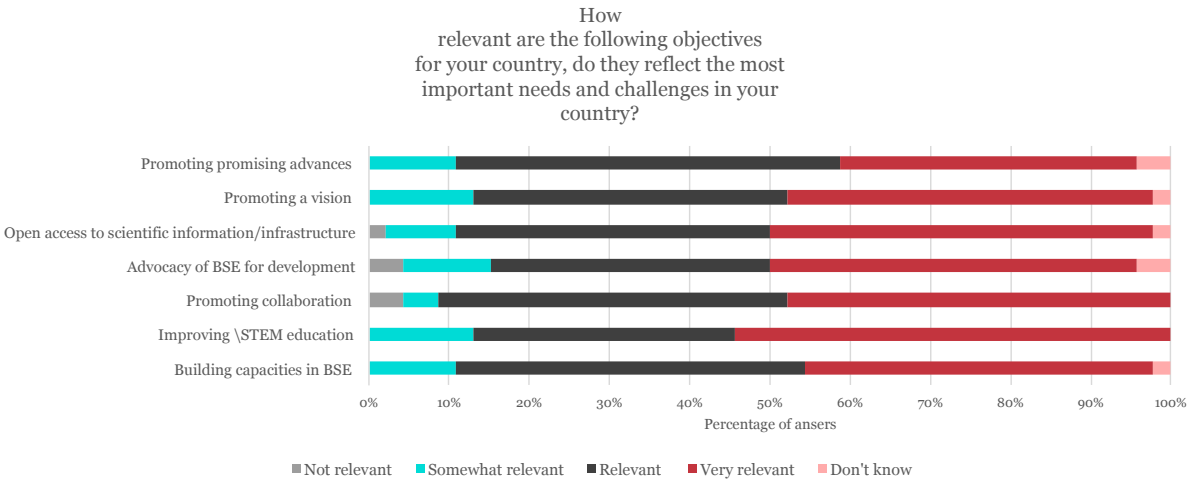
F.4 Q4_How well do you know UNESCO's activities in Capacity Building in the area of Basic Sciences & Engineering?

Answer	Did not know UNESCO worked in this area	Familiar with UNESCO's work in this area	Strongly engaged
Training	7	26	13
Education Support	8	27	11
Network Development	8	28	10
Raising awareness/advocacy	9	27	10



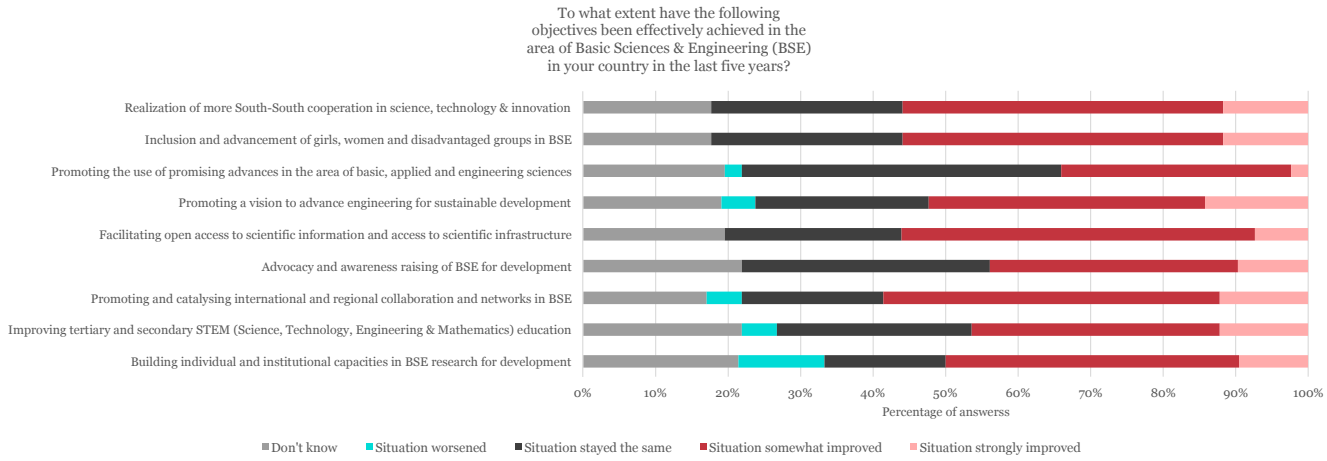
F.5 Q6- UNESCO's activities in the area of Capacity Building in the Basic Sciences & Engineering (BSE) are aimed at strengthening science, technology & innovation systems and policies. How relevant are the following objectives for your country, do they reflect the most important needs and challenges in your country?

Answer	Not relevant	Somewhat relevant	Relevant	Very relevant	Don't know
Building capacities in BSE	0	5	20	20	1
Improving \STEM education	0	6	15	25	0
Promoting collaboration	2	2	20	22	0
Advocacy of BSE for development	2	5	16	21	2
Open access to scientific information/infrastructure	1	4	18	22	1
Promoting a vision	0	6	18	21	1
Promoting promising advances	0	5	22	17	2



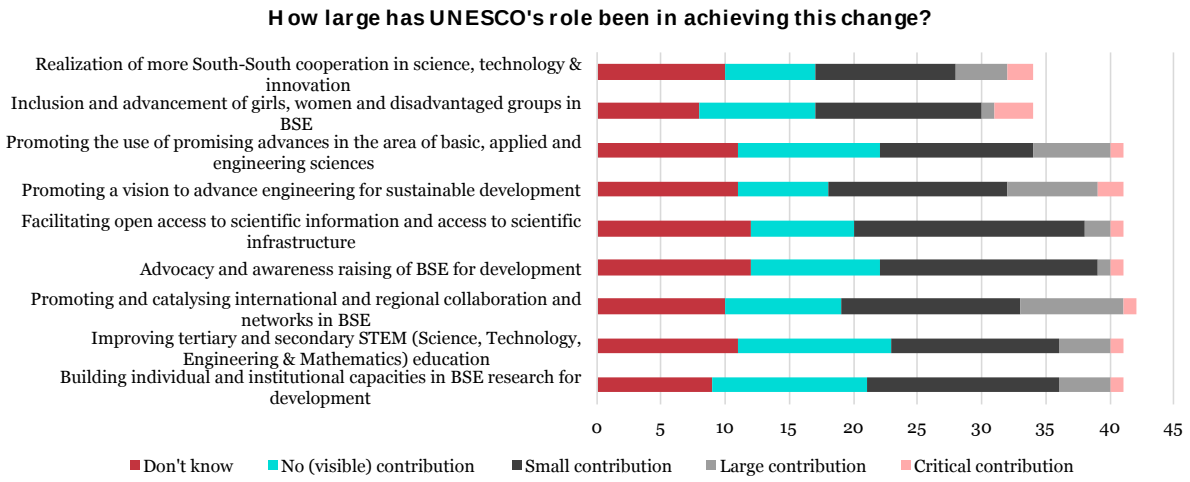
F.6 Q7 To what extent have the following objectives been effectively achieved in the area of Basic Sciences & Engineering (BSE) in your country in the last five years?

