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International environmental policy and governance issues: Global Environment Monitoring System/Water Programme

Resolution 1/9: Global Environment Monitoring System/Water Programme (GEMS/Water)

Report of the Executive Director

Summary

Prepared in response to resolution 1/9, adopted by the United Nations Environment Assembly of the United Nations Environment Programme (UNEP) at its first session, this report presents the revised Global Environment Monitoring System/Water Programme (GEMS/Water), together with a budget, for adoption by the Assembly at its second session. The revised programme has been embedded in the next biennial programme of work of UNEP.

The report provides an overview of the key components of the revised GEMS/Water programme and the underlying new partnerships, the initial steps following its transition towards regional implementation and capacity development and its embedment in the UNEP programme of work. Referring also to a workplan being developed to support programme delivery, it provides an outlook and indicative budget that reflect the rapidly increasing expectations of GEMS/Water and its role in national sustainable water management in implementing the 2030 Agenda for Sustainable Development.

The report also considers the links between the revised GEMS/Water programme and Agenda 2030, which explicitly addresses water issues in a number of interlinked Sustainable Development Goals and targets, specifically Goal 6. The prominence given to water quality and pollution, with indicators for monitoring wastewater and ambient water quality, underlines the strong rationale for globally harmonized, quality-assured water monitoring within the framework of GEMS/Water. The objective is to provide reliable water quality data and knowledge products that Member States need for the effective management of water resources and to keep track of their achievements, including in the implementation of Agenda 2030.

* UNEP/EA.2/1.

I. Background

GEMS/Water: purpose and objectives in the context of the 2030 Agenda for Sustainable Development

1. The UNEP Global Environment Monitoring System/Water Programme (GEMS/Water) is a global water quality monitoring programme coordinated by the United Nations Environment Programme (UNEP) and underpinned by Governing Council decisions 23/2, 24/16, 26/14 and 27/11 (section VI), by which the Council defined a mandate for the programme and invited Member States to participate. Until 2014, GEMS/Water was supported by the Government of Canada, facilitated by Environment Canada and its Canada Centre for Inland Waters, to develop knowledge and capacity on inland water quality issues. With new partnerships in place since 2014, GEMS/Water has transitioned to a decentralized model with global, regional and national partners. At the global level, the German Federal Institute of Hydrology in Koblenz, Germany, and University College Cork in Ireland are leading the work on data and capacity development, while regional implementation is already under way in the Latin American and the Caribbean region, led by the National Water Agency of Brazil.

2. In resolution 1/9, adopted by the United Nations Environment Assembly at its first session, the Assembly reaffirmed the GEMS/Water mandate in the light of the goals and targets of the emerging post-2015 sustainable development agenda. It also recalled paragraphs 120 and 124 of the outcome document of the United Nations Conference on Sustainable Development, entitled "The future we want", in which Heads of State and Government and high-level representativescalled for the adoption of measures to significantly reduce water pollution and increase water quality and made a commitment to the progressive realization of access to safe and affordable drinking water and basic sanitation, recognizing that good water quality and adequate water quantity were a prerequisite for sustainable development and human well-being, as well as for protecting biodiversity and the integrity of the planetary ecosystems.

3. In resolution 1/9, the United Nations Environment Assembly considered UNEP and GEMS/Water to be well suited to supporting the achievement of the water quality and pollution-related targets of the Sustainable Development Goals through the provision of data and information for assessments on the state of freshwater resources, including for the World Water Quality Assessment Report. The Assembly also requested the drafting of a revised GEMS/Water programme, embedded in the programme of work of UNEP, to provide timely, relevant and reliable data and information to inform policymaking at the relevant levels.

4. Since the adoption by the United Nations General Assembly, on 25 September 2015, of its resolution 70/1, entitled "Transforming our world: the 2030 Agenda for Sustainable Development", GEMS/Water is becoming a critical element for supporting Member States in their efforts to meet the targets of the Sustainable Development Goals and keep track of their achievements. The nature of the context and mandate is broad.

5. In Agenda 2030, the Heads of State and Government and High Representatives envisage "a world where we reaffirm our commitments regarding the human right to safe drinking water and sanitation", recognizing that "natural resource depletion and adverse impacts of environmental degradation, including desertification, drought, land degradation, freshwater scarcity and loss of biodiversity, add to and exacerbate the list of challenges which humanity faces", and that "social and economic development depends on the sustainable management of our planet's natural resources".

6. Agenda 2030, which is universal in nature, reaffirms the commitment of all Member States to "conserve and sustainably use oceans and seas, freshwater resources, as well as forests, mountains and drylands and to protect biodiversity, ecosystems and wildlife" and "to tackle water scarcity and water pollution".

7. To that end, Agenda 2030 has a dedicated Sustainable Development Goal on water (Goal 6: ensure availability and sustainable management of water and sanitation for all), with two targets referring specifically to water quality: target 6.3, "by 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally", and target 6.6, "by 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes". GEMS/Water is seen as a major contributor to assist countries in monitoring water quality and linking it to the quantity available for human consumption and ecosystem functioning. The targets also attach significant importance to another key GEMS/Water objective, capacity development: by 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including

water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies (target 6.a).

8. Agenda 2030 also addresses the critical role of water in achieving sustainable development through a number of other interlinked goals covering aspects of health, sustainable consumption and production, urbanization and oceans. The following goals and targets are particularly relevant: Goal 3, targets 3.3 and 3.9; Goal 11, target 11.5; Goal 12, target 12.4; Goal 14, target 14.1; Goal 15, target 15.1.

