WMO OMM
World Meteorological Organization
Organisation météorologique mondiale
Organización Meteorológica Mundial
Всемирная метеорологическая организация
المنظمة العالمية للأرصاد الجوية
世界气象组织

WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

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Ref.: 16655/2022-L11 I/ONM

Our ref.: 16655/2022/I/ONM/MQC/EnvSustainability-Survey 8 August 2022

Annex: 1

Subject: Survey on Environmental Sustainability of Observing Systems and Practices

Action required:
(1) To widely disseminate this information among services/institutions in your country that operate observing systems
(2) To provide feedback by filling out the online survey on environmental sustainability of observing systems and practices, by **25 September 2022**

Dear Sir/Madam,

The environmental impacts of current observing systems and methods, though important, have not been a significant consideration for network design and operation, or procurement processes to date. The recently adopted WMO Global Basic Observing Network (GBON) outlines the requirements for distance between observations, frequency of observations and international sharing of observations. To support the implementation of GBON, the World Meteorological Organization (WMO) Commission for Observation, Infrastructure, and Information Systems (INFCOM) has committed to promote the development and adoption of cost-effective strategies and technologies, which are both operationally and environmentally sustainable.

In order to assess current practices, WMO is conducting a survey on Environmental Sustainability of Observing Systems and Practices.

The intent of this survey is to gather information from WMO Members regarding current, planned, and potential approaches to enhance the environmental sustainability of observing systems in meteorological, hydrological, atmospheric chemistry, and marine domains. In addition, this survey aims to gather baseline information and ideas regarding areas of improvement and to better understand key challenges associated with implementing environmentally sustainable practices.

Detailed responses are essential in order to inform WMO of existing best practices and ongoing challenges facing Members while further developing the vision for the WMO Integrated Global Observing System (WIGOS) in 2040 associated with implementing GBON in a globally responsible manner.

The survey is available at: https://www.surveymonkey.com/r/25QS8YX. The content of the survey is also available in the annex to this letter, that is being made available in all WMO languages to ease the preparation of the replies.

I should be grateful if you could provide us with your valuable feedback, by completing the online survey at your earliest convenience, **but not later than 25 September 2022**.

To: Permanent Representatives of Members with WMO

cc: Hydrological Advisers

I would also like to urge you to widely disseminate this information among services/institutions in your country that operate observing systems, encouraging them to provide their feedback by filling out the survey.

I wish to take the opportunity to convey to you and your service my appreciation for your continued contribution to the activities of the WMO Integrated Global Observing System.

Yours faithfully,

Dr Wenjian Zhang
for the Secretary-General

WMO Survey on
Environmental Sustainability of Observing Systems and Practices

The environmental impacts of current observing systems and methods, though important, have not been a significant consideration for network design and operation, or procurement processes to date. The recently adopted WMO Global Basic Observing Network (GBON) outlines the requirements for distance between observations, frequency of observations and international sharing of observations. To support the implementation of GBON, the World Meteorological Organization (WMO) Commission for Observation, Infrastructure, and Information Systems (INFCOM) has committed to promote the development and adoption of cost-effective strategies and technologies, which are both operationally and environmentally sustainable.

The definition of environmental sustainability varies by organization, though generally, it is the practice of conserving, maintaining and protecting global ecosystems while consuming natural resources at a replenishable rate without an unnecessary strain on Earth.

The intent of this survey is to gather information from WMO Members regarding current, planned, and potential approaches to enhance the environmental sustainability of observing systems in meteorological, hydrological, atmospheric chemistry, and marine domains. In addition, this survey aims to gather baseline information and ideas regarding areas of improvement and to better understand key challenges associated with implementing environmentally sustainable practices.

Detailed responses are essential in order to inform WMO of existing best practices and ongoing challenges facing Members while further developing the vision for the WMO Integrated Global Observing System (WIGOS) in 2040 associated with implementing GBON in a globally responsible manner.

Thank you for your time in completing this survey.