Answer	Don't know	Situation worsened	Situation stayed the same	Situation somewhat improved	Situation strongly improved
Building individual and institutional capacities in BSE research for development	9	5	7	17	4
Improving tertiary and secondary STEM (Science, Technology, Engineering & Mathematics) education	9	2	11	14	5
Promoting and catalysing international and regional collaboration and networks in BSE	7	2	8	19	5
Advocacy and awareness raising of BSE for development	9	0	14	14	4
Facilitating open access to scientific information and access to scientific infrastructure	8	0	10	20	3
Promoting a vision to advance engineering for sustainable development	8	2	10	16	6
Promoting the use of promising advances in the area of basic, applied and engineering sciences	8	1	18	13	1
Inclusion and advancement of girls, women and disadvantaged groups in BSE	6	0	9	15	4
Realization of more South-South cooperation in science, technology & innovation	6	0	9	15	4



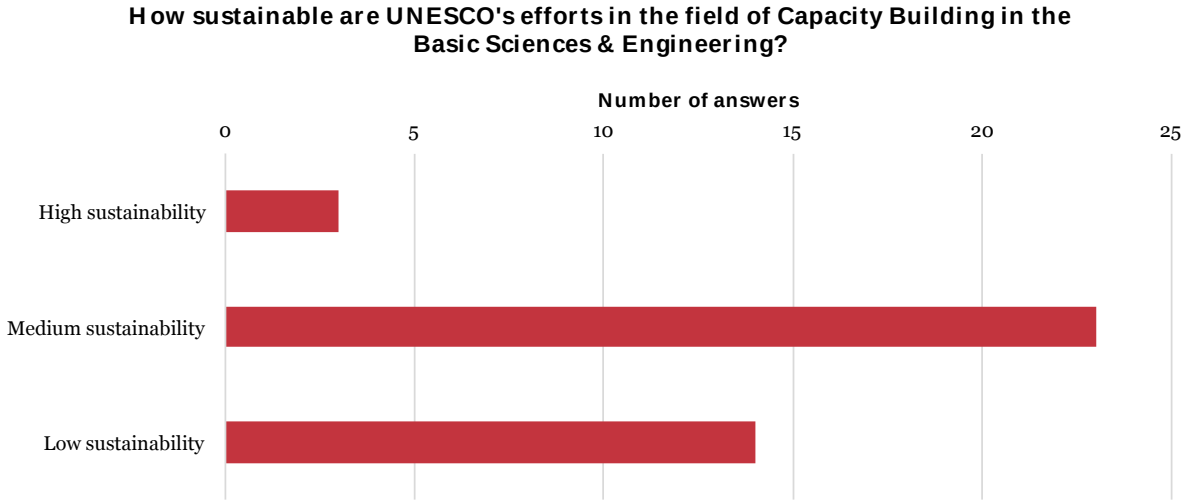
Q7 bis- How large was UNESCO's role in achieving this change?

Answer	Don't know	No (visible) contribution	Small contribution	Large contribution	Critical contribution
Building individual and institutional capacities in BSE research for development	9	12	15	4	1
Improving tertiary and secondary STEM (Science, Technology, Engineering & Mathematics) education	11	12	13	4	1
Promoting and catalysing international and regional collaboration and networks in BSE	10	9	14	8	1
Advocacy and awareness raising of BSE for development	12	10	17	1	1
Facilitating open access to scientific information and access to scientific infrastructure	12	8	18	2	1
Promoting a vision to advance engineering for sustainable development	11	7	14	7	2
Promoting the use of promising advances in the area of basic, applied and engineering sciences	11	11	12	6	1
Inclusion and advancement of girls, women and disadvantaged groups in BSE	8	9	13	1	3
Realization of more South-South cooperation in science, technology & innovation	10	7	11	4	2



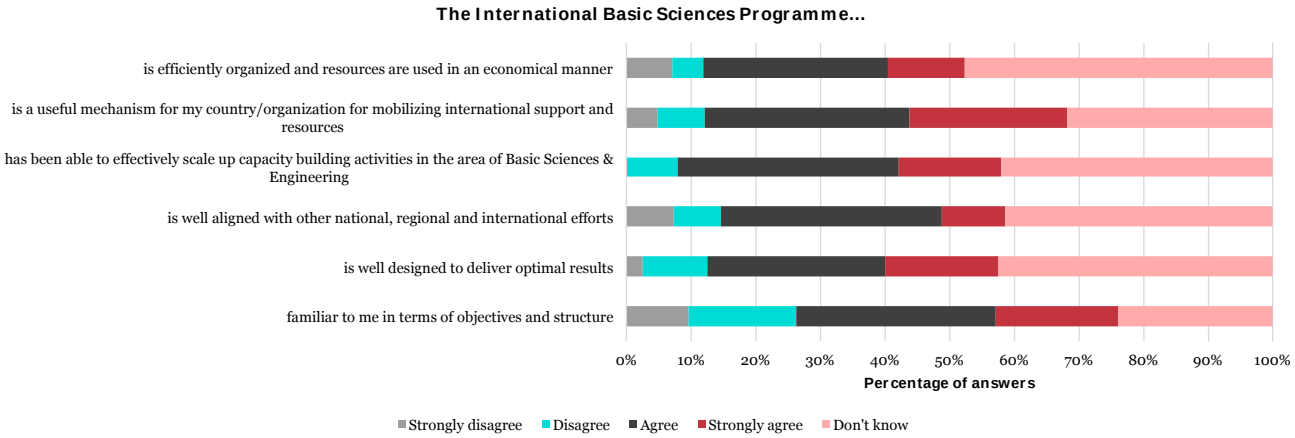
F.7 Q8-How sustainable are UNESCO's efforts in the field of Capacity Building in the Basic Sciences & Engineering?