9. Those targets address the need underlined in resolution 1/9 to "further improve the global coverage and consistency of water quality data as well as to expand the GEMS/Water network", to which end Member States, relevant United Nations agencies, the international scientific community and other interested partners and stakeholders are invited to "cooperate with the GEMS/Water Global Coordination Unit, the GEMS/Water Capacity Development Centre and GEMS/Water database (GEMStat) in building a reliable global freshwater monitoring and information system".

10. The present report sets out the main components of the revised GEMS/Water programme, its achievements in the first year subsequent to transition and the workplans developed with partners to meet expectations. It provides a budget, projected into the biennium 2018–2019, and describes the role of GEMS/Water in the recently launched "Integrated monitoring of water- and sanitation-related SDG targets" (GEMI), which is a collective effort by several United Nations entities under the coordination of UN-Water to facilitate harmonized national monitoring of, and reporting on, Sustainable Development Goal targets in the water and sanitation sector.

II. Revised GEMS/Water programme: key components

A. Partners: agreements, roles and responsibilities, staffing

1. GEMS/Water Data Centre, Federal Institute of Hydrology, Koblenz, Germany

11. The GEMS/Water Data Centre was established in early 2014 to coordinate and deliver data collection, processing and dissemination activities related to the global water quality monitoring data and information system GEMStat. Managed by the International Centre for Water Resources and Global Changeand hosted by the Federal Institute of Hydrology in Koblenz, Germany, it operates under a 10-year cooperation agreement between UNEP and the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, Germany, signed in June 2015, and an interministerial agreement between that ministry and the Federal Ministry of Transport and Digital Infrastructure, Germany.

12. The main function of the Data Centre is to mobilize and support the generation, collection and sharing of and access to quality-assured data on freshwater resource quality. This is to enable assessments of its state and trends at the regional level and globally, such as provided in the World Water Quality Assessment supported by UNEP and UN-Water. It supports standardization and harmonization efforts in relation to data collection, analysis and exchange in collaboration with the Hydrology Domain Working Group of the World Meteorological Organization (WMO) and the Open Geospatial Consortium (OGC), and develops water quality indicators in support of large-scale assessments such as for the Global Environment Outlook and the monitoring of Agenda 2030. The Centre has five scientific and technical staff: one scientific officer for overall coordination of the Centre, a second for data analysis and product development, a third for data collection, processing, product generation and public relations and a fourth for the coordination of information technology and data management, as well as one technical officer for database and information system maintenance.

2. GEMS/Water Capacity Development Centre, University College Cork, Ireland

13. Under the revised structure of the GEMS/Water programme, capacity development activities related to water quality monitoring and assessment are coordinated and delivered, under a five-year project cooperation agreement signed in September 2015, by the newly-established GEMS/Water Capacity Development Centre in Cork, Ireland. Based at the Environmental Research Institute of University College Cork, the Centre is a partnership of three of the constituent universities of the National University of Ireland – University College Cork, Trinity College Dublin and National University of Ireland Galway – together with Dublin City University, the Institute of Technology in Sligo and the Environmental Protection Agency of Ireland.

14. The function of the Capacity Development Centre will be to encourage a standardized approach to data generation by participating countries through providing guidance and training on all aspects of water quality monitoring and quality assurance in monitoring activities. The aim is to ensure

the compatibility and comparability of data for use in national, regional and global assessment and to maintain the overall coherence of the GEMS/Water programme by standardizing approaches across all regions through producing standard methods, overseeing course content and training staff, where required. All capacity development initiatives will be planned and implemented in close cooperation with the GEMS/Water Global Programme Coordination Unit and UNEP regional offices to ensure that they are appropriately – and sensitively – targeted and delivered.

15. The Capacity Development Centre has developed a five-year global workplan, with a special focus on Africa. The provision of training through in-situ workshops and online courses will promote the generation of reliable, quality-assured, data that can be shared through the GEMStat data and information system and the online data and knowledge-sharing platform UNEP Live, and contribute to water quality assessments of a national, regional and global scale. By early 2016, the Centre will have three scientific and technical staff and one information technology expert for the development of online course materials and part-time administrative support. The partnership with other universities and the Environmental Protection Agency ensures access to extensive international expertise in all aspects of water resources management – from water quality monitoring to ecological protection, from drinking water supply to wastewater treatment and disposal and from environmental assessment to policy development and implementation – and attracts significant in-kind contributions for the GEMS/Water programme. Given the internationally recognized experience in teaching and learning at all levels and the provision of training materials through University College Cork, training courses will be accredited by one of the world's leading universities, rated in the top 2 per cent, and its first "green campus".

3. GEMS/Water regional hub for the Latin American and the Caribbean region and the Community of Portuguese-Speaking Countries

16. In July 2014, UNEP and the National Water Agency of Brazil signed a memorandum of understanding that established the Agency as the GEMS/Water regional hub for Latin America and the Caribbean and the developing-country member States of the Community of Portuguese-Speaking Countries for the promotion and delivery of capacity-building activities in water quality monitoring, assessment and data dissemination. The regional hub works closely with the GEMS/Water Capacity Development Centre, contributing training modules and courses that will be instrumental in the regional implementation of the GEMS/Water programme.