Please provide the following information:

Country:

Organization:

List all domain(s) included in your response (Meteorology, Hydrology, Marine, Atmospheric Chemistry, and others):

Section 1: Planning and Procurement

1. In a standard procurement process for observing systems, many important criteria are evaluated including cost, technical specifications, and in some cases, environmental sustainability. When procuring observing systems, how would your organization rate the importance of criteria related to environmental sustainability? Please select one.

   A. Not applicable or do not know

   B. Not at all important

   C. Of little importance

   D. Somewhat important

   E. Very important

2. Procurement processes may also consider validating vendor accreditations. During procurement processes within your organization, are environmental management accreditations of potential vendors considered as a requirement for the process? (Example ISO14001[1], RoHS[2] compliance) (Yes/No/Do not know)

   If yes, please list the environmental management accreditations (domestic and international) and indicate if they are considered mandatory or suggested requirements for procurement processes.

Accreditation	Mandatory or Suggested

3. In planning, many organizations investigate innovative, advanced technologies for implementation in the next generation observing networks. Is your organization currently investigating innovative technologies that would improve the environmental sustainability of current observing practices? (Yes/No/Do not know)

   If yes, how often does your organization assess innovative and potentially more environmentally sustainable technologies? Please select one of the following:

   A. Not applicable or do not know

   B. On an ongoing basis

   C. As needed to replace non-supported/non-operational equipment

   D. Ad hoc with new funding initiatives or projects

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[1] ISO 14001 is an internationally agreed standard that sets out the requirements for an environmental management system. It helps organizations improve their environmental performance through more efficient use of resources and reduction of waste, gaining a competitive advantage and the trust of stakeholders.

[2] RoHS – Restriction of Hazardous Substances – focused on restricting the use of hazardous materials used in electrical and electronic products.
Source: https://www.tuv.com/world/en/rohs-compliance-testing.html

E. Other (please specify)

If possible, please specify the innovative technologies that are being assessed and how they could potentially improve environmental sustainability of observing practices.

Meteorological –Upper Air, Surface, Climate		Marine	
Instrument/ Technology	Potential improvement	Instrument/ Technology	Potential improvement

Hydrometric		Atmospheric Chemistry	
Instrument/ Technology	Potential improvement	Instrument/ Technology	Potential improvement

Section 2: Siting and Installation

4. Environmental accreditations for WMO Members indicate the level of environmental management system standards incorporated into the daily business practices of an organization. Is your organization ISO 14001[1] accredited? (Yes/No/Do not know)

Please list any other accreditations related to environmental sustainability that your organization holds or is working towards, such as LEED[3].

Accreditation	Compliant or Working towards compliance

5. Criteria, such as location access, transportation of goods/services, logistics for installation, operating costs, value of data and environmental impacts may be used in selecting a new location for an observing system. In your organization, how important are environmental impact criteria, when selecting a location for a new observing system?

[3] LEED rating systems cover a range of globally recognized standards for design, construction and operation of high-performance green buildings. https://www.usgbc.org/leed

A. Not applicable or do not know

B. Not at all important

C. Of little importance

D. Somewhat important

E. Very important

6. Similarly, there are environmental impact considerations related to construction materials and location infrastructure when installing a new observing system. In your organization, how important are environmental considerations when choosing materials for construction and location infrastructure?

A. Not applicable or do not know

B. Not at all important

C. Of little importance

D. Somewhat important

E. Very important

7. During the planning phase of an observing system location, environmental assessments for construction approvals may be required to meet national or jurisdictional regulations and legislations. In your organization, are there environmental regulations/legislations and associated permits that are required prior to construction of a new observing system? (Yes/No/Do not know)

If yes, please provide examples of environmental assessments that must be completed by your organization.

8. Advancements in alternative sources of power generation continue to be operationally and fiscally possible in many parts of the world. What percentage of your organization's observing systems are using an alternative power source to greenhouse gas (GHG) emitting sources, such as solar or wind? Please select one of the following:

A. Not applicable or do not know

B. 0%

C. 1–10%

D. 11–40%

E. 41–60%

F. 61%+

9. Is the adoption of environmentally sustainable power sources a component of future network design plans for your organization? (Yes/No/Do not know)

If yes, please provide further details.