Answer	Freq
High sustainability	3
Medium sustainability	23
Low sustainability	14



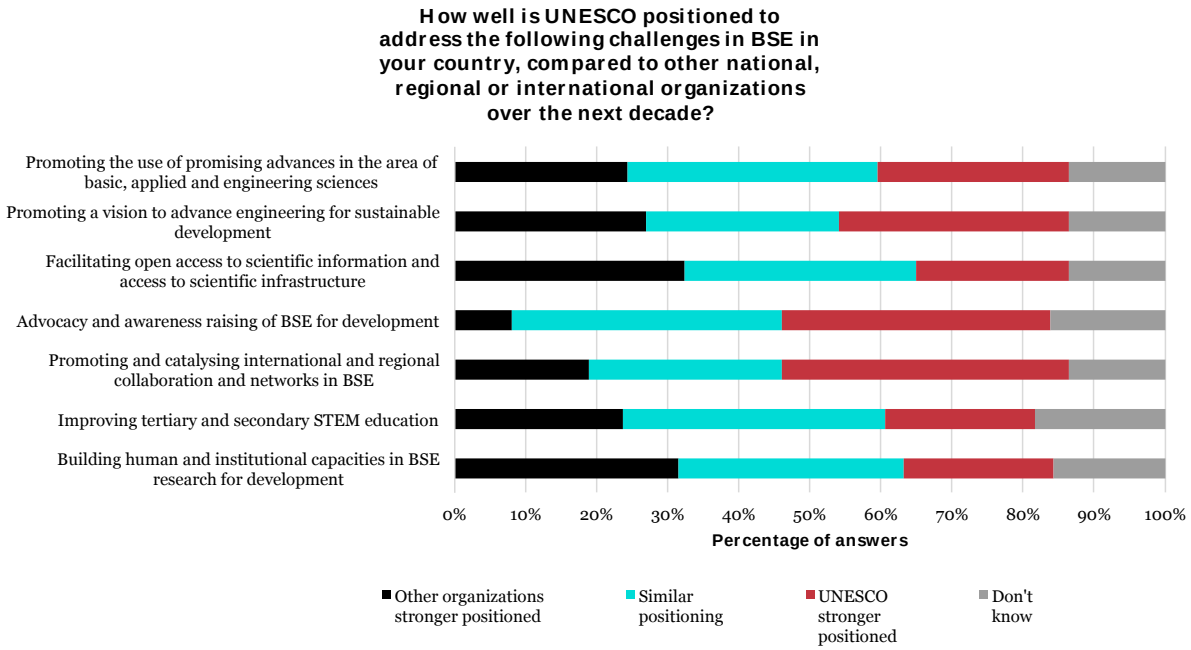
F.8 Q9- The IBSP (International Basic Sciences Programme) is the main UNESCO cooperation mechanism for Capacity Building support in the Basic Sciences. Please respond to the following statements with respect to the IBSP:

Answer	Strongly disagree	Disagree	Agree	Strongly agree	Don't know
Familiar to me in terms of objectives and structure	4	7	13	8	10
Is well designed to deliver optimal results	1	4	11	7	17
Is well aligned with other national, regional and international efforts	3	3	14	4	17
Has been able to effectively scale up Capacity Building activities in the area of Basic Sciences & Engineering	0	3	13	6	16
Is a useful mechanism for my country/organization for mobilizing international support and resources	2	3	13	10	13
Is efficiently organized and resources are used in an economical manner	3	2	12	5	20



F.9 Q12- How well is UNESCO positioned to address the following challenges in the area of Basic Sciences & Engineering (BSE) in your country, compared to other national, regional or international organizations (public or private) over the next decade?

Answer	Other organizations more strongly positioned	Similar positioning	UNESCO stronger positioned	Don't know
Building human and institutional capacities in BSE research for development	12	12	8	6
Improving tertiary and secondary STEM education	9	14	8	7
Promoting and catalysing international and regional collaboration and networks in BSE	7	10	15	5
Advocacy and awareness raising of BSE for development	3	14	14	6
Facilitating open access to scientific information and access to scientific infrastructure	12	12	8	5
Promoting a vision to advance engineering for sustainable development	10	10	12	5
Promoting the use of promising advances in the area of basic, applied and engineering sciences	9	13	10	5


How well is UNESCO positioned to address the following challenges in BSE in your country, compared to other national, regional or international organizations over the next decade?
Promoting the use of promising advances in the area of basic, applied and engineering sciences
Promoting a vision to advance engineering for sustainable development
Facilitating open access to scientific information and access to scientific infrastructure
Advocacy and awareness raising of BSE for development
Promoting and catalysing international and regional collaboration and networks in BSE
Improving tertiary and secondary STEM education
Building human and institutional capacities in BSE research for development
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percentage of answers
Other organizations stronger positioned
Similar positioning
UNESCO stronger positioned
Don't know

Appendix G List of IUCr-UNESCO open labs

Table 6 IUCr-UNESCO OpenLabs

	Dates	Type	Location
1. IUCr-IUPAP-ICTP OpenLab Senegal	20th Nov 2017 - 2nd Dec 2017	OpenLab Type 1	Ziguinchor **Senegal**
2. Bruker OpenLab Cameroon	6th Oct 2016	Travelling Lab	Dschang **Cameroon**
3. Rigaku OpenLab Bolivia	12th Sep 2016 - 16th Sep 2016	OpenLab Type 2	La Paz **Bolivia**
4. Bruker OpenLab Albania	30th May 2016 - 3rd Jun 2016	Travelling Lab	Tirana **Albania**
5. Bruker OpenLab Uruguay 2	23rd Feb 2016 - 29th Feb 2016	OpenLab Type 2	Montevideo **Uruguay**
6. Rigaku OpenLab Cambodia 2	11th Jan 2016 - 15th Jan 2016	OpenLab Type 2	Phnom Penh **Cambodia**
7. Bruker OpenLab Vietnam 2	7th Dec 2015 - 11th Dec 2015	OpenLab Type 2	Hanoi **Vietnam**
8. Bruker OpenLab Senegal	5th Oct 2015 - 10th Oct 2015	Travelling Lab	Ziguinchor **Senegal**
9. PANalytical OpenLab Mexico 2	29th Sep 2015 - 2nd Oct 2015	OpenLab Type 2	Puebla **Mexico**
10. Cambridge Crystallographic Data Centre OpenLab Kenya	6th Sep 2015 - 12th Sep 2015	OpenLab Type 2	Nairobi **Kenya**
11. Bruker OpenLab Tunisia	14th May 2015 - 23rd May 2015	Travelling Lab	Monastir and Nabeul **Tunisia**
12. Bruker OpenLab Algeria	9th May 2015 - 14th May 2015	OpenLab Type 2	Constantine **Algeria**
13. PANalytical OpenLab Turkey	19th Jan 2015 - 22nd Jan 2015	OpenLab Type 2	Ankara **Turkey**
14. Bruker OpenLab Vietnam	8th Dec 2014 - 12th Dec 2014	OpenLab Type 2	Ho Chi Minh City **Vietnam**
15. Agilent OpenLab Hong Kong	3rd Dec 2014 - 7th Dec 2014	OpenLab Type 2	Hong Kong **Hong Kong**
16. PANalytical OpenLab Mexico	18th Nov 2014 - 21st Nov 2014	OpenLab Type 2	Mexico City **Mexico**
17. Rigaku OpenLab Colombia	27th Oct 2014 - 31st Oct 2014	OpenLab Type 2	Bucaramanga **Colombia**
18. STOE DECTRIS Xenocs OpenFactory	10th Sep 2014 - 19th Sep 2014	OpenFactory	Grenoble and Darmstadt **France and Germany**
19. Agilent OpenLab Turkey	1st Sep 2014 - 5th Sep 2014	OpenLab Type 2	Izmir **Turkey**