4. GEMS/Water Global Programme Coordination Unit, UNEP Headquarters, Nairobi

17. In the revised GEMS/Water programme, the Global Programme Coordination Unit is based in the Division of Early Warning and Assessment at UNEP Headquarters in Nairobi. It is in charge of day-to-day programme coordination and management at the global level, including interaction with partners, links to regional offices and interaction with the UNEP interdivisional water group and the GEMS/Water Steering Committee. It will be supported by one senior programme officer for internal and external oversight and coordination, one programme officer (currently being recruited) acting in a support role, one junior programme officer (currently being recruited) and one United Nations volunteer recruited from partner Governments, whenever the opportunity arises, together with one general service staff member, with support from the Fund Management Officer.

18. The Unit is in charge of day-to-day programme management and liaising with key partners, regional offices and donors. Its responsibilities include coordination, planning and joint strategy design with partners, as well as services to inform policymaking and coordinating direction. A particular role will be to ensure coordination with the UNEP senior programme officer heading the Freshwater Ecosystem Unit, currently under recruitment, in the Division of Environmental Policy Implementation, and the programme officer for the implementation of GEMI, also under recruitment in that Division. The Unit will maintain the website and, in collaboration with partners, coordinate the annual and multi-annual workplans and the organization of workshops that will feed into the GEMS/Water Capacity Development Centre. Funding issues are also addressed collectively with partners.

B. GEMS/Water in the context of the Sustainable Development Goals

19. "Integrated monitoring of water and sanitation related SDG targets" (GEMI) is a United Nations inter-agency initiative coordinated by UN-Water in the context and in support of reporting on the Goal 6 targets. It aims to provide a coherent water and sanitation monitoring framework based on improved data collection and analysis, the ultimate goal being to contribute to Agenda 2030 by fostering the advancement of water management across the entire water sector through informed decision-making based on harmonized, comprehensive, timely and accurate information (www.unwater.org/gemi/en/). While under the dedicated Sustainable Development Goal

on water (Goal 6) the World Health Organization (WHO), through its Joint Monitoring Programme with the United Nations Children's Fund (UNICEF), and UN-Water, through its Global Analysis and Assessment of Sanitation and Drinking-Water, are already tracking achievements in the areas of drinking water, sanitation and hygiene (targets 6.1 and 6.2, with targets 6.a and 6.b focusing on the means of implementation), GEMI combines the forces of seven United Nations agencies to expand existing monitoring efforts on wastewater treatment and water quality, water use and use-efficiency, integrated water resources management and water-related ecosystems (targets 6.3 to 6.6): the Food and Agriculture Organization of the United Nations (FAO), the United Nations Educational, Scientific and Cultural Organization (UNESCO), UNEP, the United Nations Human Settlements Programme (UN-Habitat), UNICEF, WHO and WMO.

20. The FAO information system, AQUASTAT, and the revised GEMS/Water programme data and information system, GEMStat, collect data from over 4,000 sampling stations and figure among the crucial existing monitoring efforts on which the GEMI global initiative relies. GEMS/Water is expected to be the operational system for monitoring ambient water quality, providing data flows in support of indicators 6.3.2 (already approved by the Inter-agency and Expert Group on The Sustainable Development Goal Indicators) and 6.6.1 (to be approved in March 2016). It will also assist Member States with dedicated capacity development through a "ladder approach" that allows them to start with water quality monitoring at a level in line with their national capacity and available resources, then encourages and supports them in efforts to expand the scope of their efforts over time. The role of GEMS/Water will be to provide the methodological backstopping, standard definitions and quality assurance for national monitoring. On a regional and global scale, comparison of national data over time will enable progress to be tracked against the Sustainable Development Goal targets.

III. Status of the revised GEMS/Water programme: embedment in the current programme of work and projection through to 2018–2019

A. Water quality: strengthening the normative basis for planning, monitoring and managing water quality for aquatic ecosystems (subprogramme 3: healthy and productive ecosystems)

21. Since its transition to new partners and donor countries, the revised GEMS/Water programme has been visibly embedded in the UNEP programme of work. It is central to the water sector as a whole and has become a core element in a broader water quality project entitled strengthening the normative basis for planning, monitoring and managing water quality for aquatic ecosystems, which is contributing to expected accomplishment (a): Use of the ecosystems approach in countries to maintain ecosystem services and sustainable productivity of terrestrial and aquatic systems is increased. Delivery in the revised programme is organized in line with two main outputs: the first to provide tools, technical support and partnerships to improve integrated water resource management including water quality using the ecosystem approach, and the second to provide technical support to use ecosystem management tools and approaches and partnerships strengthened to improve integrated water resource management including water quality.

22. GEMS/Water contributes to two of the four elements of the project in providing for capacity development for national and regional water quality monitoring and in developing environmental data and information on water quality for the World Water Quality Assessment. At the same time it relates, as appropriate, to the other two elements concerning the International Water Quality Guidelines for Ecosystems and outreach.

23. The GEMS/Water budget reflects the lifetime of the project, including the biennium 2016–2017, and relies fully on financial and in-kind support from donor countries. The table below shows the budget situation through to 2017 and a projection for the biennium 2018–2019, based on the assumption that the lifetime of the underlying agreements, that is, the memorandums of understanding with Ireland (five years) and Germany (10 years), remains unchanged.

24. It is anticipated that the tracking of Sustainable Development Goal targets in the implementation of GEMI will accelerate demand for training and capacity development. It is therefore assumed that a larger number of workshops and training measures will be required, in addition to those set out in the workplan to be carried out by GEMS/Water partners and the GEMS/Water Global Programme Coordination Unit. Current observations indicate a growing interest in the regions. While regional offices will support them to some extent, the technical and organizational capacity will have to come mostly from the partners and the Coordination Unit. The high demand for training and capacity development on the ground is likely to result in higher costs to enable the broadest possible, active, involvement of developing-country participants in the next two or even three bienniums,

from 2016 to 2020. An estimate of the additional resources required based on that assumption is provided in the budget table.