Section 3: Operations

10. Challenges with the cost and availability of helium are affecting many WMO Members. This is expected to continue and expand to other important resources. As a result, it is increasingly important to continually explore alternative sustainable resources (e.g. hydrogen gas for helium) to conduct observations.
Please answer the following questions on this topic:

    (a) If your organization uses hydrogen gas for operational weather balloon observations and atmospheric chemistry observations, how is it being produced?

    (b) If your organization is using a chemical alkaline process for hydrogen generation, please explain methods of disposal for unused caustic and used solutions?

    (c) If your organization relies on the delivery of hydrogen gas to stations by compressed cylinders, are there any considerations to the generation method? If yes, what are these considerations?

    (d) If your organization relies on the delivery of hydrogen gas to stations by compressed cylinders, are there any considerations to the method of delivery and frequency?
    If yes, what are these considerations?

    (e) If your organization uses or is exploring an alternative, more sustainable hydrogen production system (e.g. hydrogen fuel cell exchange membrane system), please explain.

    (f) Has your organization faced availability challenges with other important resources? If so, how have you been handling the problem and have you had any success?

11. In your organization, what is the annual average number of balloon-based observations for meteorology and atmospheric chemistry?

    (a) Meteorology (flights/year) =

    (b) Atmospheric chemistry (flights/year) =

12. For upper air observations, radiosondes are an integral part of the observing system. Once the radiosonde is released, it may travel great distances before returning to Earth. What percentage of your organization's operational radiosondes are recovered after they are released and returned to Earth?

    A. Not applicable or do not know

    B. 0%

    C. 1–10%

    D. 11–40%

    E. 41–60%

    F. 61%+

    If applicable, please describe how radiosondes are recovered by your organization.

13. For atmospheric chemistry observations, ozonesondes are a method used to gather related data. Once the ozonesonde is released, it may travel great distances before returning to Earth. What percentage of your organization's ozonesondes are recovered after they are released and returned to Earth?

    A. Not applicable or do not know

    B. 0%

    C. 1–10%

    D. 11–40%

    E. 41–60%

    F. 61%+

    If applicable, please describe how ozonesondes are recovered by your organization.

14. For hydrological observations, some instruments/technologies require the use of tracers in order to make measurements (e.g. dilution, surface velocity).
    Does your organization make use of such tracers? (Yes/No/Do not know)

    A. If yes, how many observations per year are made using this method (#/year)?

    B. If yes, please describe the tracer chemical and/or material used.

    C. If yes, what considerations are important to the decision-making process of the type of tracer? (identify the top three priorities, ordering #1, 2, 3 beside the consideration)

    - Measurement quality
    - Cost
    - Environmental impact
    - Safety procedures for staff
    - Other: (Please explain)

15. Incentive programmes (e.g. radiosonde recovery) may be a valuable way to minimize the environmental impact of observing systems. Does your organization participate in any incentive programme? (Yes/No/Don't know)

    A. If yes, please provide details.

    B. If yes, how effective are these?

    - Not applicable or do not know
    - Not at all effective
    - Of little effectiveness
    - Somewhat effective
    - Very effective

16. For marine observations, both moored and drifter buoys are often used as a main source of in-situ measurement. In your organization, what percentage of operational moored and drifter buoys are lost/not recovered? Please select from the table below.

Moored Buoys	Drifter Buoys
A. Not applicable or do not know	A. Not applicable or do not know
B. 0%	B. 0%
C. 1–10%	C. 1–10%
D. 11–40%	D. 11–40%
E. 41–60%	E. 41–60%
F. 61%+	F. 61%+

17. Physical waste from day-to-day operations and maintenance of observing systems is a challenge. Examples of physical waste could include dunnage, instrument packaging, containers to recharge precipitation gauges, used lubricants, defective instruments etc. Does your organization monitor the level of physical waste associated with observing systems? (Yes/No/Do not know)

    If yes, how are levels of physical waste being monitored for current observing systems (e.g. amounts, type of materials, etc.)?