	Dates	Type	Location
20. Bruker OpenLab Indonesia	18th Aug 2014 - 22nd Aug 2014	Travelling Lab	Bandung **Indonesia**
21. Bruker OpenLab Uruguay	23rd Jul 2014 - 31st Jul 2014	OpenLab Type 1	Montevideo **Uruguay**
22. Rigaku OpenLab Cambodia	7th Jul 2014 - 11th Jul 2014	OpenLab Type 2	Phnom Penh **Cambodia**
23. PANalytical OpenLab Ghana	9th Jun 2014 - 12th Jun 2014	OpenLab Type 2	University of Ghana, Accra **Ghana**
24. Bruker OpenLab Morocco	20th May 2014 - 20th Jun 2014	Travelling Lab	Rabat and Agadir **Morocco**
25. Agilent OpenLab Argentina	5th May 2014 - 10th May 2014	OpenLab Type 2	La Plata and Buenos Aires **Argentina**
26. Bruker OpenLab Pakistan	30th Apr 2014 - 8th May 2014	OpenLab Type 2	Karachi **Pakistan**

Source: IUCr website

Appendix H Terms of Reference

Terms of Reference

Evaluation of Capacity Building in the Basic Sciences and Engineering

1. Introduction

This document outlines the Terms of Reference for an external evaluation of UNESCO's work in capacity building in the basic sciences and engineering (BSE) for the first time since it was considered as part of a more comprehensive evaluation at the UNESCO Strategic Objective level in 2010. The evaluation will take place early in 2017. This will enable UNESCO's Natural Sciences Sector (SC) to make any recommended adjustments to its planned work and/or structure in time to be able to incorporate them into the planning for the next Programme and Budget, for the period 2018-2021, which will be approved in late 2017.

2. Background Inclusion of the "S" in UNESCO enabled the Organization to continue efforts begun by its predecessor, the International Institute of Intellectual Cooperation (IIIC), part of the League of Nations, to use science as a vehicle for international cooperation and understanding. At UNESCO's creation in 1945, rebuilding capacity in BSE following the war was seen as essential. BSE were, and remain, the core of modern science, at the root of any innovative science response to meet basic human needs and foster peace and development. As such, there has continuously been work at UNESCO in this domain. Major BSE institutions were created with support from UNESCO, including The European Organization for Nuclear Research (CERN), the Abdus Salam International Centre for Theoretical Physics (ICTP) and most recently the Synchrotron-light for Experimental Science and Applications in the Middle East (SESAME).

In 1999 UNESCO and the International Council for Science (ICSU, created by the IIIC) held the World Conference on Science to chart future directions in science. In 2003 SC had five divisions, one of which was the Division of Basic and Engineering Sciences. In that year the governing bodies of UNESCO approved the International Basic Sciences Programme (IBSP) in order to "…introduce a significant initiative in order to set up a new international platform in the basic sciences for implementation of the follow-up to the World Conference on Science through a concerted goal-oriented partnership between governmental institutions and international scientific organizations." It was expected that IBSP would afford opportunities "…for strengthening national capacities in science, sharing scientific knowledge, promoting science education and reducing the divide in the basic sciences." IBSP became operational in 2005. Following the financial crisis at UNESCO, SC now has three divisions, with IBSP and a reduced Engineering Programme located within the Division of Science Policy and Capacity Building (SC/PCB).

UNESCO's current activities in BSE contribute to Strategic Objective 4 (SO 4, "Strengthening science, technology and innovation systems and policies -- nationally, regionally and globally") of the UNESCO Medium-Term Strategy for 2014-2021 (37 C/4), and to Expected Results (ER) 2 "Capacity-building in research and education in the natural sciences enhanced, including through the use of ICTs", and ER 3 "Interdisciplinary engineering research and education for sustainable development advanced and applied" of Main Line of Action 2 "Building institutional capacities in science and engineering", of the Programme and Budget for 2014-2017 (38 C/5). Activities focus principally on tertiary, but also secondary STEM education and on research and cooperation in BSE for sustainable development. The BSE Programmes aim to advance, transfer, share and disseminate scientific knowledge and to transform this basic scientific know-how into useful applications for today's multiple sustainable development challenges, as well as to promote scientific infrastructure and normative and institutional framework for science development, which resonates well with the Science, Technology, Innovation Strategy for Africa (STISA-2024).

The IBSP, in particular, represents a normative instrument for further reinforcing international/intergovernmental cooperation in these areas. In this context, UNESCO's work leans on the synergy between IBSP and its broad network of partners, including Category 1 and 2 institutes and centres, main international scientific unions, the African Academy of sciences and other UNESCO programmes such as TWAS, the World Academy of Sciences for the advancement of science in developing countries.

BSE form a cornerstone of education that provides scientific and technological knowledge and skills needed by every citizen in order to participate meaningfully in the emerging knowledge-based society. The overall objective and activities of BSE focus on building human and institutional capacities in order to efficiently harnessing research knowledge, technology transfer and sharing, promoting science, technology, engineering and mathematics (STEM) education at all levels including scientific literacy and numeracy, and for promoting the use of promising advances in the area of basic, applied and engineering sciences, in order to address the sustainable development challenges of the society, with an emphasis on Africa and gender equality as the two global priorities of UNESCO.

In terms of regular programme staffing, the BSE capacity building function (ER 2) currently has five professional posts (one is a secondment) in Headquarters, while ER 3 has one post at Headquarters. SC has 44 professionals in field offices, many of whom contribute to BSE activities. The allotment for activity costs for ERs 2 and 3 combined is US$ 852,676 in regular budget resources, with US$ 21.1 M in extrabudgetary resources for the current biennium.

3. Purpose and Use

The main purpose of the evaluation is to assess the relevance of UNESCO's work in capacity building in BSE and its comparative advantage within the global sciences and development landscape, as well as its effectiveness and efficiency. The evaluation shall generate recommendations for the future with a view to providing strategic orientation in this area and to provide guidance on how to leverage UNESCO's networks and partnerships with a view to optimizing its contribution in this domain to the 2030 Agenda for Sustainable Development, including in particular targets under SDGs 4, 9 and 17.

The evaluation shall therefore inform decisions to be taken for the formulation of the future 39C/5 Programme and Budget of SC and as relevant the UNESCO Governing Bodies regarding the future focus areas, the most adequate modalities of implementation, the most appropriate distribution of roles and functions as well as how to best engage and work with specialised networks and other stakeholders in this field.

4. Scope

The evaluation will focus on the last six years of activities, representing the period of time since the previous evaluation of the 34 C/4 Strategic Programme Objective 4 (SPO 4) "Fostering policies and capacity-building in science, technology and innovation", which included an assessment of the thematic area[39]. As such, the evaluation will focus on programme work which started in the 2010-2011 biennium (i.e. 35 C/5 Programme and Budget) and which is still on-going in the current biennium (i.e. 38 C/5 Programme and Budget). On certain issues it may be necessary to go further back. For example, this will be the first in-depth evaluation conducted of the IBSP. The geographical scope is global with priority consideration of activities in the Africa region. The findings of the evaluation of SPO 4 shall, to the extent possible, provide the baseline for assessing the evolution and implementation of the relevant recommendations.

4.1 Main dimensions

The evaluation should assist UNESCO's governing bodies, senior management and SC by making evidence-based recommendations focused on the following main dimensions:

[39] The evaluation of Strategic Programme Objective 4 (SPO 4) was completed in early 2010.