25. In addition, the number of requests for the continued provision of performance evaluation services by GEMS/Water to foster quality-assured data and monitoring is increasing. National state-of-the-environment water quality monitoring reports and data flows for tracking the Sustainable Development Goals rely on continuously improved and tested performance and methodologies. Additional resources will be required to organize and coordinate this from GEMS/Water, beginning with the Capacity Development Centre and its partners. The table below includes a financial projection for performance evaluations once every biennium.

26. The current budget provided covers the agreement to operate the GEMS/Water Capacity Development Centre set out in the workplan approved by the donors, including personnel, travel, activities and outreach. It provides for a full-time programme officer (P-3) to support the GEMS/Water Global Programme Coordination Unit in Nairobi, with some $133,000 per year remaining, after the deduction of programme support costs for activities and operations and Coordination Unit travel. It caters for core coordination activities and support for a minimum number of workshops, assuming that the Unit is fully staffed. It does not, however, extend to capacity development activities for the larger number of workshops likely to be required or to the offer of performance evaluation services.

27. United Nations Environment Assembly resolution 1/16, on the management of trust funds and earmarked contributions, explicitly approved the extension of several trust funds subject to the Executive Director of UNEP receiving requests to do so from the relevant Governments or contracting parties. Accordingly, the General Trust Fund to Provide Support to the Global Environment Monitoring System/Water Programme Office and to promote its Activities, which is part of the portfolio, has been extended to 31 December 2017. It is hoped that the fund will be able to attract additional support for broad capacity development and performance evaluation as core GEMS/Water services in the context of Sustainable Development Goals, and that it will ensure the continuity of funding in the light of Agenda 2030.

Type of funding	Source of funding	2014	2015	2016	2016 (unsecured)	2017	2017 (unsecured)	Total ($)* (current agreement lifetimes as per programme of work /subprogramme 3)	2018	(2018 unsecured)	2019	(2019 unsecured)
	Environment Fund											
	Regular budget											
Extra-budgetary funding Cash	Total extrabudgetary funding secured under the memorandum of understanding with Ireland (lifetime: 5 years) Project cooperation agreement with University College Cork, covering: - 1 staff (P-3) for the Global Programme Coordination Unit; - Global/regional capacity development activities, including travel, outreach and daily operations (some $133,000 per annum available after deduction of programme support costs)		743 910	743 910		743 910		**2 231 730**	743 910		743 910	
In kind	Co-financing secured on the basis of in-kind contributions through the memorandum of understanding with Germany (lifetime: 10 years)	613 930	613 930	613 930		613 930		**2 455 720**	613 930		613 930	
	Additional estimated costs (unsecured): GEMS/Water Capacity Development Centre and Global Programme				125 000		250 000			250 000		250 000

Type of funding	Source of funding	2014	2015	2016	2016 (unsecured)	2017	2017 (unsecured)	Total ($)* (current agreement lifetimes as per programme of work /subprogramme 3)	2018	(2018 unsecured)	2019	(2019 unsecured)
	Coordination Unit (not including partial contributions from regional offices)											
	Support for workshop organization and regional capacity development activities (including anticipated increased demand for GEMI)						100 000			100 000		100 000
	Performance evaluation of laboratories globally (once every 2 years)				300 000					300 000		
Total secured (before deduction of programme support costs)		613 930	1 357 840	1 357 840		1 357 840		**4 687 450**	1 357 840		1 357 840	
Total unsecured (estimated additional resource requirements)					425 000		350 000	**775 000**		650 000		350 000

B. Overview of the GEMS/Water workplan and activities of the GEMS/Water Global Programme Coordination Unit

28. The overall workplan of the revised GEMS/Water programme comprises four components, addressing the activities of the GEMS/Water Global Programme Coordination Unit, Capacity Development Centre, Data Centre and regional hubs. Individual plans for each component are currently under development with the respective partners and are expected to be completed by March 2016, then made available on the GEMS/Water website (www.unep.org/gemswater/). The overall workplan addresses outputs 2 and 3 under expected accomplishment (a) of subprogramme 3 (healthy and productive ecosystems), which concern the use of the ecosystem approach. It also complements other areas of the UNEP programme of work on, among other things, rapid developments in data and knowledge management (UNEP Live and the national reporting system,and the development of a catalogue of definitions, i.e., the semantic ontology context, for the Sustainable Development Goals, all of which is expected to feed into GEMI.

29. Accordingly, activities to deliver capacity development (output 2) comprise training in water quality monitoring and assessment and the provision of a data handling, statistics and services component through the global data and information system, GEMStat. They also encompass the development of technical capacity at the regional level and the design and implementation of monitoring frameworks to ensure relevant scales of support for sustainable development, with reference mainly to GEMI. National monitoring will benefit from enhanced state-of-the-environment reporting to GEMStat. Countries are encouraged to make use of the UNEP Live knowledge management platform and to seek assistance in national reporting of relevant data through the national reporting system (see document UNEP/EA.2/3, on the science-policy interface, and resolution 1/4).