18. To access and maintain many observing systems, transportation by motor vehicle is usually required. If your organization uses vehicles within their daily operations, what is the percentage of vehicle fuel source used (to the nearest 5%)?

    A. Not applicable or do not know

    B. Gasoline

    C. Diesel

    D. Hybrid

    E. Electric

    What is the approximate size of your vehicle fleet (i.e. number of active vehicles)?

19. Is your organization actively changing or does it have plans to change to a more environmentally sustainable vehicle fleet management? (Yes/No/Do not know)

    If yes, please provide further details.

Section 4: Decommissioning

20. When decommissioning an observing system location, the goal is usually to return the location back to its previous pre-construction status. Does your organization have formalized decommissioning practices in place once an observing system ceases operations? (Yes/No/Do not know)

    If yes, please provide more details on how this is done.

21. Observing systems sometimes contain hazardous materials that should be properly disposed of to minimize environmental impacts.

    A. Does your organization need to comply with regulations defining hazardous materials and how to decommission them properly? (Yes/No/Do not know)

    B. How does your organization decommission hazardous materials from observing systems?

22. In accordance with adoption of the Minamata Convention on Mercury[4], mercury and mercury containing compounds are to be phased out of use. Is your organization on track to phasing out mercury from all observing systems in accordance with the Minamata Convention on Mercury? (Yes/No/Do not know)

    If yes, please explain the process that has led to this success.

    If no, please explain any challenges that are delaying the removal of mercury from your organizations observing systems (e.g. replacement instrumentation availability, cost, removing and disposing after instrument reaches end of life, not a party to the adoption of the convention etc.).

Section 5: Challenges and Opportunities

23. Environmental sustainability of observing systems and practices may be incorporated into any aspect of the weather, water and climate monitoring value chain through WMO Statements of Guidance[5]. For your organization, what are considered the top three opportunities for advancing environmental sustainability of observing systems and practices? Rank the top three from the list below or add your own.

    - Policy development
    - Innovative technology assessment and implementation
    - Power generation
    - Building materials
    - Fleet management
    - Waste management
    - New/modified standards/practices
    - Other: _____

[4] The Minamata Convention on Mercury is a global treaty to protect human health and the environment from the adverse effects of mercury through a phase-down and phase-out approach. https://www.mercuryconvention.org/en/about

[5] Statements of Guidance are part of the outcome of the WMO Rolling Review of Requirements for Observations. They are produced for WMO Application Areas and are essentially gap analysis with recommendations on how to address the gaps. See the WMO website for more details: https://community.wmo.int/rolling-review-requirements-process

24. The ability to move towards more environmentally sustainable observing systems and practices may not be feasible for several reasons. In your organization, what are the main challenges that limit the implementation of more environmentally sustainable observing systems and practices? (Rank in order of importance)

    A. Cost prohibitive

    B. Availability of viable solutions

    C. Operational feasibility

    D. Regulations

    E. Regional/location based environmental considerations (e.g. remoteness, unique climates, mountainous regions)

    F. Other _____

25. One of the proposed outcomes of this WMO project is to generate Statements of Guidance[5] for implementing more environmentally sustainable observation standards, technologies and methods. Are you supportive of these Statements of Guidance being used to inform the Vision for WIGOS in 2040? (Yes/No/Do not know)

    If no, please share your concerns.

26. This survey has asked many questions surrounding methods of observations and ways to reduce their environmental impact. Are there any opportunities or best practices that your organization would like to highlight for improving the environmental sustainability of observing systems and practices?

27. Thank you for dedicating the time and expertise required to complete this survey. Are you or someone from your organization willing to participate in follow-up activities and participate in generating recommendations on environmental sustainability of observing systems and practices associated with GBON implementation? (Yes/No)

    If yes, please add contact information:

    Name:

    Title:

    Organization:

    Email:

_____