- The **positioning of UNESCO** in the overall landscape of capacity building in BSE with a view to UNESCO's comparative advantage and complementarity with other actors and stakeholders;
- The relevance and effects (results) of capacity building in BSE in terms of **inclusion of disadvantaged groups** and in particular in promoting **gender equality and participation by youth;**
- The **adequacy of the geographical spread** of activities to address needs in the capacity building in BSE with a view to UNESCO **Global Priority Africa and Small Island Developing States**;
- The **performance in this field** in terms of approach, quality and results and the main challenges of capacity building in BSE, such as for improving STEM education at all academic levels, building institutional research capacity, promoting and catalysing international scientific collaboration and networks, facilitating access to scientific information in particular through open access to scientific information, and thus improving the scientific capacity of Member States;
- The **institutional setting** of capacity building in BSE and its configuration within UNESCO, including distribution of responsibilities and potential synergies, nature and quality of **partnerships and engagement between** Headquarters, the field office structure, Category 1 and 2 centres (ICTP), special programmes such as TWAS, and its interaction with external partners such as ICSU; and
- The **resource situation** of the programme (both financial and staffing) and its effect on performance (balance of Regular Programme versus extrabudgetary resources, fundraising strategy).

All dimensions shall as relevant relate to each of the parts of UNESCO's capacity building work in BSE, i.e. IBSP, TWAS, ICTP and others. On each of these dimensions the evaluation will adopt a retrospective and forward-looking perspective with the aim to develop action-oriented recommendations formulated on the basis of substantive findings.

4.2 Evaluation Questions

The following questions of the evaluation are indicative and listed in order of priority. The questions will be further refined in the evaluation's inception report. The evaluation shall assess in particular those questions that are identified of high priority, and as possible provide answers to the additional questions.

Relevance of UNESCO's work in capacity building in BSE (positioning within UNESCO and within the global sciences landscape, focus areas, relevant level of intervention and implementation modalities)

- ✓ What are UNESCO's comparative advantages (in terms of niche areas, scale and results achieved) with a view to other players in science and development who are contributing to the 2030 Agenda for Sustainable Development in this field?
- ✓ What subject areas should be maintained as the priority focus areas in the future (under the current restricted resource scenario) and in light of the 2030 Agenda?
- ✓ To what extent have outcomes and interventions at national level been relevant to beneficiary countries' needs and priorities?
- ✓ To what extent have issues relating to inclusion of disadvantaged groups, youth and UNESCO's priorities on Africa and gender equality been reflected in the capacity building work in BSE?

Additional questions to be considered:

- ✓ To what extent is UNESCO best placed to deliver on institutional, organizational and/or individual capacity building compared to other players in science and development?

- ✓ To what extent and at what level is UNESCO represented in the global sciences fora? In which areas is it expected to take an authoritative role?
- ✓ What has been the added value of this strand of work for the achievement of SC's objectives?
- ✓ Has the capacity building agenda been complementary to that of SC and other Sectors or have there been issues of overlap/duplication?
- ✓ How relevant is UNESCO's contribution in capacity building in BSE (STEM education, IBSP, basic sciences research, research grants etc.) overall within the global context of sciences capacity building and with a view to the 2030 Agenda?

Efficiency in the implementation (in terms of resources, organizational setting, distribution of roles and responsibilities

- ✓ Are the resources invested in the capacity building work adequate and justified by the results achieved?
- ✓ Do the results achieved by the IBSP justify its management costs? What measures could lead to increased synergies and cost efficiencies?
- ✓ Given the current resource situation, assumed to remain constant over the coming four years, what aspects of UNESCO's efforts in capacity building in the BSE should be given priority? Which, if any, should be discontinued?
- ✓ What are the optimal future management and operational arrangements, including distribution of roles and responsibilities at Headquarters and field offices for efficient planning, implementation and monitoring of activities?

Additional questions to be considered:

- ✓ Does the current fundraising strategy and extrabudgetary portfolio support UNESCO's comparative advantages in contributing to the 2030 Agenda?

Effectiveness/ Signs of Impact (results achieved, adequacy of implementation modalities and intervention level)

- ✓ What have been the key outputs and to what extent have the interventions in this field led to outcomes in terms of increased capacities in research and education at institutional, organizational and individual levels? To what extent were activities implemented as planned and outputs achieved?
- ✓ What difference has UNESCOs capacity building work in BSE made at the country level overall and with a view to inclusion of disadvantaged groups, and of girls and women?
- ✓ Does the current monitoring framework allow capturing the results at the different levels of intervention?
- ✓ Is the IBSP optimally geared towards contributing to delivering the expected results? What difference has the programme made in terms of coherence, effectiveness and scale of UNESCO's capacity building work?

Additional questions to be considered:

- ✓ What measures are applied to ensure that the capacity building work in BSE feeds into upstream policy advice/ is translated into better quality STEM education? What alternative measures could strengthen this aspect?
- ✓ Are there any unintended effects that the capacity building work in BSE has brought about or are likely to be observed at the global or at the country level?
- ✓ What lessons can be learnt from the current delivery modalities and what would be the optimal modalities of intervention to ensure a balanced development of institutional, organizational and individual capacities?

Partnerships and cooperation: (engaging with and leveraging on networks and partners)

- ✓ To what extent have partnerships been sought and established and synergies been created in the delivery of assistance at the country level?
- ✓ What is the contribution of UNESCO's capacity building work in creating opportunities for South-South cooperation?

Additional questions to be considered:

- ✓ Are there potential synergies or complementarities with specialized projects, networks, institutions or partners that have not yet been optimally exploited (i.e. TWAS, ICTP, ICSU)?
- ✓ How has UNESCO's capacity building work in BSE been positioned within larger national donor coordination frameworks at the country level?
- ✓ To what extent has SC mobilized and made use of UNESCO's wide in-house expertise, particularly its field offices, Category 1 and 2 Institutes and Centres, in benefit of the delivery of its interventions?
- ✓ What is the optimal level of intersectoral cooperation and division of work between SC and Education Sector in the field of STEM education?

Sustainability (are the right conditions put in place for results to be further developed/ scaled up/ multiplied/ financially /institutionally/politically sustained)

- ✓ Has UNESCO's capacity building work in BSE contributed or is likely to contribute to long-term effects for individuals, organizations and institutions?
- ✓ What are the pre- or enabling conditions that must be in place to facilitate such lasting effects? What obstacles and risks need to be taken into consideration?

Additional questions to be considered:

- ✓ To what extent does the approach of UNESCO's capacity building work in BSE ensure ownership and facilitate further development, multiplication or scaling up of the capacities built?
- ✓ What measures would be required to better ensure ownership and financial, political and institutional sustainability?

Methodology

The evaluation will include the methodological elements below. These will be further refined by the evaluation team during the inception phase.