30. In addition, the revised GEMS/Water programme has been instrumental in informing the first phase of the World Water Quality Assessment. Activities under output 3, to develop environmental data and information on water quality, will synthesize information embedded in GEMStat for a pre-assessment phase. UNEP, UN-Water and other partners initiated the collaboration in 2014. The Helmholtz Centre for Environmental Research in Leipzig, Germany, the University of Kassel in Hessen, Germany, and several other partners have been contracted to assist with the background research and data collection, in close cooperation with GEMStat, as well as with analysis. A report entitled “A snapshot of the world’s water quality: towards a global assessment” will be launched at a science-policy forum to be held in Nairobi on 19 and 20 May 2016. The report links water quality to food security and environmental drivers, and provides a preliminary insight into technical and methodological issues related to global water quality monitoring, including the current utility and limitations of GEMStat and future requirements, such as the inclusion of modelled data and remote sensing information. Those issues and the future requirements in terms of data coverage, including modelled data, will be summarized in a UN-Water analytical brief coordinated by the UNEP Division of Early Warning and Assessment.

31. Other activities carried out as part of the Global Programme Coordination Unit workplan portfolio can be categorized as “outreach, partnership and review” activities. In that regard, GEMS/Water was involved in the second Eye on Earth Summit in October 2015 in Abu Dhabi (http://web.unep.org/eye-on-earth). The GEMS/Water Global Data Centre is actively engaged in the Eye on Water Security special initiative of the Eye on Earth Alliance to further develop the essentials for enhanced water data exchange. The range of ongoing efforts includes links between the state of water resources, water demand, management costs, climate data and broader geopolitical analysis; the energy-water security nexus in the Arab region and globally; space technologies for water security; citizen-science participatory mapping; and the role of automated data sampling in producing models to guide water-related policymaking.

32. The Eye on Earth Summit also called for the establishment of a number of special interest groups to address priority data issues. In addition, the discussions emphasized that there was still widespread hesitation in freely sharing water-related data and that it was necessary to set the conditions to address the problem. Recommendations shared included the development and use of water data standards for dissemination across boundaries and scales in time and space and between institutions, all of which fall within the scope of GEMS/Water priorities. Together with other partners, the GEMS/Water Global Data Centre is preparing a project proposal for the development of a collaborative platform known as “OpenWaterMap” to share knowledge on the location of water resources and how they are connected hydrologically. The Centre also supports the Eye on Global Network of Networks special initiative e in enlisting existing water information systems for improved access to and reporting of water data, information and knowledge.

33. Furthermore, the Global Programme Coordination Unit coordinated a GEMS/Water closed meeting at World Water Week in Stockholm in August 2015 on the subject of "water quality data and assessments: co-benefits for Sustainable Development Goals, country reporting and decision support". Co-chaired by donor Governments and UN-Water, the meeting supported the revised GEMS/Water workplan and took note of its status, achievements and future plans. It was emphasized that continued efforts were needed to strengthen regional presence and to improve methodologies to address data gaps and the critical role of GEMS/Water in assessments and, ultimately, in policy information and capacity development. It is critical that GEMS/Water consider a strong role not only in the context of the Sustainable Development Goals but also in the equally important area of services to meet institutional and country-level demands for improved water monitoring.

C. GEMS/Water workplan and activities of the GEMS/Water Capacity Development Centre and regional hubs

34. During 2015, a detailed workplan for capacity development in 2016–2017 was discussed by UNEP, the GEMS/Water Global Programme Coordination Unit, the GEMS/Water Capacity Development Centre and Irish donors. The workplan was agreed in August 2015 and a capacity development project cooperation agreement was signed in September 2015. The key elements are as follows: a detailed training needs assessment for water quality monitoring in sub-Saharan Africa, focusing initially on 12 countries; a training strategy for the 12 countries; consultation with UNEP regional offices and national focal points to prepare capacity development strategies for the other regions; the development of trial training materials for face-to-face and online delivery, in partnership with one regional hub (National Water Agency of Brazil); the organization of three workshops in Africa and two in Asia-Pacific and/or Latin America and the Caribbean; the commencement of efforts to develop a suite of nine technical training courses available in a variety of delivery modes, with a particular focus on initial implementation in Africa (to be extended to all regions online); and efforts to develop a suite of more advanced "training the trainers" modules.

35. Throughout the biennium 2016–2017, emphasis in the workplan of the GEMS/Water Capacity Development Centre will be placed on establishing contacts and partnerships for the development and delivery of training. Attendance of the relevant international water meetings will serve to focus on making contact with countries currently inactive, or only relatively active, in the GEMS/Water Global Network, as well as on exploring potential partnerships for the new regional hubs. It will also serve to promote GEMS/Water and the availability of capacity development activities through presentations, printed literature and a redesigned web presence. The Capacity Development Centre will work closely with all regional offices, supported by the GEMS/Water Global Programme Coordination Unit; this has already begun in various regions.

36. The need for capacity development in the West Asia region is currently being examined through contacts with the UNEP Regional Office for West Asia following an introductory training day in Muscat in October 2014 and a regional meeting on data networking in Amman in November 2014 (see paragraphs 53 and 54, below). A strategy is currently under development to promote coordinated water quality monitoring and assessment and the provision of data from the Arab region to GEMStat and UNEP Live.

37. The scoping of current activities and needs with regard to capacity development for water quality monitoring and assessment in Africa began in August 2015 at an Africa region workshop, co-organized with the UNEP Regional Office for Africa in Maputo on the theme "Strengthening institutional arrangements for Lake Malawi: a workshop on building capacity for water quality and ecosystems". The objective was to foster institutional cooperation to build and strengthen institutional arrangements through technical discussions, with a focus on the current status of the Lake Malawi ecosystem and practices related to water quality monitoring and assessment, data and information. At the workshop, the GEMS/Water Capacity Development Centre outlined good practices for water quality monitoring activities and the generation of data for assessment purposes. Various approaches to water quality monitoring were discussed and key parameters for the monitoring programme identified. In addition, joint activities for monitoring the Lake Malawi ecosystem and related services, as well as the potential development of joint ecosystem management projects were explored. As a way forward, a framework for enhancing cooperation in the field of water quality monitoring and ecosystems management was drafted. Further scoping is being planned for the other focus countries in Africa, and training materials are currently being developed for testing and trial delivery in the region in early 2016.