- Desk study, comprising a mapping of all relevant Regular Programme and extrabudgetary projects activities / projects; summary of findings and recommendations of previous evaluations (e.g. SPO 4, ICTP, TWAS); review of additional documentation such as the Director General's report on the implementation of the programme (EX/4 Report, Programme Implementation Report, Strategic Results Report), the IBSP Chair's Report to the General Conference; the report of the head of the Commission for Natural Sciences to the General Conference, project documents, annual progress reports, final reports and evaluations of relevant extrabudgetary projects; mission reports; internal think pieces; UNESCO Country Programme Documents; UNDAFs; evaluations, studies and research of other UN organizations and main stakeholders on the subject being evaluated.

- The development and refining of a Theory of Change for UNESCO's capacity building work in BSE.

- Semi-structured interviews with key stakeholders.

- Questionnaires and surveys addressed to various groups of stakeholders (e.g. relevant Ministries, UNESCO National Commissions, universities, academies of science, scientific unions, international and intergovernmental programmes, research institutions and networks, Category 1 and 2 Institutes and Centres, UNESCO Chairs).

- Two field visits (tentatively UNESCO Nairobi and Cairo Offices) and at least one Headquarters visit.

5. Roles and Responsibilities

The evaluation will be managed by UNESCO's Internal Oversight Service (IOS) with the support of the Executive Office of SC and will be conducted by an independent external evaluation team. The evaluators are expected to contribute specific expertise and knowledge of the global basic science capacity building landscape as well as experience in evaluating co-ordination activities, networks and partnerships. IOS is responsible for the overall management of the evaluation and quality assurance of the deliverables. The external evaluation team will be expected to further develop the Theory of Change (i.e. Intervention Logic for the programme), to develop a detailed evaluation methodology including the data collection tools, to conduct data collection and analysis, as well as to conduct fieldwork and to prepare the draft and final reports in English.

Evaluation Reference Group

A reference group has been established to accompany the evaluation process and provide feedback on the Inception Report and Draft Evaluation Report. The reference group comprises members from the IOS Evaluation Office, the Division of Science Policy and Capacity Building, the SC Executive Office, and ICTP. The Reference Group shall meet periodically during the evaluation, as necessary.

Logistics

The evaluation team will commonly be responsible for their own logistics: office space, administrative and secretarial support, telecommunications, printing of documentation, etc. Suitable office space will be provided for the consultants when they are working from UNESCO premises. The evaluation team will also be responsible for administering and disseminating all methodological tools such as surveys. SC will provide access to all relevant documentation and contact details of all relevant stakeholders and distribution lists. It will also facilitate access to UNESCO staff from both Headquarters and field offices.

6. Evaluation Team and Resources

Qualifications

The consultants comprising the evaluation team should possess collectively the following mandatory qualifications and experience:

- Extensive knowledge of the global BSE capacity building area, with particular emphasis on the development needs in the basic sciences in the African region
- Extensive knowledge of networks, transnational co-ordination of science programmes and capacity building in sciences
- Experience in applying qualitative and quantitative evaluation methods, with a minimum of seven years of professional experience for the lead expert (a minimum of five years' experience for the other team members) in programme and policy evaluation demonstrating a strong record in designing, conducting and leading evaluations. At least some of this experience will be in the science area.
- Experience in gender analysis and gender in evaluation
- An advanced university degree with specialisation in a basic science, engineering, science policy, public policy or related fields
- Excellent language skills in English (oral communication and report writing) and at least good language skills in French (reading and oral communication)
- No previous involvement in the implementation of the activities under review

It is desirable that the evaluation team possess the following qualifications and characteristics:

- Knowledge of the global science capacity building area with particular emphasis on the development needs in sciences in LDCs and SIDS
- Knowledge of the role of the UN and its programming
- Understanding and application of UN mandates in Human Rights and Gender Equality
- Experience with assignments for the UN
- Experience as a scientific researcher or engineer
- Experience with assignments focusing on multi stakeholder partnerships, co-ordination and capacity building
- Other UN language skills (Spanish, Arabic, Russian and Chinese) will be considered an advantage

Verification of these qualifications will be based on the provided curriculum vitae. Moreover, references, web links or electronic copies of the two or three examples of recently completed evaluation reports should be provided together with the technical proposal. Candidates are also encouraged to submit other references such as research papers or articles that demonstrate their familiarity with the subject under review. The recommended composition of the evaluation team is one senior and one junior evaluator.

7. Budget

The evaluation has a draft budget allowing for approximately 50-65 days of professional time, including travel. The external team members are expected to travel to Paris at least once to participate in a kick-off meeting during the inception phase, to conduct two field missions indicatively to Cairo and Nairobi, to develop and conduct a survey and conduct interviews during the data collection phase, hold a stakeholder workshop for discussing and validating findings and recommendations. Some of these tasks may be conducted through virtual meeting via skype or video conference.

8. Deliverables and Schedule

The evaluation is expected to commence in December 2016 and be concluded by April 2017. The indicative timetable of key activities and deliverables is shown below.

Activity / Deliverable	**Timing**
Procurement – Request for Proposals	November 2016
Selection of external evaluation team; contractual arrangements completed	December 2016
Evaluation launch – entrance meeting in Paris	Mid December 2016
Inception report	January 2017
Data collection & analysis; field missions	January-February 2017
Stakeholder workshop	Mid-March 2017
Draft Evaluation report	End March 2017
Final Evaluation report	End April 2017

The Draft and Final Evaluation reports should be written in English and comprise no more than 50 pages excluding annexes. It should be structured as follows:

- ✓ Executive summary (2-4 pages)
- ✓ Programme description and Intervention Logic
- ✓ Evaluation purpose
- ✓ Evaluation methodology (including challenges and limitations)
- ✓ Main Findings
- ✓ Lessons learned
- ✓ Recommendations and conclusions Annexes including TOR, interview list, data collection instruments, key documents consulted.

Annexes:

Annex 1: Indicative List of Key documents to be consulted

World Conference on Science – Science for the twenty-first century: a new commitment. (2000)

Evaluation of UNESCO's Strategic Programme Objective 4: Fostering Policies and Capacity-Building in Science, Technology and Innovation (2010)

Audit of the International Basic Sciences Programme (2015)

38 C/REP, 37 C/REP, 36 C/REP and 35 C/REP documents for General Conferences

Document: UNESCO's mandate for the basic sciences: Challenges and prospects (185 EX/11)

Document: Development and outcomes of the IBSP (35 C/INF.18)

Reports of the IBSP Scientific Board Meetings

Evaluation of the Abdus Salam International Centre for Theoretical Physics (2011)

Evaluation of the World Academy of Sciences for the advancement of science in developing countries (TWAS) and its components (2016)

UNESCO C/4 Medium Term strategies, C/5 Programme and budget and EX4 report documents

UNESCO SC websites

Websites of TWAS, IAP, IAMP, OWSD, GenderInSITE and ICTP

UNESCO Report on Engineering (2010)

UNESCO Science Report: Toward 2030 (2015)

Report on the International Year of Light (2016)

Annex 2: Indicative List of Key stakeholders to be consulted

SESAME Centre in Jordan

African Academy of Sciences

International Union of Crystallography

International Mathematical Union

EPS

IUPAC

IUPAP

ICSU

CERN

UNESCO Category 1 and Category 2 Centres (such as engineering (Denmark), renewable energy (Morocco), new ones affiliated with ICTP in Viet Nam, Mexico, Brazil)