38. Discussions are under way with the regional hub for Latin America and the Caribbean – the National Water Agency of Brazil – to support the development and delivery of two training modules on water quality monitoring. The first draft modules are being prepared in cooperation with the

São Paulo State Environment Agency, which also serves as a regional centre for the promotion of capacity-building in Latin America and the Caribbean of the Stockholm Convention on Persistent Organic Pollutants. In the biennium 2016–2017, the GEMS/Water Capacity Development Centre will cooperate with this and other regional hubs to ensure worldwide online delivery of university-accredited versions of the modules and other parallel technical modules are being developed for a more technical audience, including the advanced "training the trainer" modules in the period 2016–2018.

39. The GEMS/Water Capacity Development Centre can also offer custom, demand-driven, training in specific aspects of water quality monitoring and assessment for small groups on the Centre's premises. For example, after the Seventh World Water Forum in April 2015, the Republic of Korea requested a two-day training workshop for 10 staff members from its National Institute for Environmental Research, entitled "Quality-assured data from water quality monitoring programmes: practice and practicalities." The workshop was held at the Centre in Cork, Ireland, on 29 and 30 October 2015.

40. The GEMS/Water Capacity Development Centre has participated in other water project activities under subprogramme 3 of the programme of work since 2014, such as those associated with Working Group 2 of the "Compendium of Water Quality Regulatory Fremeworks: Which Water for Which Use"; a progress meeting at World Water Week 2014 in Stockholm; the drafting of the World Water Quality Assessment Report in Magdeburg, Germany, in January 2015; and the International Water Quality Guidelines for Ecosystems advisory and review group, including attending the final review meeting in Bonn, Germany, in September 2015.

41. Provided adequate additional funding or a suitable partner can be found, the GEMS/Water Capacity Development Centre plans to coordinate a laboratory performance evaluation exercise focusing on a limited number of laboratories from the current GEMS/Water network in 2016.

D. GEMS/Water Work Plan and activities of the GEMS/Water Data Centre:

42. A workplan of data-related activities for the period 2015–2017 has been developed, with a focus on three key elements. The first is to operationalize the GEMStat data and information system, including through:

(a) Revising and extending data management procedures related to data governance, database management, data security, data quality, data-sharing and metadata;

(b) Revising database structure and content to include additional metadata on monitoring sites, water quality parameters and analytical methods;

(c) Redesigning the online information system component using state-of-the-art web frameworks for enhanced end-user experience, including a revision of the available statistical and load estimation tools;

(d) Revising existing data quality assurance and control procedures;

(e) Redesigning the existing web services providing access to monitoring data, metadata and data products, based on the standardized open protocols and exchange formats of the Open Geospatial Consortium (OGC), including the development of an ISO 19115/19139-compliant metadata profile for water quality monitoring data and associated services and supporting the standardization of a WaterML 2.0 water quality profile, in collaboration with members of the OGC/WMO joint Hydrology Domain Working Group;

(f) Linking the revised GEMStat system with UNEP Live, the WMO Information System and the Global Earth Observation System of Systems;

(g) Enhancing the analytical methods dictionary as a reference for controlled vocabulary for water quality parameters and related analytical methods for a vocabulary registry that is accessible to humans and machines and that supports lifecycle management and the versioning of vocabulary terms using Semantic Web technologies and linked data principles.

43. The second key element of the 2015–2017 workplan is to augment acquisition of water quality monitoring data to increase the global coverage of the GEMStat system through:

(a) Promoting enhanced networking with existing members of the GEMS/Water Global Network, United Nations agencies, regional offices, regional hubs and other partners, and expanding the Network to include new partners;

(b) Supporting the capacity development activities of the GEMS/Water Capacity Development Centre and regional hubs in developing training materials, organizing workshops and compiling guidelines for data management and analysis;

(c) Investigating the usability of, and then incorporating, monitoring data from emerging sources, such as satellite-based remote sensing and citizen-science monitoring programmes, in collaboration with research institutes, nongovernmental organizations, space agencies and the private sector.

44. The third element is to enhance existing and develop new key water quality indices and indicators in support of the World Water Quality Assessment and the emerging monitoring and reporting framework for Sustainable Development Goal 6 – the "Integrated monitoring of water and sanitation related SDG targets" (GEMI) initiative (see paragraph 19, above). Activities include:

(a) Supporting the development of an ambient water quality indicator to monitor progress on water pollution under target 6.3 and contributing to others, such as target 6.6;

(b) Supporting the development of guidelines for the monitoring and reporting required at the national level;

(c) Assisting a selection of countries in implementing the guidelines during a "proof-of-concept" phase in 2016, then revising them based on the feedback;

(d) Extending the initiative to a larger number of countries;

(e) Providing input for a global baseline report due in 2017.

45. Since the transfer of the GEMStat system and its related assets from Environment Canada to the GEMS/Water Data Centre in March 2014, the Centre has conducted a review of the database structure and content, the online information system, including web services, and the business processes associated with the retrieval, processing, archiving and sharing of data from GEMS/Water partners. The focus has initially been on harmonizing the database content, restructuring the database and enhancing import and export capabilities and quality control procedures.