All SC/PCB/CB staff and selected former staff

ICTP staff and selected former staff

Staff of TWAS, IAP, IAMP, OWSD and GenderInSITE

Selected SC Regional Bureau Directors and MSRB Directors (Nairobi, Cairo, Jakarta)

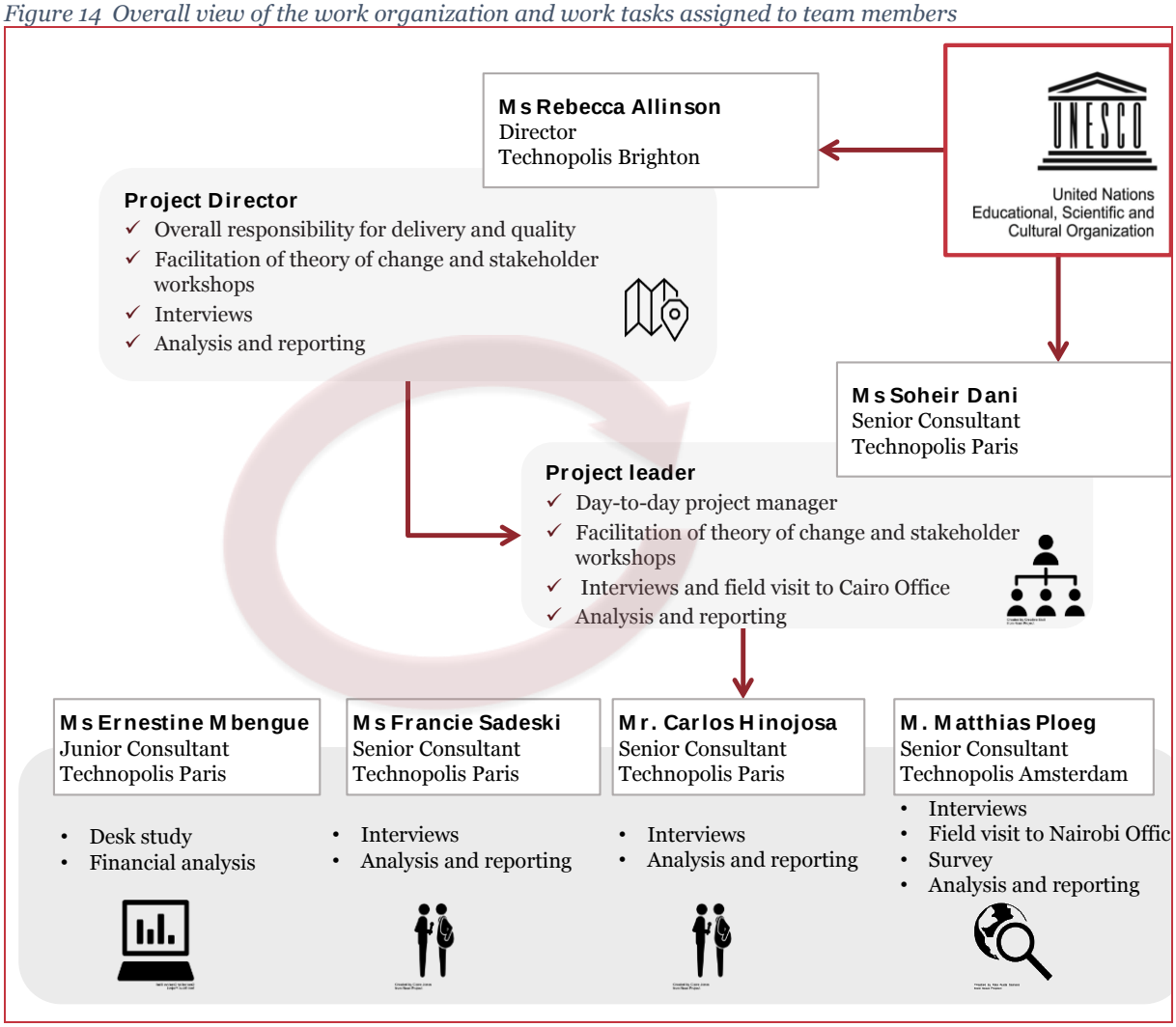
Selected Member States that requested assistance in the area (such as Gabon, Equatorial Guinea)

Representatives of Selected Member States that have been or plan to be donors in the area (such as China, Sweden, South Africa, Angola) including from Member State Delegations, relevant line ministries (Angola), bilateral cooperation agencies, national research institutes

Representatives from other relevant UN agencies and global players in science and development

Appendix I Evaluator's biodata and/or justification of team composition

Figure 14 Overall view of the work organization and work tasks assigned to team members



I.1 Short biographies

I.1.1 Rebecca Allinson, Director, Brighton Office

Rebecca Allinson is a Director at Technopolis and is responsible for projects/work in the field of International, European and UK public policy, specifically related to the Higher Education, Research, Information Society and Enterprise Policy. This includes research, project management and evaluation. Rebecca has both evaluated and taught evaluation theory and practice. Rebecca is also the Principal of the group-wide thematic area of higher education in Technopolis.

Rebecca's work in the last few years has concentrated on issues of Higher Education reforms and the interplay between education, research and innovation.

Rebecca's work in the last few years has concentrated on the interplay between education, research and innovation. Recent work includes, the support for the development of a guiding framework for Entrepreneurial Universities, the production of best practice case studies for the compendium of higher education reform, the evaluation of the Enriching Engineering Education Programme in Sub-Saharan Africa, Royal Academy of Engineering, 2016, the development of a monitoring and evaluation

framework for the African Institute of Mathematical Sciences, AIMS South Africa, 2016, the mid-term evaluation of AIMS – African Institute for Mathematical Sciences, 2015 and the evaluation of operational research capacity building in Tuberculosis and Lung Disease – DFID, UK Government, 2014

Rebecca holds a Masters in Silicon Chemistry from the University of Bordeaux and a BSc (Hons) Biological Chemistry from King's College London.

I.1.2 Soheir Dani, Senior Consultant, Paris Office

Soheir Dani is Senior Consultant at Technopolis Group. For the last 10 years she has been providing policy advice, evaluation and research services to the public sector in the field of science & technology, higher education and economic development policies.

Soheir has evaluated major national research and development and innovation policies in France such as the evaluation of the French Competitiveness Poles (innovation clusters) for the French Ministry of Economy in 2016 and 2012, the evaluation of the French "grappes d'entreprises" (business clusters) for the Ministry of Economy in 2014 and the evaluation of the national incubators for the Ministry of Higher Education and Research in 2006.

Soheir regularly works on international cooperation studies in particular in MENA, Central and West African regions. She is currently supporting the World Bank and the Association of African Universities in verifying disbursement-linked indicators for 19 African Centres of Excellence. Soheir also conducted several studies for the African Institute for Mathematical Sciences (AIMS) including the definition and collection of baseline M&E indicators and the evaluation of specific programmes and centres. In 2015 she worked for the Technical Centre for Agricultural and Rural Cooperation (CTA), evaluating its Science, Technology and Innovation (ST&I) programme. This programme mainly focuses on scientific cooperation and capacity building. In 2014 Soheir took part in the evaluation of the European & Developing Countries Clinical Trials Partnership (EDCTP) first programme. She is currently evaluating for DG RTD - European Commission the impact of the European Union's research funding for poverty related and neglected diseases. In the MENA region she has recently evaluated the African Development Bank's assistance in the energy sector in Egypt. She has also evaluated several scientific cooperation programmes in Maghreb for the French Ministry of Foreign Affairs and the French Institute of Research for Development (IRD).

Before joining Technopolis, Soheir worked for UNESCO's Internal Oversight Service - Evaluation Section (2004-2005). In 2011 she also worked as a researcher at the Tavistock Institute of Human Relations (TIHR) and as an evaluation officer and the Arts Council England (2009-2010).

Soheir conducts studies and evaluations through desk research, interviews, focus groups and workshops, case studies, surveys, report writing as well as project and team management. She deals with projects ranging from the definition of strategic plans to ex-post evaluations using a mix of quantitative and qualitative research methods.

Soheir holds a post-graduate degree in economics from the Sorbonne University (Paris I). She is fluent in French and English.

I.1.3 Matthias Ploeg, Senior Consultant, Amsterdam Office (based in Amsterdam and Abidjan)

Matthias Ploeg is a senior consultant and economist at Technopolis Group, focusing on innovation policy and strategy, with a particular interest in the role of the entrepreneurship and innovation in higher education and private sector development. Based both in Amsterdam and in Abidjan, Côte d'Ivoire, Matthias is very active in the field of economic and innovation policy both in Europe and in emerging countries. He recently was the co-ordinator for Technopolis' activities in the research project 'Innovation for Growth' in 5 African and Asian countries, funded by the British Department for International

Development (DFID). Matthias is works regularly in the field of higher education and entrepreneurship (e.g. start-ups, incubator) in emerging countries, in particular in Africa in the domain of STEM. He was part of the core evaluation team of the African Institute for Mathematical Sciences (AIMS) for DFID/IDRC, and is the methodological lead for Technopolis' monitoring & evaluation support to the Africa Centre of Excellence for the Association of African Universities (World Bank Funded). As an economist, Matthias is often responsible for designing and overseeing quantitative methodologies.

He is also engaged in the GRCF Africa Catalyst programme development on engineering institutions (UK Royal Academy of Engineering). In his work, Matthias worked on projects for national public authorities throughout Europe (the Netherlands, Ireland, Belgium, France), and international organizations such as the European Commission, OECD, GIZ and the African Development Bank. In Africa, Matthias has carried out projects in Ghana, Côte d'Ivoire, Uganda, Nigeria, Senegal, Kenya, Cameroon and South Africa.

He graduated with a M.Sc. in Economics (distinction) from Trinity College Dublin. He is currently pursuing a PhD (part-time) in Economics on innovation in emerging economies at Radboud University Nijmegen. On a personal title, Matthias is a board member of the recently founded Spark Business Support Centre at the Nangui Abroguoa University in Abidjan, one of the first on-campus incubators in Côte d'Ivoire. Matthias is fluent in both Dutch and English, and has a good command of French.

I.1.4 Carlos Hinojosa, Senior Consultant, Paris Office

Carlos is an experienced policy evaluator specialising in the fields of research & development, innovation and higher education.

Since joining Technopolis in 2010, Carlos has contributed and managed to more than two dozen evaluations for national, European and international clients including UNESCO, the World Bank, the Inter-American Development Bank and the OECD. This includes the evaluation of UNESCO's Abdus Salam International Centre for Theoretical Physics (ICTP) and the independent external evaluation of the Technical Centre for Agriculture and Rural Cooperation's (ACP-UE) Science, Technology and Innovation programme. Carlos recently authored a background paper on the impacts of greening economies on educational systems as part of UNESCO's Global Education Monitor report. In 2011 he contributed to a study on doctoral systems in EU neighbouring countries (DG EAC). Between 2013 and 2014, Carlos joined the World Bank's Innovation, Technology and Entrepreneurship unit as the Innovation Policy Platform project manager.

Shortly before joining Technopolis, Carlos worked for the OECD Local Economic and Employment Development Programme in Paris and Italy. Carlos obtained his undergraduate degree in Political Science from the Universidad de las Américas-Puebla, Mexico; and his Master's degree from the Institute of Political Studies of Paris. Between 2005 and 2007 he worked as the assistant to the political section of the Embassy of Canada in Mexico City.

Carlos is fluent in English, French and Spanish and has working knowledge of Italian.

I.1.5 Francie Sadeski, Senior Consultant, Paris Office

Francie Sadeski is leading Technopolis Group's "emerging countries" activities. She graduated from the Institut d'Etudes Politiques de Rennes, major in Economics and Finance, as well as the European Masters in International Aid and Development from the University of Aix-en-Provence/Uppsala Universitet Sweden.

Francie has been working for more than ten years in international cooperation and management of complex projects funded by major international donors (AFD, European Commission, World Bank, Asian Development Bank) in Vietnam, Cambodia, Indonesia, Iran, Palestine, Jordan, Soudan, Chad,

Nigeria, Ivory Coast, Liberia, Senegal, Congo, South Africa, and Georgia. She also conducted technical assistance missions for the Ministry of Health and Social Affairs on behalf of institutions such as the Asian Development Bank in Vietnam, to support capacity building.

Francie works as a senior consultant in the field of social policy and economic development, performing (*ex-ante, in itinere* and *ex-post*) evaluations, feasibility studies, regional studies, benchmarks, and strategic diagnosis. Her main working areas are: financial instruments and financing innovation, health and life sciences, green growth, research, regional innovation strategies, territorial development policies and international cooperation. Francie has gained a real expertise in the design, co-ordination, animation and evaluation of international and European research and innovation projects and programmes.

She has led recently the Mid Term Evaluation of the African Institute for Mathematical Sciences –Next Einstein Initiative and has also contributed to the DFID funded research project on "Innovation and Growth in LIC's" to issue a case study on the Ghanaian National Innovation System. She has also contributed recently to the DFID funded program on Operational Research Capacity in the Health Sector as well as an FP7 funded Program named EDCTP 1 (Clinical Trials Partnership) where, among other responsibilities, she conducted case studies in South Africa, Congo Brazzaville and Mali.

Francie is a French native speaker, is fluent in English, and has a good knowledge of Spanish.

I.1.6 Ernestine Mbengue , Intern Consultant, Paris Office

Ernestine Mbengue is an intern consultant based in the French office of Technopolis Group. She holds a bachelor's degree in social sciences and international relations from Sciences Po Paris, where she is currently a graduate candidate in Economics and Public Policy.

Ernestine works in French and English.

technopolis |group| France
88 rue Lafayette
75009 Paris
France
T +33 1 49 49 09 20
F +33 1 49 49 09 29
E info.fr@technopolis-group.com
www.technopolis-group.com