46. The redesign of the GEMStat graphical user interface has focused on improving the discoverability of the data through enhanced map client and filter capabilities, and on enhancing the chart features. The statistical analysis functionalities, loading estimate and water quality indicator products are currently being reviewed. They will be implemented and adapted to the modified requirements originating from the World Water Quality Assessment and the monitoring of the Sustainable Development Goals in the second phase of the revision of GEMStat, from April 2016.

47. The revision of the web services includes updating the GeoNetwork metadata catalogue, including through the development of a metadata profile for water quality and quantity monitoring data in collaboration with the Global Runoff Data Centre. It also includes the replacement of the existing data download services implemented as Open Geospatial Consortium Web Feature Services by an OGC Sensor Observation Service offering WaterML 2.0-encoded data and a custom representational state transfer application programming interface. In order to further improve interoperability with the web services of data providers and other global information systems, such as UNEP Live and the Global Earth Observation System of Systems, the GEMS/Water Data Centre will support the standardization of a WaterML 2.0 water quality profile based on OGC Best Practice WaterML-WQ during the second phase. Furthermore, the development of additional OGC-compliant web services for calculating statistics, load estimates and water quality indicators is planned.

48. The Data Centre has continued the work initiated by Environment Canada in 2013 on further developing the analytical methods dictionary. In the first phase, existing metadata on water quality parameters and analytical methods have been harmonized and extended through additional attributes, such as detection limits. Starting in August 2015, the dictionary is being converted into formalized Simple Knowledge Organization System vocabularies. For the publication and maintenance of those vocabularies, the Centre plans to implement a vocabulary registry service during the second phase, which will allow for referencing data submissions and provide additional information in the data offered to users through the other web services.

49. While GEMStat may be the most comprehensive global data source on freshwater quality, its data coverage needs to be substantially improved to effectively support the World Water Quality Assessment and the monitoring of the Sustainable Development Goals. In 2014–2015 the Data Centre focused on re-establishing existing partner contacts to increase data submissions to the GEMStat system. The Centre supports the GEMS/Water Global Programme Coordination Unit in its

collaboration with the regional hub for Latin America and the Caribbean and the Community of Portuguese-Speaking Countries and UNEP regional offices to identify and gain new members for the GEMS/Water Global Network. Integrated into a UNESCO category 2 water centre, the Centre reaches out to research institutes through the network of the International Hydrological Programme.

50. The GEMS/Water Data Centre also explores other cost-effective water quality monitoring methods, such as remote sensing and citizen-science, in order to address the challenge of spatial and temporal data gaps in the GEMStat system. It has partnered strategically with several remote sensing organizations, community of practice groups and research and development projects monitoring and gathering water quality satellite-derived data and information. The Data Centre is coordinating the provision of in-situ monitoring data from the national focal points to develop and validate appropriate methods and resulting products. In 2016, a one-year Sentinel-2 satellite pilot service will be established and an assessment of Sentinel-1 and Sentinel-2 derived surface water quality products will be provided. One of the GEMS/Water requirements is the utility of the products for reporting on Sustainable Development Goal target 6.3 and other interlinked targets; and based on the project results, the Centre plans to engage with space agencies and donors to establish operational remote sensing of water quality services.

51. In 2014, the GEMS/Water Data Centre participated in a UN-Water technical working group to assess potential water quality indicators in support of the monitoring of the Sustainable Development Goals, resulting in an indicator proposal based on the GEMS/Water Water Quality Index and focusing on five key water quality parameters to support the assessment of freshwater resource quality. Throughout 2015, the Data Centre worked on improving the design of a proposed indicator for Sustainable Development Goal target 6.3 (indicator 6.3.2: Percentage of water bodies with good ambient water quality) and compiled input for a consolidated UN-Water metadata note on all proposed Goal 6 indicators provided to the Inter-agency and Expert Group on Sustainable Development Goal Indicators in September 2015. Since July 2015, it has been participating in the GEMI target team on Sustainable Development Goal target 6.3, led by WHO and UN-Habitat. The GEMS/Water Data Centre supports the compilation of a monitoring methodology with detailed information on the data, computational methods and resources required for implementation at the national level, as well as regarding the monitoring "ladder approach" (see paragraph 20, above). The monitoring methodologies will be discussed and tested in selected Member States of the United Nations in 2016.

E. GEMS/Water in the regions

52. GEMS/Water is constantly assessing the options for regional hubs in consultation with UNEP regional offices as a means of ensuring ownership and buy-in for GEMS/Water at the regional level, while striving to improve data flows and capacity development and provide Member States with a platform to assist in reporting and assessment. Mutually positive experiences in collaboration with the National Water Agency of Brazil in the Latin American and the Caribbean region strongly support this concept. Further discussions have been initiated – and need to be continued – for Africa, with the departments of water and forestry, and the national focal points for the African Ministers' Council on Water in Kenya and South Africa. For the Asia-Pacific region, initial consultations have taken place with relevant departments in the ministries of the environment and land, infrastructure, transportation and tourism of Japan, together with Kyoto University and the National Institute for Environmental Studies. A broader context for a regional hub, such as with partners of GEMI, may also be considered in the light of whether synergies can be achieved. To date, two post-transition workshops have taken place with the participation of GEMS/Water in the Arab region, in Amman and Muscat, in late 2014; other regions will follow.

53. In October 2014, the GEMS/Water Programme participated in a fact-finding workshop in Muscat, on the theme "Water Quality Monitoring and Assessment in the Arab region: challenges and opportunities", at the control centre of the country's Public Authority for Electricity and Water. The revised GEMS/Water operational principles and the good practices required for collecting, storing and interpreting data on water quality and quantity were shared with participants from Oman, Saudi Arabia, Tunisia, the United Arab Emirates and Yemen. A number of current water challenges in the region were addressed, together with ways to develop a regional water strategy. Support for UNEP was received through the Eye on Earth network.

54. As a direct follow-up, the GEMS/Water Programme also attended a regional network meeting on data and knowledge-sharing in Amman (25–27 November 2014). The meeting placed emphasis on standardization and data quality for assessment and developed outlines for a regional action plan to foster institutional cooperation and provide data to GEMS/Water and UNEP Live.

55. In conclusion, GEMS/Water has been shown currently to have very few active national focal points in Arab countries. There is a lack of time series and comparable, comprehensive, information on water quality and, to some extent, quantity and, at the same time, unprecedented pressure on the water sector owing to the number of displaced people in the region. A UNEP GEMS/Water regional hub may be instrumental in developing the capacity of experts and specialized institutions in the region. Initial consideration is directed towards the Arab Centre for the Study of Arid Zones and Dry Lands, which, among other things, provides technical assistance on water issues to Arab region countries. Also, Jordan has been carrying out pioneering work on water quality at the national and regional levels for several years, and has recently indicated an interest in being considered as a "proof-of-concept" country for initial testing of the GEMI approach, which may help to foster additional synergies. GEMS/Water will work with the regional office to further explore the options for a regional hub.

F. First operational regional hub for Latin America and the Caribbean and the Community of Portuguese-Speaking Countries: workplan and activities

56. Over the past five years, the National Water Agency of Brazil has promoted several courses on water quality with participants from countries from Latin America and the Caribbean, and has developed bilateral cooperation agreements for the promotion of water quality monitoring and assessment.

57. In view of the need to increase capacity-building activities, the regional hub, in consultation with the Data Centre and the Capacity Development Centre, has recently developed a GEMS/Water capacity-building regional strategy for Latin America and the Caribbean. The strategy comprises the development of water quality training modules tailored to the needs of countries in the region, as well as the member States of the Community of Portuguese-Speaking Countries. The Agency is in the process of preparing the first draft modules in cooperation with the São Paulo State Environment Agency (see para. 38 above).

58. The National Water Agency, as the regional hub, is working to implement the above strategy and to increase data-sharing among countries in collaboration with the UNEP Regional Office in Panama and the UNEP Brazil Office. Key elements of the strategy include the assessment of existing water monitoring strategies in the region, as well as their operational status, comparability, the standards applied and the capacity-development needs. Eight countries currently have national strategies in place and twelve have national focal points. The strategy is based on the assumption that the demand for water quality information will increase in Latin American and Caribbean countries in the years to come as a consequence of the implementation of international agreements and commitments, such as Agenda 2030 and the Sustainable Development Goals, the Amazon Cooperation Treaty and theTreaty of the River Plate Basin, and as a result of increased public pressure for environmental quality improvement, especially in the urban environment.

IV. Outlook for the next biennium and beyond

59. Provided that the proposed indicator 6.3.2 of Sustainable Development Goal 6 is approved by the Inter-agency and Expert Group on The Sustainable Development Goal Indicators, GEMS/Water – through its Data Centre, including the GEMStat system, and its Capacity Development Centre – will be a key component of the emerging monitoring framework for Goal 6 in delivering custom training material and courses and supporting the reporting process from the national to the global levels. Given that some countries may begin with a limited number of parameters and simple methodologies, the demand for support through the "ladder approach" is likely to increase, as will the data flows.

60. While all GEMS/Water capacity development materials will be made available online, there is still a need for associated field training, expert back-up for participants studying online and, in some regions, traditional classroom-style training and workshops. The GEMS/Water Capacity Development Centre will organize and participate in national and regional training workshops on water quality monitoring, assessment and quality assurance within the constraints of present funding (two to four workshops worldwide per year). In order to meet the anticipated demand, especially in relation to future monitoring of the water-related Sustainable Development Goal, additional resources are likely to be needed to fund Capacity Development Centre staff and participation in additional training workshops.

61. Laboratory performance evaluation exercises are a key component of global water quality monitoring and data-sharing for meaningful regional and global assessments. GEMS/Water participating countries, especially those still developing their capacity for water quality monitoring, rely on such exercises for verifying their own data. There is currently no specific targeted funding to support the exercises and, hence, additional funds will need to be sourced and mobilized. Coordination of the exercises will be assured through the GEMS/Water Capacity Development Centre as required in relation to the resources provided to support sample preparation and distribution.

62. In conclusion, GEMS/Water will be instrumental in implementing the Agenda 2030. This will generate increasing demand, giving rise to a need for fundraising to cover additional workshops, training participation, performance evaluations and country visits. Budget requirements will also arise in areas where GEMS/Water is making a contribution, such as in a second phase of the World Water Quality Assessment. It will be critical at the beginning of the biennium and, moreover, in the next programme of work of UNEP to raise additional funding through the trust funds. While the biennial performance evaluations can be budgeted at approximately $300,000 each, the increasing demand for country-level presence and training workshops can only be estimated based on assumptions (see the budget, above). It will be critical to maintain the funding support for all GEMS/Water components throughout the entire implementation period of Agenda 2030 and the Sustainable Development Goals.